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# PROCEEDINGS
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Number 1

A HISCOCK PRIMER

Number 2

GENESEE VALLEY GLACIAL AND POSTGLACIAL GEOLOGY
FROM 50,000 YEARS AGO TO THE PRESENT:
A SELECTIVE ANNOTATED REVIEW

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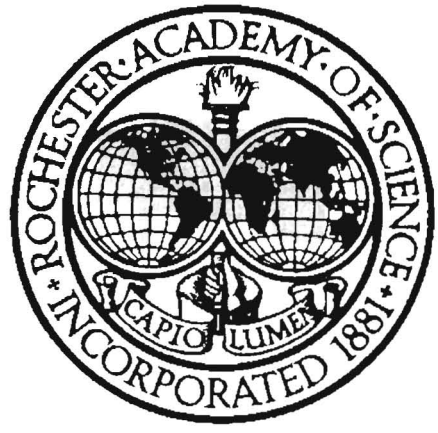
October 2012



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# PROCEEDINGS

OF THE
ROCHESTER ACADEMY OF SCIENCE

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# A HISCOCK PRIMER

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The past draws us. Perhaps we see it as a simpler time, one less threatening than our own, since we know how things turned out. Or, we may crave the lessons it offers us from those who have already gone where circumstance may yet lead us. Or yet again, we could be drawn by the possibility of intriguing discoveries, similar to opening an old chest in our grandparents' attic.

We return to the past usually by reading about it, or listening to the accounts of those who have studied it enough to be considered residents of their selected times. But what is more immediate than actually seeing and touching objects from another age, even one so remote that we grow dizzy looking back that far?

The Hiscock Site lies in the Town of Byron, Genesee County, New York (Laub, DeRemer, Dufort & Parsons, 1988). It is western New York's own La Brea Tar Pits, one of those rare spots where geography, geology, and time have collaborated to give us a startlingly rich trove of objects that were witnesses to another time. These bones, plants and artifacts, many predating the Pyramids by 5,000 years and more, contain answers to questions we haven't even learned to ask yet.

Having reached its high-water mark around 20,000 years ago, the great ice sheet that covered much of North America during the Ice Age (in which we still live) began melting back. By about 13,000–12,500 radiocarbon years ago it had receded from the latitude of northern Genesee County, New York (Calkin & Feenstra, 1985). In the process it left behind a basin in the Town of Byron, one slightly less than two acres in area. We're uncertain how this basin came to be, but it contains within it, and associated with it, topographical features with approximately the same trends as the neighboring drumlins. This suggests that the basin may reflect scoured glacial grooves, similar to those seen today on Kelley's Island in Lake Erie.

As the glacier receded, meltwater accumulated against its front, forming a large pro-glacial lake. The quiet floor of this lake was covered by fine silt and clay, the "rock flour" produced as stones incorporated in the glacier during its southward journey were ground against other stones. Some of these larger rocks were freed from the main ice sheet as bergs calved off of the glacial front and floated out onto the lake. As they melted, the gravel, pebbles and boulders they bore sank to the lake floor and became incorporated into the silt and clay. The boulder-rich ground moraine and lake sediments left in the wake of the retreating ice sheet are referred to as the Cobble Layer at the Hiscock site, and they constitute the "basement" on which the fossil– and artifact-bearing deposits lie.

Eventually, as the glacier continued to recede northward, low lands were exposed that allowed the pro-glacial lake to drain out of its temporary basin between the glacial front and higher lands to the south. The water remaining in the basin may have become considerably shallower. Currents from some unknown source winnowed away the highest levels of silt and clay, leaving the cobbles behind, concentrated in areas of the basin into a sort of armor resembling a cobblestone road (Figure 1).

Then, sometime before 11,500 radiocarbon years ago, spring flow became the dominant geological agency affecting sedimentation in the basin. The sediment that now began to accumulate, termed the Fibrous Gravelly Clay (Figure 2), was apparently derived largely from reworking of the lake and ground moraine deposits that already existed in the basin. This conclusion is based on the close similarity between the earlier sediments and those deposited by the springs. There are two major differences,

Figure 1. Top of the Cobble Layer exposed in the floor of a pit at Hiscock. The tight packing of the cobbles is typical of the more marginal areas of the basin.

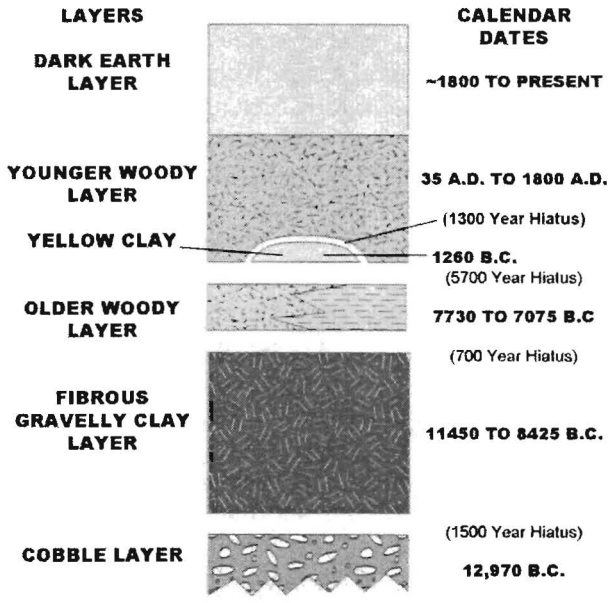


Figure 2. Stratigraphic column for the Hiscock Site. Gaps represent an absence of deposits for a given time interval.

however, between them. The lake sediments have a bluish-grey cast, reflecting rapid burial under reducing (oxygen-poor) conditions. The later, spring-derived sediments usually have a brownish color, reflecting oxidizing conditions due to extensive exposure to the air. This would be expected if they were deposited in shallow water, and possibly churned up and redeposited by currents. Also, while the lake sediments contain little organic material other than pollen grains, the spring-deposited sediment contains abundant fragments of conifer twigs, as well as cones of white spruce and jack pine. (More on these plant remains in a bit.)

The spring-laid sediments herald the first appearance of fossil bone in the basin. The earliest radiocarbon dates on these bones, around 11,500 years old, come from caribou antler fragments, suggesting that these animals were among the pioneer species entering the area following glacial retreat.

Far and away, however, the most abundant remains are bones and teeth of *Mammut americanum*, the American mastodon. This species, a distant cousin of the living elephants and of the various extinct elephant species that we call "mammoths," was common in the conifer forests that cloaked the Northeast. It was also, however, found throughout North America, from Alaska south at least to central Mexico, ranging across several vegetational zones and thus reflecting a highly adaptive nature.

Hiscock has so far yielded the remains of at least 15 mastodons, and quite possibly several times that number. These include adult males and females, as well as juveniles. More than a hundred mastodon teeth have been found, but not one from a mammoth. We know that mammoth lived in western New York at about this time, but for some reason they avoided, or were excluded from, the Hiscock Site.

Does this great accumulation of mastodon remains reflect a mass-death event? The evidence indicates that it does not. University of Michigan paleontologist Daniel Fisher refined a technique that has allowed him to analyze the growth increments of several tusks. These increments are like conical drinking cups inserted within one another, the last one forming the wall of the pulp cavity at the end that fit into the skull. The spacing of these increments changed with the seasons, and the final ones inside the pulp cavity tell the season of death. Of the tusks examined, representing six individuals, the deaths had occurred in the early winter, late winter, two near the winter-spring boundary, mid-spring, and summer. This suggests that the assemblage of bones accumulated through occasional deaths spread across an expanse of time. Radiocarbon dates taken directly from mastodon remains range from 11,033±40 to 10,430±60 rcyBP (radiocarbon years before present), a tusk and tooth, respectively.

This second date is rather young for mastodon, for which ages post-dating 10,800 years are unusual. There is, however, evidence suggesting that this species may have survived even longer in the Great Lakes area. The layer containing mastodon bones is suffused with short segments of conifer twigs. In the early 1990's we did a study that included comparison of these twigs with the contents of elephant droppings (Laub, Dufort & Christensen, 1994). The physical condition and size–frequency distribution matched closely, suggesting that the twigs were disaggregated droppings from living mastodons, and gastrointestinal content from dead ones. Subsequent observations strongly support this view (e.g., Griggs & Kromer, 2008). Remarkably, while dates on some of these twigs fall within the same range as the mastodon bones and ivory, two twigs gave even younger dates: 9475±95 and 9205±50 rcyBP, a hint that a population of mastodon may have endured in the lower Great Lakes beyond the extirpation of the species from most other regions.

Other fossil remains enrich our picture of the late Ice Age fauna here. Herds of caribou ranged through the area. The stag-moose, *Cervalces*, an extinct elk-like animal the size of a moose, similarly came to the basin. A single tooth is the sole record in New York State of the long-nosed peccary, *Mylohyus,* a species that was far more common in the southeastern states. *Castoroides*, a beaver nearly the size of a black bear, left a giant incisor tooth at the site. The foot bone of a hare, anything but impressive visually, represents the first fossil remains of a lagomorph from Ice Age New York.

A major surprise was the California condor (Steadman & Miller, 1987), the largest land bird in North America today. This species, which until recently teetered on the verge of extinction, previously had a fossil record limited to areas of the United States and northern Mexico with subtropical and warm-temperate climates. The Hiscock discovery shows that this was actually a pretty tough bird, adaptable to peri-glacial conditions, and this has caused ornithologists to reconsider the reason for its dramatic range reduction.

## ICE AGE PEOPLE AT HISCOCK

One of the many fascinating things about the Hiscock Site is the presence of human artifacts associated with the Ice Age animal remains. These were left by some of the earliest people to inhabit our

region, people whose everyday experiences included animals now long extinct, and sights and conditions quite different from those we know today. At this time, the glacial front lay about 150 miles north of present Toronto, and these people, whom scientists refer to as "Paleoindians," doubtless had either seen this wonder, or at least carried memories of it in their folklore.

We have found six of their signature fluted points, bifaced spearheads that bore a channel on either side for hafting onto a shaft (Ellis, Tomenchuk & Holland, 2003). It's interesting, however, that none of these finished its life as a projectile point. All had been modified, sometimes after breakage in use, into alternative tools, primarily knives and scrapers (Figure 3). Beyond these there are pieces of bone, tusk and antler that had been formed into simple tools (Tomenchuk, 2003) (Figure 4). They were probably made quickly, at the moment of need, rather like us sharpening a stick found in the woods and using it to skewer and cook a hot dog. Bone tools are absent or, at best, rare at other Paleoindian sites. Hiscock has so far yielded 17 of them. There are, however, probably many more, as only a small portion of the Ice Age collection has been examined for them.

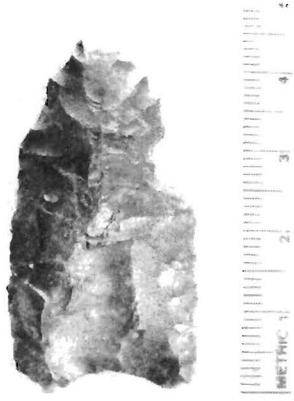

Figure 3. A Paleoindian fluted point. While this may have originally served as a projectile point, it was subsequently modified into a "gutting knife," a tool for removing the hide from prey animals.

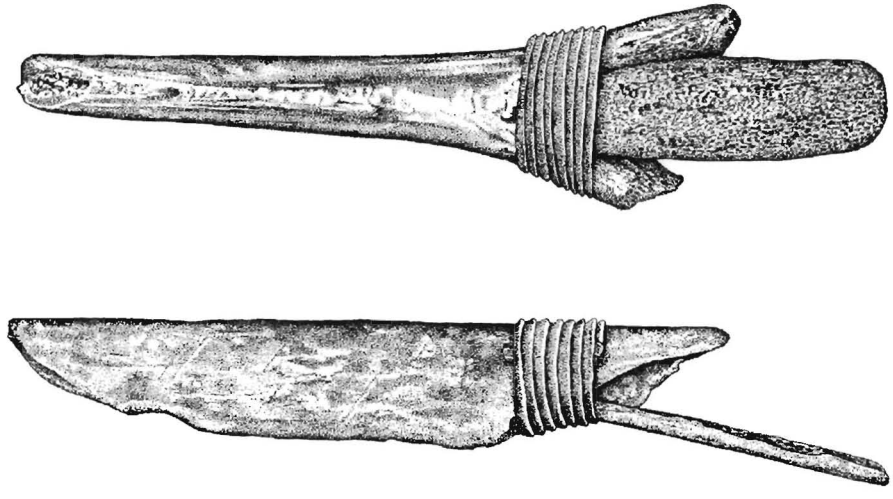

Figure 4. A hypothetical Paleoindian hide scraper. This is a composite of two mastodon bone fragments from a rib and a vertebra, found at the Hiscock Site.

The pattern of lost or discarded artifacts suggests that their owners didn't live for extended periods at the site. Rather, they appear to have belonged to small parties dispatched from the main habitation area, remaining at the basin only long enough to carry out specific tasks. Analysis of the tools suggests that butchery and hide-working were among these tasks.

Around 9,000 to 10,000 radiocarbon years ago, the spring activity diminished considerably, and the water in the basin became more stagnant. The forest, no longer held back by browsing mastodons, closed in around the basin. Initially, conifers, particularly white pine, spruce and tamarack, dominated these forests. Later, probably sometime around 7,000 radiocarbon years ago, the nature of the forest changed, and broadleaf trees such as beech, ash and elm became dominant.

The sediment that accumulated in the basin was now peat, soil containing a high percentage of incompletely decayed plant material. The oldest component, a fine-grained peat called the Older Woody Layer, dates to somewhere between 8,000 and 9,000 rcyBP. The Younger Woody Layer, consisting of coarser peat, dates from 1,000 or 2,000 rcyBP until about 200 years ago. Between these two horizons occurs the Yellow Clay, a burn layer reflecting a forest fire that raged through the basin 3,000 years ago. Clearly there are sizable chunks of chronology missing from the post–Ice Age record. Here, however, is where the soft nature of the soil is a blessing, because objects from the missing periods were often preserved by being intruded into the existing older layers. For example, we found a log of ash (*Fraxinus*) that had jammed vertically, deep into the Ice Age layers. Probably a branch that fell from a large tree, it dated to 4500 rcyBP, thus telling us something about the missing years at Hiscock.

A typical forest fauna of mammals, birds (the richest fossil avifauna in the Northeast) reptiles and amphibians lived in this forest, leaving an extraordinarily abundant array of bones in the post–Ice Age peat. It is rarely possible to attach a specific age to these remains, other than that they post-date the Ice Age, belonging to the last 10,000 years. There are, however, a few specimens for which radiocarbon dating has given us more precise ages. Two elk bones have yielded dates of 8620±50 and 6220±85 rcyBP, and a deer bone dated to 7880±90 rcyBP. Passenger pigeon, black bear, and beaver remains found in the 8000 to 9000 rcyBP peat of the Older Woody Layer may belong to that period. On the younger end of the scale, a southern flying squirrel bone yielded an age of 445±25 rcyBP.

Early European settlers of the Northeast reported vast flocks of passenger pigeons that sometimes took several days to fly by. Whether these accounts are exaggerations or not, Hiscock does have something to say about this issue. Bones of passenger pigeons are extraordinarily abundant, more so than those of the other 34 post-Pleistocene bird species combined. Remains of deer and elk, successors to the Pleistocene "megafauna," are also numerous.

Following is a list of species that inhabited the virgin forest of the Holocene, as attested by the presence of their bones in the Woody Layer:

**Mammals:**

Insectivores:
- short-tailed shrew (*Blarina brevicauda*)
- star-nosed mole (*Condylura cristata*)
- hairy-tailed mole (*Parascalops breweri*)

Carnivores (meat-eaters):
- raccoon (*Procyon lotor*)
- short-tailed weasel (*Mustela erminea*)
- mink (*Mustela vison*)
- fisher (*Martes pennanti*)
- black bear (*Ursus americanus*)

Artiodactyls (cloven-hooved mammals):
- elk (*Cervus elaphus*)
- white-tailed deer (*Odocoileus virginianus*)

Rodents:
- southern flying squirrel (*Glaucomys volans*)
- northern flying squirrel (*Glaucomys sabrinus*)
- woodchuck (*Marmota monax*)
- gray squirrel / fox squirrel (*Sciurus carolinensis / niger*)
- eastern chipmunk (*Tamias striatus*)
- red squirrel (*Tamiasciurus hudsonicus*)
- American beaver (*Castor canadensis*)
- white-footed mouse / deer mouse (*Peromyscus leucopus / maniculatus*)
- meadow vole (*Microtus pennsylvanicus*)
- muskrat (*Ondatra zibethicus*)
- southern bog lemming (*Synaptomys cooperi*)
- porcupine (*Erethizon dorsatum*)

Lagomorphs (rabbit-like mammals):
- snowshoe hare (*Lepus americanus*)
- eastern cottontail (*Silvilagus floridanus*)

**Birds:**

Birds of prey and scavengers:
- Cooper's hawk (*Accipiter cooperii*)
- red-shouldered hawk (*Buteo lineatus*)
- red-tailed hawk (*Buteo jamaicensis*)
- barred owl (*Strix varia*)
- great horned owl (*Bubo virginianus*)
- common raven (*Corvus corax*)
- turkey vulture (*Cathartes aura*)

Non-passerine grain-eaters:
- ruffed grouse (*Bonasa umbellus*)
- wild turkey (*Meleagris gallopavo*)
- greater prairie chicken (*Tympanuchus cupido*)
- passenger pigeon (*Ectopistes migratorius*)

Non-passerine insect-eaters:
- yellow-shafted flicker (*Colaptes auratus*)
- yellow-bellied sapsucker (*Sphyrapicus varius*)
- downy woodpecker (*Picoides pubescens*)
- yellow-billed cuckoo / black-billed cuckoo (*Coccyzus americanus / erythrophthalmus*)

Passerine omnivores:
- blue jay (*Cyanocitta cristata*)
- gray catbird (*Dumetella carolinense*)
- American robin (*Turdus migratorius*)
- northern oriole (*Icterus galbula*)
- common grackle (*Quiscalus quiscula*)

Aquatic omnivores:
- Virginia rail / sora (*Rallus limicola / Porzana carolina*)
- common moorhen (*Gallinula chloropus*)
- American coot (*Fulica americana*)
- solitary sandpiper (*Tringa solitaria*)
- mallard / black duck (*Anas platyrhinchos / rubripes*)
- wood duck (*Aix sponsa*)

Canada goose (*Branta canadensis*)
American wigeon (*Anas americana*)
gadwall (*Anas strepera*)
pintail (*Anas acuta*)
shoveler (*Anas clypeata*)
green-winged teal (*Anas crecca*)
blue-winged teal (*Anas discors*)
dabbling ducks (*Anas* sp.)
redhead (*Aythya americana*)

**Reptiles and Amphibians:**
common snapping turtle (*Chelydra serpentina*)
spotted turtle (*Clemmys guttata*)
wood turtle (*Clemmys insculpta*)
painted turtle (*Chrysemys picta*)
snakes
frogs
toads

One of the most surprising and intriguing discoveries at Hiscock is the remains of a dog. More than 70 bones, bone fragments, and teeth were found scattered over 50 square meters, with an outlying specimen about 8 meters from the main cluster. These fossils, analyzed by Toronto zooarchaeologist Stephen Cox Thomas, appear to come from a single animal that was butchered and at least partly eaten, and that may have then been interred (Thomas, 2003). The bones date to 5110±150 rcyBP, which equates to slightly less than 6,000 calendar years old.

The presence of a dog infers the presence of humans, and indeed Holocene stone artifacts have been unearthed here. Seven projectile points range in age from Early Archaic to Late Woodland. It is noteworthy that the basin contains considerably more late Pleistocene (Paleoindian) artifacts, spanning several hundred years, than post-Pleistocene (Archaic and Woodland) artifacts, spanning nearly 10,000 years. This suggests that the basin was perceived and used by Holocene people differently from their late Pleistocene predecessors.

American settlement of the area began around 1810. The forest was gradually cut down and the land cleared for agriculture. The Dark Earth layer, which caps the stratigraphic sequence at Hiscock, appears to `reflect this final period, and its thickness, compared with that of the underlying Woody Layer, indicates that the rate of slope erosion increased by at least a factor of 20 when the tree cover was removed and plowing began. Large pieces of wood are no longer abundant in the peat, and items of "European" origin begin to appear. These include glazed ceramic sherds, glass, pieces of brick, coal, nails, bullets, wooden and leather objects, buttons, fragments of smoking pipes, remains of sheep and horse, and a cobble-filled drainage ditch. The nature of these materials indicates that they were deposited here over a broad period of time, rather than in a single event. We are in the process of trying to understand the source from which they came, and what they have to tell us about the people who left them, their activities, and how their lives changed over the past 200 years.

Hiscock has made valuable contributions to our understanding of the past 13,000 years of this region's history. A partial list of these would include (1) the presence of the California condor; (2) one of the richest troves of Paleoindian bone artifacts known; (3) an Ice Age stone bead; (4) early evidence of the diet of mastodons; (5) one of the oldest pieces of evidence of textile-making east of the Mississippi River (minimally 7,900 rcyBP, and possibly older); (6) the presence of mammal species not previously reported from the New York Pleistocene; and (7) evidence of a previously unknown severe drought in the late 1400's AD that lasted for at least 15 years.

Hiscock is also an excellent example of how complex stratigraphic relationships can be, and how easily this can lead to erroneous interpretations. I have offered examples of this (Laub, 1998), and the cardinal lesson that it teaches: No matter how firm one's conclusions may seem, there is value in continuing to gather data, re-evaluating it, and keeping an open mind to alternative interpretations.

**ACKNOWLEDGEMENTS**

The Hiscock excavation project has been supported primarily through funding from the Buffalo Museum of Science and the George G. and Elizabeth G. Smith Foundation of Buffalo. The land on which the site is located was given to the Museum by the Hiscock Family to ensure the continuation of this project and its benefits to science and the public.

The site has been excavated annually since 1983 by hundreds of volunteers, ranging in age from 13 to over 80. The dedication of these people, who labor and endure through blistering heat, storms, and 12-hour days, is a perpetual source of wonder and inspiration to me. Without them, there never would have been a Hiscock excavation project, nor the volume of new knowledge that project has yielded. And my life would have been much the poorer without the privilege of knowing and working with them.

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# GENESEE VALLEY GLACIAL AND POSTGLACIAL GEOLOGY FROM 50,000 YEARS AGO TO THE PRESENT: A SELECTIVE ANNOTATED REVIEW

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## INTRODUCTION

The global chronology for The Pleistocene Epoch, or "ice age," has been significantly revised during the last three decades (Alley and Clark, 1999) as a result of the extended and more accurate data provided by deep sea drilling projects, ice core studies from Greenland and Antarctica (Andersen et al. 2006; Svensson et al. 2008), oxygen isotope studies of marine sediments, and climatic proxy data from lake cores, peat bogs, and cave stalactites. These new data have improved our ability to match the Earth's Milankovitch orbital cycles to the improved ice core and radiometric chronologies (ages based on radiocarbon, U-Th, U-Pb). However, the Milankovitch theory has recently been the subject of renewed controversy, and not all cyclical climatic phenomena are directly reconcilable with Milankovitch's original ideas (Ridgwell et al., 1999; Ruddiman, 2006). Overall, it is evident that there must have been as many as 20 or more glacial cycles in the last 2.5 million years, not all of which necessarily resulted in the expansion of large ice sheets as far south as the United States–Canadian border.

The International Union of Geological Sciences recently adopted a change for the Pliocene-Pleistocene boundary, extending the beginning of the Pleistocene Epoch back from 1.8 to 2.588 million years Before Present (BP). The average length of the most recent glacial-interglacial cycles (also known as "Stages") is on the order of 100,000 years, with 10,000 to 15,000 years being the approximate length of the interglacial warm episodes between the longer cold cycles (also known as cold stadials and warm interstadials). Although a wide variety of geologic studies has improved the chronology of major terrestrial and oceanic climatic oscillations during the youngest "late" Wisconsin Stage of the Pleistocene Epoch, there are still unanswered questions concerning the causes of shorter climatic cycles such as Heinrich Events and Dansgaard-Oeschger Cycles, as well as unique climatic excursions, such as the Younger Dryas cold period around 12,000 years ago (Voelker, 2002).

The middle and late Wisconsin glacial history of the Genesee Valley (Figure 1) has been extended back approximately 50,000 years by the dating of glacial and interglacial sediments, as well as wood samples recovered from water well drill holes, and by a complex stratigraphic record preserved in two adjacent gravel excavations on the west bank of the Genesee River near its confluence with Honeoye Creek (Young and Sirkin, 1994; Young and Burr, 2006). The glacial history has been extended back through a middle Wisconsin ice advance that occurred approximately 35,000 years ago to a warmer interstadial episode that peaked globally around 50,000 years ago. This middle Wisconsin ice advance buried interstadial spruce trees growing on the ancestral Genesee floodplain that have finite radiocarbon ages as old as 48,800 $^{14}C$ years BP and extending slightly beyond the range of conventional radiocarbon dating (Young and Burr, 2006).

The postglacial Genesee River floodplain history also has been extended back nearly 15,000 calendar years from analyses of wood samples buried by a prehistoric landslide near Avon, NY (Young, 2003). Historic human impacts on the Genesee River floodplain at the surface and from underground salt mining are significant and ongoing (Young, 2003). This brief review cites critical peer-reviewed

references that contain the details of the glacial history of the Genesee Valley and of the adjacent Great Lakes and eastern North America, as well as some of the most relevant concepts, chronology and climatic data that are essential to understand the local glacial history within a broader global perspective.

## WISCONSIN GLACIAL HISTORY

Although the most recent Wisconsin Stage of the Pleistocene Epoch lasted approximately 100,000 years, most of the depositional glacial features (drumlins, moraines, kames, kettle lakes, eskers, outwash channels, proglacial lake shorelines) that modify the older bedrock landscape of New York State were only formed during the late Wisconsin glacial advance and recession, between approximately 21,000 and 12,500 $^{14}C$ years BP in upstate New York (see endnote on radiocarbon dating conventions and calendar year conversion). The late Wisconsin glacial episode essentially ended in New York State when the Laurentide ice sheet melted back from the latitude of the glacial Lake Iroquois shoreline (Ridge Road) into the Lake Ontario Basin. Lake Iroquois drained rapidly when the ice sheet finally melted back from the northern Adirondack Mountains (Covey Hill spillway) and opened the St. Lawrence Valley for glacial meltwater to escape directly to the Atlantic Ocean, rather than following its earlier eastward routes through the Hudson and Mohawk Valleys or westward into the glacial predecessors of Lake Erie. Reviews of the Wisconsin glacial history of the eastern Great Lakes and eastern North America can be found in Karrow and Occhiette (1989), Karrow et al. (2000), Muller and Calkin (1993), Muller and Prest (1985), and Morner (1971), as well as in the numerous references therein. During the final retreat of the Late Wisconsin ice sheet a series of 14 progressively larger and lower proglacial lakes formed in the Genesee Valley (Fairchild, 1904, 1928), a sequence of events that is reviewed and updated in Muller et al. (1988).

The last major glacial lake stage that submerged part of the lower Genesee Valley was Lake Iroquois (~435 ft. ASL, ~130 m ASL, near Rochester), after which Lake Ontario dropped significantly below its current elevation (246 ft. ASL, 75 m ASL) to a level currently referred to as "early lake Ontario," a lake stage whose exact age and lowest elevation have been somewhat uncertain (Muller and Prest, 1985). The surface water level of this early Lake Ontario stage at Irondequoit Bay was at least 140 ft below current lake level, as documented by borings for the Town of Webster well field, the Irondequoit Bay bridge, and the new bridge foundation borings located on the Irondequoit Bay outlet sandbar (Young, 1983, 1988; Kappel and Young, 1989; Erdman et al., 1991). Anderson and Lewis (2012) have revised the water-level history for this low water stage in the Lake Ontario basin. Their comprehensive analysis indicates that Lake Ontario occupied a closed basin, disconnected from an outlet to the Atlantic Ocean for approximately 4,000 years beginning 12,300 calendar years BP during a relatively dry climatic interval. Immediately prior to this time the lower lake level was confluent with the Champlain Sea, but the fresh water influx to the lake prevented it from becoming a marine environment. During the low, closed-basin stage, Lake Ontario's shoreline would have been as much as 50 to 60 meters (164 to 197 feet) below modern-day sea level.

Ongoing glacial rebound of the rising Ontario outlet threshold in the St. Lawrence Valley has gradually caused the southwestern Lake Ontario lake level to rise, creating the drowned shoreline features (embayments) that characterize the lakeshore from Sodus Bay westward to Buffalo (Muller and Prest, 1985; Young, 1983, 1998). In contrast, the northeastern shoreline of the lake has been elevated (emerged), thus shaping modern features such as the Thousand Islands. Contrary to some of the ideas of Fairchild and other early workers, marine waters (Champlain Sea) never dominated the St. Lawrence Valley further southwestward than the approximate longitude of Brockville, Ontario, immediately after the ice retreated, and before postglacial rebound of the land became significant. Differential postglacial rebound continues to tilt Lake Ontario toward the southwest at a rate that changes the relative shoreline elevations by almost one foot (30 cm) per century between the eastern and western ends of the lake.

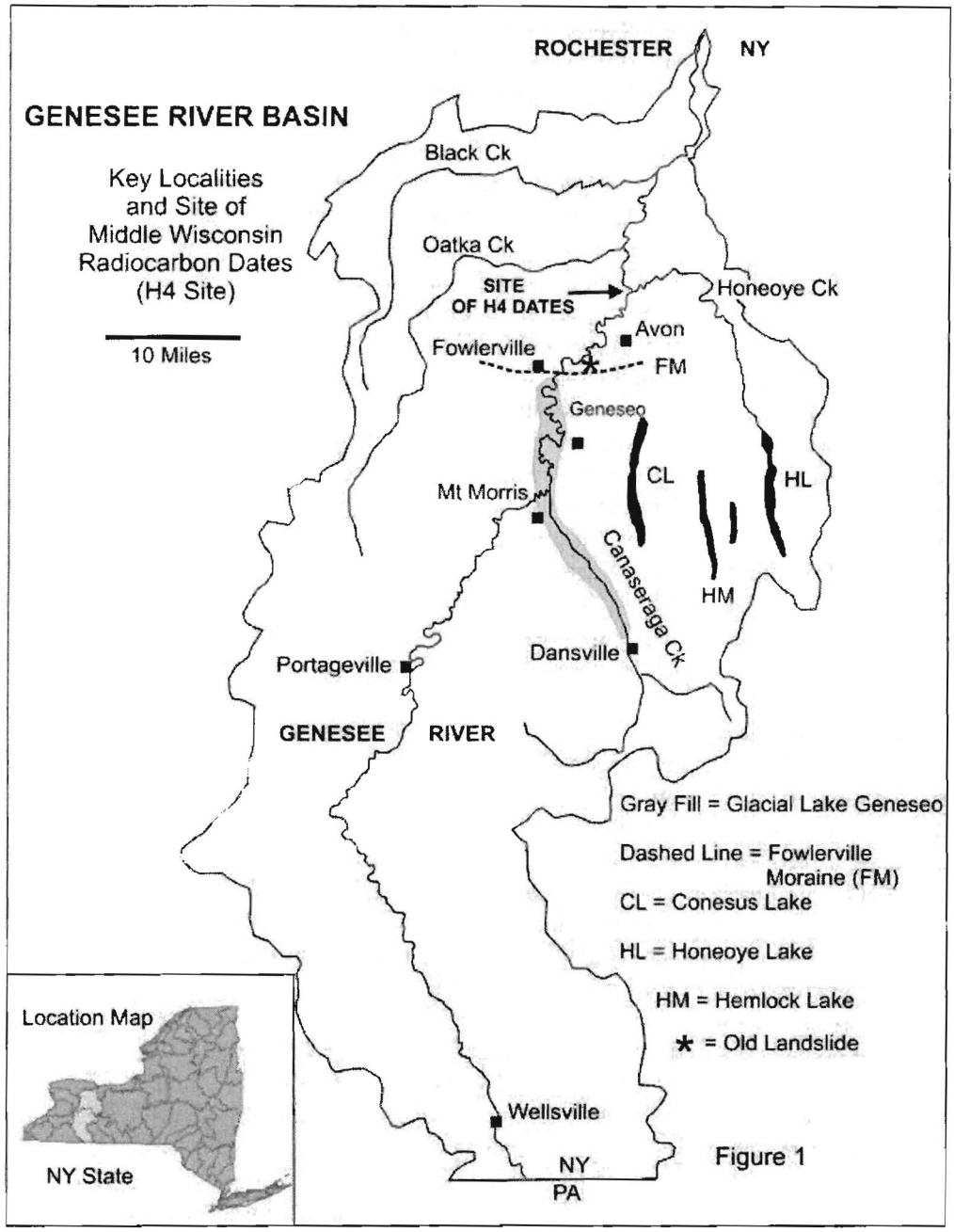


Figure 1. General location map with outline of Genesee River Basin and key locations discussed in text. (Scale bar: 10 miles = 16 km.)

The existing landforms in the Genesee Valley downstream from the postglacial Letchworth Park gorge were formed by a combination of ice advance (erosion), ice recession (deposition, including a widespread mantle of varved lake sediments and shoreline deposits), and subsequent modifications related to the effects of the modern Genesee River (fluvial erosion, floodplain deposition, landslides, historic deforestation, agricultural impacts, mining) (Young, 2003). The glacial landforms and glacial geology of the region and across the entire state may be examined on the 5 large sheets of the Surficial Geology Map of New York published in 1986 as New York State Museum Map and Chart Series #40 (Scale, 1:250,000).

## CORRELATION OF GLACIAL TERRESTRIAL AND GLACIAL MARINE RECORDS

The incomplete terrestrial chronology of continental glaciations has been gradually improved and reorganized using the more complete and combined climatic records from ice cap studies and from hundreds of deep-sea sediment cores. The ability to correlate the Pleistocene stratigraphic record from the deep-sea cores directly with poorly preserved terrestrial landforms (such as glacial moraines) is a more difficult and challenging task, given the sparse occurrence of organic remains that are preserved in the generally coarser and more oxidized continental sediments. The Genesee Valley near the Monroe-Livingston County border contains a unique and diverse continental record of organic remains that is contemporaneous with one of the best studied marine glacial events in the North Atlantic Ocean, Heinrich Event H4.

Seven thin sand layers, named Heinrich Events, and designated as H0 through H6, have been defined in North Atlantic Ocean sediment cores and are presumed to record seven distinct periods of extreme Laurentide glacier advances, or surges, accompanied by massive episodes of iceberg calving (Bond and Lotti, 1995). These massive iceberg discharges are tentatively attributed to an unstable thickening of the Laurentide ice sheet, which eventually results in basal-ice shear failure accompanied by a sudden outward surge of the ice margin. The result is a massive, but relatively short-lived, discharge of icebergs into the North Atlantic (Bond et al., 1992, 1993; Cortijo et al., 1997; Elliot et al., 1998). The southward drift and slow melting of these iceberg armadas disperses sandy glacial sediment that forms thin but pervasive sand layers encountered in the otherwise fine-grained sediments that characterize most deep-sea sediment cores. These Heinrich iceberg discharge events have been dated as occurring at the following approximate times ($^{14}$C years BP): H0 at 12,000; H1 at 17,000; H2 at 24,000; H3 at 31,000; H4 at 35,000; H5 at 45,000; and H6 at 60,000. A number of the younger Heinrich Events correspond to the approximate ages of the major dated glacial moraine sequences in the terrestrial glacial record of North America (Clark and Bartlein, 1995; Mooers and Lehr, 1997). In other words, the unusually prolific marine iceberg calving events correspond with terrestrial ice sheet advances that created some of the major glacial terminal and recessional end moraines. However, accurate radiocarbon dating of organic material is not feasible for events much older than 49,000 $^{14}$C years BP, and few glacial deposits older than 35,000 in eastern North America contain well-preserved and datable organic remains. Wood found in glacial tills generally has an uncertain age relationship to the encompassing sediments, due to the fact that glacial advances and associated till deposition can override and incorporate organic remains that are significantly older than the age of the till-forming ice advance (Young and Burr, 2006; Young, 2003).

Heinrich Event H4 (35,000 $^{14}$C years BP) is marked by a relatively thick detrital sand layer (2- to 4-inch range; 5–10 cm) in deep-sea cores. There is evidence in the ocean cores that it was a dual-pulsed glacial advance (sand layer with 2 distinctively coarser intervals). It is estimated by marine geologists to be as short as 250 years in duration, but may have impacted global climate for as long as 1000 years (Kirby and Andrews, 1999; Cortijo et al., 1997). The calendar age for circa 35,000 $^{14}$C years BP dates most likely falls somewhere between 37,000 and 39,000 actual calendar years BP.

Middle Wisconsin Site, Northern Livingston County

A complexly stratified glacial deposit in shallow gravel pit excavations adjacent to the west edge of the Genesee River floodplain in northern Livingston County, opposite the Genesee confluence with Honeoye Creek (Figures 1–3), was studied for over 10 years by the author (Young and Sirkin, 1994; Young and Burr, 2006). The site produced 68 radiocarbon dates with ages ranging between 30,000 and 49,000 $^{14}$C years BP on large wood fragments, mammoth bones, and miscellaneous organic materials (spruce cones, twigs, tiny pelecypod shells, small plant roots) all of which predate the most recent (late Wisconsin) ice advance in western New York. The late Wisconsin ice advance that created the terminal moraines in northern Pennsylvania and on Long Island occurred approximately 22,000 to 20,000 $^{14}$C years ago. Middle Wisconsin time in NY State is poorly defined but probably corresponds roughly to events spanning the time interval from ~30,000 to ~60,000 $^{14}$C years BP.

The unique middle Wisconsin glacial section in the lower Genesee Valley consists of an interstadial ancestral Genesee River floodplain deposit dominated by spruce trees between 49,000 and 36,000 $^{14}C$ years old and overlain by two separate gray glacial lake deposits, all of which underlie the red-colored glacial till of the better-known late Wisconsin ice advance (Figures 4–9). The two middle Wisconsin lake deposits are very close in age (circa 35,000 $^{14}C$ years BP), but are separated by a conspicuous gravel deposit that signifies a short interval of glacial retreat and coarse glacial outwash deposition (Figures 4, 5). The glacial lake sediments contain distorted annual varves that were subsequently converted to more homogeneous glacial tills (known as "deformation till") by the two associated short ice advances that had formed two consecutive proglacial lakes in the Genesee Valley (Elson, 1961). The two varved lake clay and silt deposits were subsequently overridden and deformed by two southward ice advances (Figures 4, 10). The close agreement of the ages of these two closely spaced ice advances with the established age of marine Heinrich Event H4 is convincing evidence that the dual glacial surges suggested by the marine sediment cores (two closely-spaced, coarse sand layers) were contemporaneous with terrestrial ice advances well inland from the North Atlantic margin. Prior to the publication of the details of this well-dated middle Wisconsin site in the Genesee Valley by Young and Burr (2006), Canadian geologists had long debated whether any ice sheet of middle Wisconsin age had ever advanced south of the latitude of Toronto (Hicock and Dreimanis, 1992a, 1992b; Eyles and Eyles, 1983).

Other proglacial deposits in the Cayuga Valley and from a site closer to Buffalo previously provided a few isolated $^{14}C$ ages for events close to the same middle Wisconsin interval, but the glacial events associated with those sites are not as clearly defined or as well documented as in the Genesee Valley study (Muller and Calkin, 1993). In summary, well documented evidence now exists for a middle Wisconsin ice advance that extended at least 20 miles (32 km) south of the Lake Ontario shoreline and that clearly preceded the classical late Wisconsin event that created most of the modern surficial glacial landforms. Additional evidence from other buried organic remains and dated wood from engineering and water well borings (Young and Burr, 2006) suggests that the record of middle Wisconsin glaciation is probably much more widespread, but is buried beneath glacial drift in the scoured bedrock valleys of the northern Finger Lakes region.

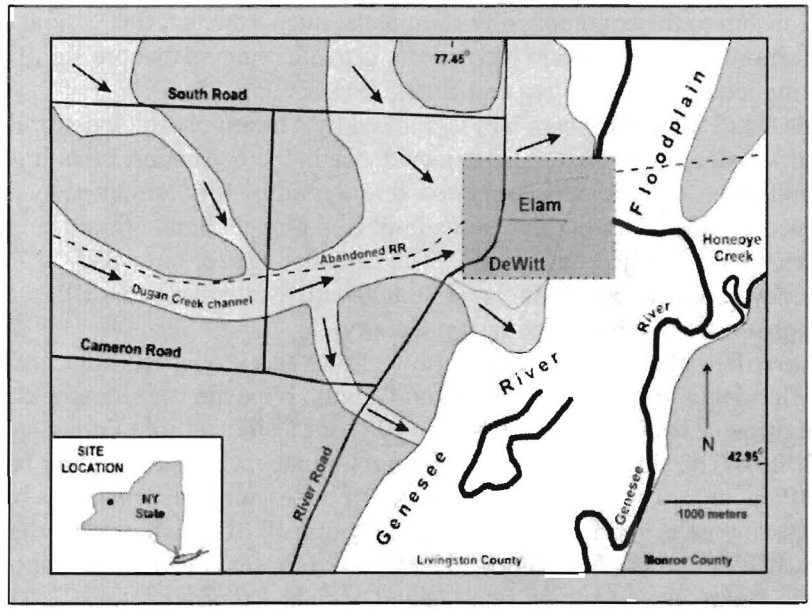


Figure 2. Location map for Elam-DeWitt middle Wisconsin glacial site (within dark gray square) in northern Livingston County. Arrows indicate flow of younger, late Wisconsin meltwater in well-preserved ice-marginal channels colored light gray. Modern flood plains of Genesee River and Honeoye Creek are shown as white.


Figure 3. South-looking aerial view of Elam and DeWitt gravel pit sites in northern Livingston County.

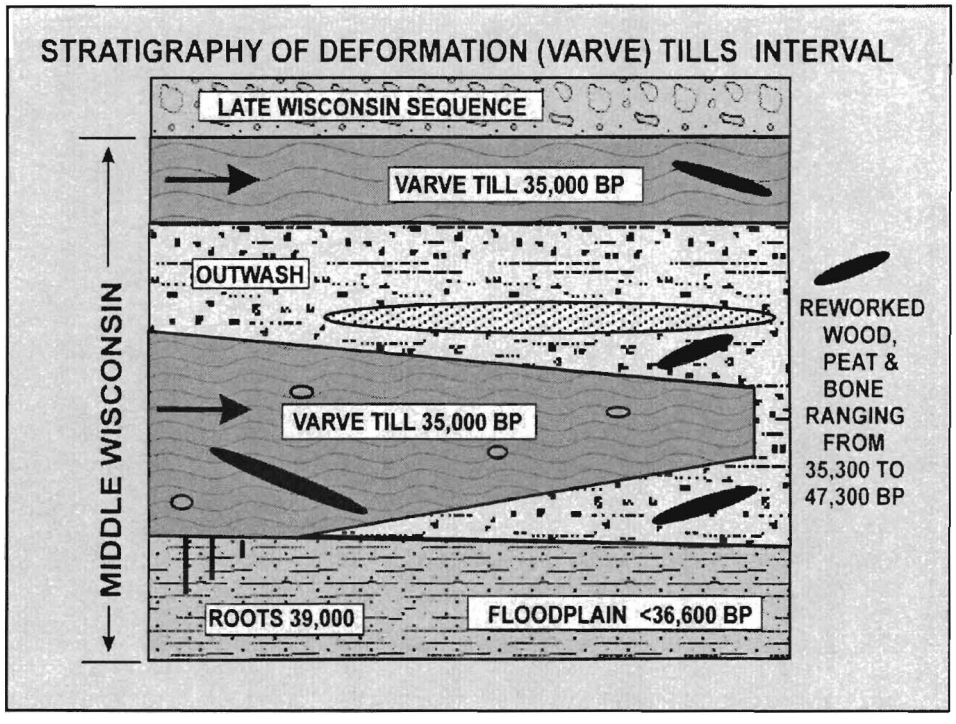


Figure 4. Diagrammatic section of middle Wisconsin glacial sequence showing the record of two glacial advances (gray varve deformation tills) surrounded by outwash gravels above ancestral Genesee River floodplain (bottom). Ages are in $^{14}C$ years BP.

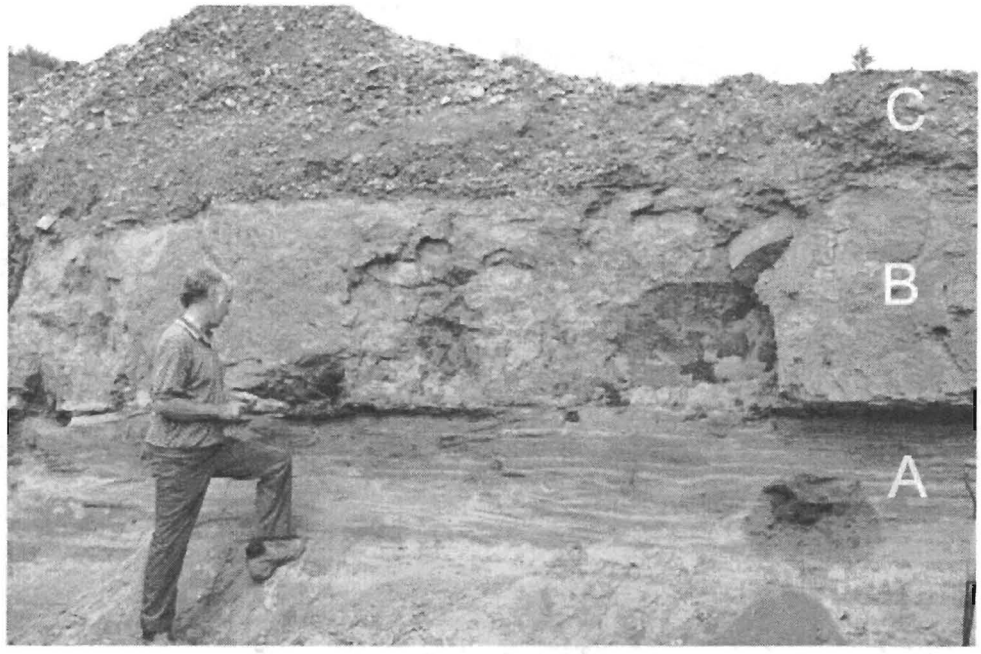


Figure 5. Author standing on stratified interstadial floodplain deposits (A) of ancestral Genesee River that are overlain by first gray deformation till (B) and capped by middle Wisconsin outwash gravel (C) at Elam site. Deposits A and C are brown from normal oxidation that tends to destroy organic remains. Deformation till (B) is gray indicating limited oxidation due to the fine grain size of the original lake clay sediment, and also accounts for the unusually complete preservation of the varied organic remains collected on site.


Figure 6. Close-up view of the contact between the interstadial floodplain sands (bottom) and overlying gray deformation till. The first gray clay layer at the base of the lens cap is the individual fine-grained sedimentary deposit from the first year of proglacial lake formation that killed (drowned) local vegetation, which in turn, formed the black organic-rich spots seen within this basal varve. Varve layers above the lens cap were remobilized into a more homogeneous deformation till by ice overriding the lake sediment at around 35,000 $^{14}$C years BP. See Figures 4 and 10.

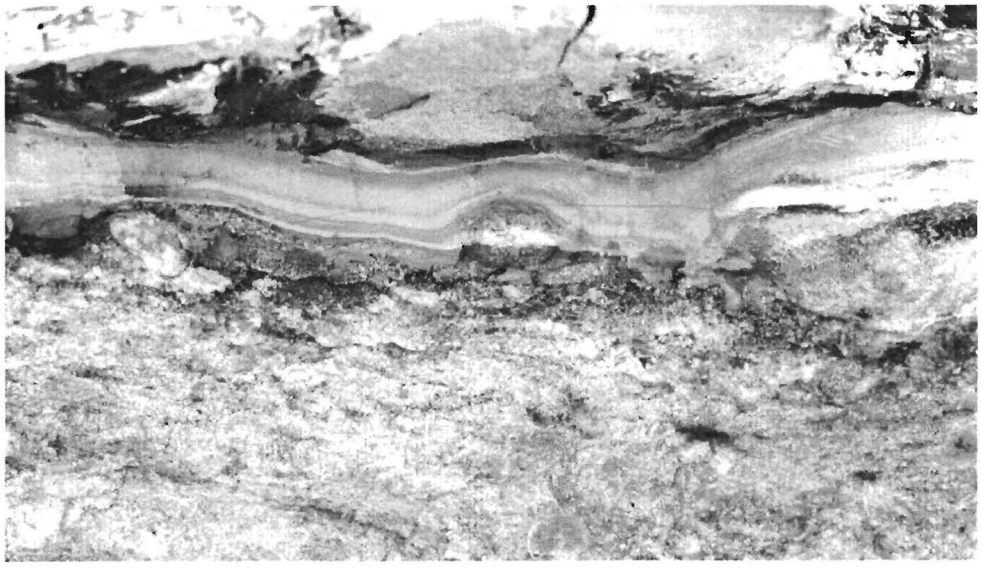

Figure 7. The contact between the interstadial floodplain sandy river gravel (bottom) and the overlying varved lakebeds at the base of lower deformation till. Note how the varves conform to the irregularities on the original floodplain surface and are draped over individual pebbles (center). This indicates that the lake-forming event involved slow sedimentation in a low energy environment as the advancing glacier dammed the ancestral Genesee River. The pebble near the center of the image is approximately two inches (5 cm) in diameter.

Figure 8. Contact between interstadial floodplain sands (bottom) and the basal varve of the initial proglacial lake sequence. This image clearly shows the nature of the organic-rich basal varve (layer with black spots near top of view). Vertical black root (center) is from a small reed-like plant that grew in the floodplain sediment before the 35,000-year-old ice advance, similar to annual plant growth seen on modern Genesee River point bars (Diagrammatic location of roots is shown on Figure 4). The organic remains of both the basal lake varve and the root were radiocarbon dated to obtain the relative age of the initial glacial lake (ice advance) compared to the age of the preexisting floodplain. The youngest organic remains found in the floodplain sediment were approximately 1000 years older than the 35,000-year-old basal lake sediment, which is in remarkable agreement, considering the random nature of the geologic preservation and the equally random collection and dating methods.

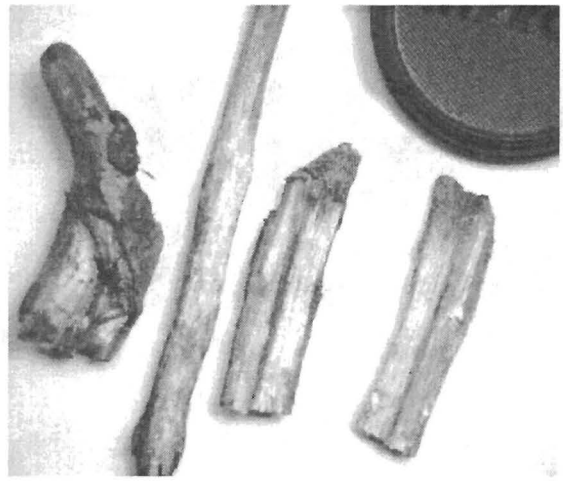

Figure 9. Fresh-looking, well-preserved nature of 48,000- year-old spruce wood collected from clay-rich till at Elam site. Natural wood colors rapidly turned black after a few hours exposure to air (oxidation). These old woody remains must have been buried in the older floodplain sediments, scoured by the advancing ice, and then released into the proglacial lake during the first ice advance. Water-logged wood in such an environment would sink to the lake floor and be buried by sediment. Such conditions can be seen in modern glaciers where they advance across and erode older surface deposits. Camera lens cap in upper right indicates scale.

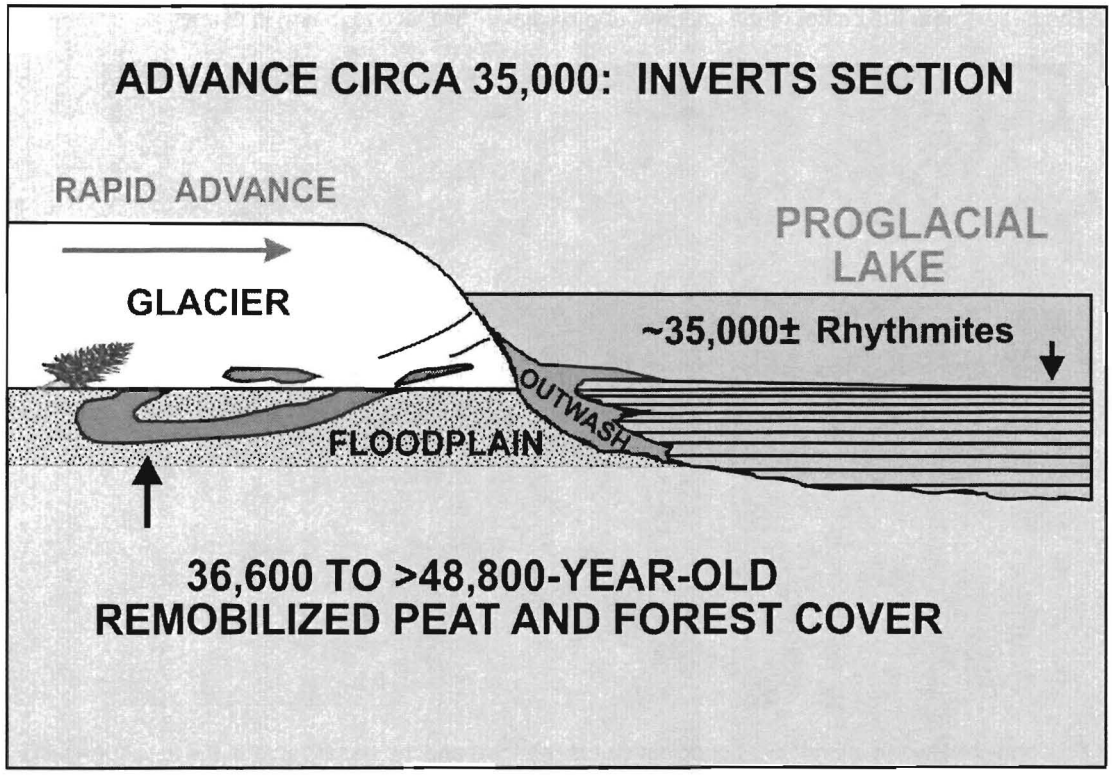


Figure 10. Diagrammatic view of how an hypothetical ice advance creates a deformation till from varved lake clays (rhythmites) and causes inversion of radiocarbon ages (older wood pushed onto top of younger lake material). Darker gray layer being dragged by advancing glacier represents woody peat of floodplain deposits later scattered throughout till layers. "Rhythmites" is a term that is used when it is not clear whether the layers preserved are produced by annual sedimentation events (storm activity in lakes also can sometimes create multiple varve-like layers). Annual glacial varves usually contain finer-grained winter layers alternating with coarser summer layers.

## LATE GLACIAL AND POSTGLACIAL HISTORY OF THE GENESEE VALLEY

Floodplain sediments such as those of the Genesee River usually contain a detailed sedimentary record of the erosional and depositional history averaged over a large region. In the absence of bogs or lakes, such fluvial sediments often contain the best local records of climatic variability, archaeology, and tectonic history. Such histories are admittedly incomplete and require sophisticated sampling techniques and detailed analyses to accurately interpret the geologic history. The postglacial history of the Genesee Valley is preserved within approximately 50 feet (15 m) of fluvial sediments that cover the glacial drift within the confines of the modern Genesee River floodplain.

Detailed studies of floodplain erosion and deposition rates for Monroe County and for the US Army Corps of Engineers include 55 new $^{14}C$ ages on organic materials collected from within the floodplain sediments (Young 1997, 2003). The oldest dates in these floodplain studies come from a prehistoric landslide on the east bank of the Genesee River near Avon, NY, that occurred nearly 15,000 calendar years before the present (Figure 1) (Young, 2003). This landslide buried small trees that are preserved within 2 feet (60 cm) of the current channel bed elevation of the Genesee River (Figure 11a, 11b). The adjacent river channel is eroded into glacial varves at this site. This demonstrates that the Genesee River had carved its channel through glacial drift essentially to its present depth at the time of the landslide and only a short time after the late Wisconsin ice sheet is known to have receded from the northern border of Livingston County. This landslide site is on the northern edge of the large Fowlerville moraine complex that fills much of the valley between Geneseo and Fowlerville (Figure 1). The river floodplain is quite narrow (1000 ft., 305 m) through this long morainal reach due to the greater erosional resistance of the glacial till exposed by the 1973 Oxbow Lane landslide (Young, 1973; Muller et al., 1988). This broad, nearly featureless moraine created glacial Lake Geneseo (Figure 1), the last glacial lake stage in the central part of the Genesee Valley (Muller et al., 1988). Lake Geneseo extended from the edge of the Fowlerville moraine southward nearly to Dansville, and was probably no deeper than 120 feet (37 m) (Muller et al. 1988).

Figure 11a. Prehistoric landslide deposit on Genesee River bank near Avon, NY.

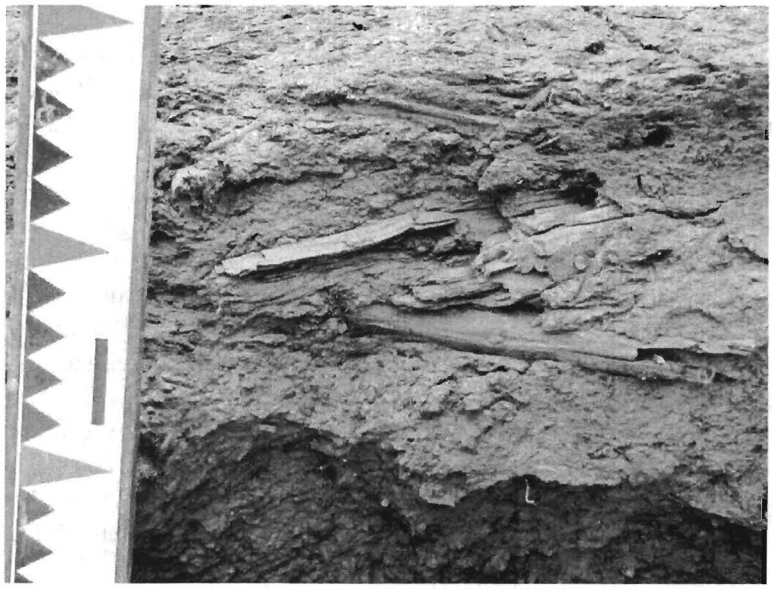

Figure 11b. Close-up view of trees buried by landslide in 11a. Large arrows are 6 inches (15 cm) apart.

The age and depth of postglacial erosion at the prehistoric Avon landslide indicate that glacial Lake Geneseo could not have been a long-lived feature. Glacial Lake Geneseo would have drained as soon as the Genesee channel had eroded deeply enough to cause the landslide. Thus the river must have eroded entirely through the Fowlerville moraine to its present level by 15,000 years ago, within a few hundred years of the age of the estimated ice sheet recession from this latitude. Furthermore, the modern elevation of the river channel at the foot of the prehistoric landslide indicates that erosion (lowering) of the channel bed over the past 15,000 years since the landslide occurred has been minimal (~2 feet, 60 cm). This suggests that lateral reworking (not downcutting) of fluvial sediment within the upper 50 feet (15 m) of the floodplain has been the dominant activity of the river since that time, as argued by Young (2003). This is probably due to two major factors: (1) the Genesee River channel crosses two bedrock thresholds at Geneseo and near York Landing, which restrict vertical incision of the channel, and (2) the impact of glacial rebound (southward tilting of the entire basin) has acted to reduce the channel gradient between the York Landing bedrock threshold and the bedrock elevation of the resistant Lockport Dolomite, which forms the crest of the Upper Falls in the City of Rochester.

## RESULTS OF THE 2002–2003 FLOODPLAIN STUDY

The floodplain study contracted by the US Army Corps of Engineers for the Genesee River downstream from Letchworth Park gorge concluded the following (from Executive Summary; Young, 2003):

Of the three major geologic reaches identified in this 57-mile (92-km) study, the 15-mile (24-km) channel reach on the agricultural floodplain located on the former glacial lake bed immediately below the Mt. Morris Dam has experienced the most rapid changes in recent time. Changes along the remaining 42 miles (67.6 km) of channel to the north are relatively insignificant by comparison.

Channel changes within the Mt. Morris–Honeoye Creek reach (42 miles, 67.6 km) since 1942 include meander migration rates of up to 28 feet (8.5 m) per year, with an average of 4.75 feet (1.45 m) per year for 45 locations. The downstream banks of north-trending, non-vegetated meander loops show the fastest erosion rates.

Estimated floodplain overbank sedimentation rates on the natural, forested (?) floodplain were relatively constant prior to European settlement at rates between 4 and 6 inches (10 to 15 cm) per century. Post-European settlement sedimentation rates appear to have more than doubled, but radiocarbon data are too scarce to provide adequate measurements for the last 300 years.

Lateral migration of the river channel in areas where the Genesee flows through glacial till and where the banks are naturally vegetated shows little change since 1942. However, significant prehistoric channel changes near major tributary junctions north of Fowlerville are obvious from abandoned channel

patterns still visible on aerial photography. These include the reaches immediately upstream and downstream from Dugan Creek (Figure 2), Oatka Creek and Black Creek (Figure 1). Tributary junction areas on the floodplain are likely to be areas of sudden or discrete channel changes (avulsions) triggered by exceptional flood events combined with debris dams.

Both the measured rate of vertical channel sedimentation and the inferred rate of lateral channel migration, implied by the ages of the majority of point bars sampled, suggest that both the overbank floodplain sediments and point bar deposits to the depth of the modern channel base have been extensively reworked and deposited by natural processes within the past 2500 years with an estimated error of ±20%.

The channel shows an inverted, abnormal gradual widening upstream between Geneseo and Mt. Morris, below the Mt. Morris Dam. This atypical upstream widening may be related to flood-control discharge practices and/or land-use practices. Local channel widening also occurs erratically near major and minor tributary junctions. This localized widening may be a response to decreasing channel depth where tributary bedloads are added to the main stem Genesee channel bedload.

The 15-mile (24-km) Geneseo-Mt. Morris reach of the river channel lengthened by 1.36 miles (2.19 km, 9.8 %) in the interval from 1942 to 2002, upstream from a bedrock threshold near Geneseo. This length change resulted in an addition of 2.72 miles (4.38 km, both sides of channel) of erosion-prone banks, which contribute to increased sedimentation along downstream reaches.

At least one conspicuous charcoal horizon (forest fire?) sampled between 5- and 6-foot depths (1.5–1.8 m) in the overbank sediments appears to correlate with a documented anomaly in global climate that is preserved in drought records circa 536 AD on most continents. Location of additional evidence of such potentially widespread events can provide a means of subdividing the floodplain stratigraphy into more geologically significant intervals over larger areas, or to link similar chronologies among several basins.

Where the river banks are heavily vegetated, the dense root-growth exposed along the channel sides attests to the erosion protection provided by natural tree growth along channel banks.

The dating of annual leaf mats within point bar sediments provides a more reliable measure of sediment age than ages derived from random wood fragments, which may have a complex history of reworking from older buried logs. In contrast, charcoal residues from overbank sediments do appear to provide reliable measures of sediment age (presumed floodplain fire events).

Erosion by the Genesee River channel to near its present grade appears to have occurred in a short time interval following the last glacial retreat. This assertion is based on the discovery of a 14,000-to 15,000-year-old landslide exposed at the base of the modern channel near Avon, NY (Figure 11a). It is also assumed that the river had vertically incised its channel through the Fowlerville moraine complex (immediately upstream) by this time. In any event, the location of the landslide next to the modern channel indicates that the river must have been at or very close to its present grade between Avon and Rochester by 14,000 years ago.

Mean annual discharge at the Mt. Morris gage shows an increase of as much as 25% for the period of record (1909 to present). If this is simply a normal fluctuation in the natural system, it fortuitously coincides with the period of post-dam channel adjustment. Most of the increased discharge postdates the regional drought of the mid 1960s.

Insufficient information exists at present to adequately address the potential contribution of the 1994 Akzo-Nobel mine collapse and resulting floodplain subsidence to localized flooding and recent channel adjustments between Mt. Morris and Geneseo. Future studies should address this issue.

## SUMMARY AND CONCLUSIONS

The geologic record of the glacial history of the Genesee Valley and west-central NY is imperfectly understood and is more complex than indicated in much of the published geologic literature. The known $^{14}C$ ages of major glacial features in central New York State are still very limited in most areas, and the presumed ages of many events, such as ice advances marked by dated moraine positions, have previously

been extrapolated entirely across NY State from the eastern Erie Basin near Buffalo all the way east to the Hudson Valley region (Calkin, 1970; Cadwell et al. 1988; Muller and Cadwell, 1986). It is now clear there was a middle Wisconsin ice advance into central and western NY circa 35,000 $^{14}$C years BP that extended well south of the Lake Ontario shoreline, but the event has been poorly documented elsewhere. The presence of these much older glacial lake deposits (varved clays) in the Genesee Valley also may have complicated previous studies of the glacial history that were based on the paleomagnetism of the varved glacial clays (Brennan, 1988). Discrimination between middle and late Wisconsin glacial lake sediments within or near the floodplain would have been problematic prior to discovery and dating of the Elam-DeWitt site. The middle Wisconsin proglacial lake sediments could have extended well south of the middle Wisconsin ice margin, and exposures of varved sediments in riverbanks or small tributaries might have widely differing ages (middle and late Wisconsin) due to their random preservation and selective exposure by river and tributary erosion.

The preservation of the middle Wisconsin glacial sediments at depths no greater than 30 feet (9 m) below the late Wisconsin surface in the Genesee Valley near Honeoye Creek also indicates that the well known late Wisconsin ice advance southward into Pennsylvania, and as far as Long Island, did not necessarily scour all the Finger Lakes valleys completely down to bedrock as implied in Mullins and Eyles (1996). The shape and depth of the buried bedrock valley under the Genesee River floodplain is similar to that of the largest Finger Lakes, and the longitudinal valley profile is similarly influenced by the resistance of the southward-dipping resistant Onondaga limestone. The buried valleys of the Finger Lakes region are likely to be hiding a rich source of geologic information concerning middle Wisconsin, and possibly older glacial events. The failure of the late Wisconsin ice sheet to significantly scour the middle Wisconsin glacial drift from the buried Genesee Valley at the latitude of Honeoye Creek raises fundamental uncertainties regarding our understanding (or assumptions) concerning the severity of glacial erosion by individual ice advances, especially in the classic Finger Lakes region.

The postglacial history contained in the floodplain sediments of the Genesee Valley provides a wealth of information concerning postglacial erosion and sedimentation rates, as well as about the apparent historic impact of agriculture and dams on the behavior of large river systems (US Army Corps of Engineers, 1969; Mansue et al., 1991; Mansue and Bauersfeld, 1991; Young, 2003). However, the impact of the Akzo-Nobel salt mine collapse on the Genesee River's hydraulic readjustment has yet to be quantitatively evaluated over the long term (Nieto and Young, 1998). Much data concerning this avoidable mine disaster is contained in both published and unpublished reports, including the ongoing impact of upward vertical brine migration into the basal floodplain aquifer near the collapse area east of Cuylerville, NY (Yager et al. 2001, Nieto and Young, 1998). In addition, details of the subsurface geology of the valley are as yet to be quantitatively evaluated from several detailed deep borings between Sonyea and Fowlerville completed during the summer of 1999 (Research in progress, Young, 2012).

**END NOTE: RADIOCARBON DATING ISSUES**

The conversion of measured radiocarbon years to actual calendar years, using methods such as tree ring calibration and continuous ice core records, is relatively accurate back to 30,000 radiocarbon years, but at that point calendar years may be as much as 5,000 years older than measured $^{14}$C ages. When reading the geologic literature it is important to distinguish between radiocarbon years, commonly expressed as "$^{14}$C years BP," (BP = Before Present) and "calendar years" (actual years before the present, and usually expressed as "kyr BP"). The "present" is always measured from 1950 AD, the common conventional reference point used for comparing radiocarbon measurements (Joris and Weninger, 1998; Voelker et al., 1998). Calibration programs to explain and readily convert radiocarbon ages to actual calendar years are maintained online by radiocarbon research laboratories. One such program is CALIB, provided by the Quaternary Isotope Lab, University of Washington, and currently maintained by Paula and Ron Reimer. Maintenance of CALIB is supported by the University of Washington, Queens University of Belfast, and the National Science Foundation. CALIB can be located by a simple web

search or accessed directly at: http://calib.qub.ac.uk/calib. The conversion of radiocarbon years to calendar years is not a simple linear relationship, and individual radiocarbon ages sometimes have two or more different calendar year conversions. Many interesting examples and discussions of the relationships between calendar years and radiocarbon measurements for different portions of the 50,000-year timescale can be found online. Regardless of these inherent problems, $^{14}C$ dating is the best means of comparing the relative ages of glacial events that happened during the past 50,000 years.

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# TWENTY-NINTH ANNUAL SCIENTIFIC PAPER SESSION

## DEPARTMENT OF THE EARTH SCIENCES
## SUNY COLLEGE AT BROCKPORT, NY
## November 2, 2002

## LARRY J. KING MEMORIAL LECTURE

## 20,000 Leagues Under the Sea: Exploration of the Mid-Ocean Ridge using a Manned Submersible
## Dr. Tracy Gregg, University of Buffalo

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### PROACTIVE, LOW TOXIC MANAGEMENT OF STINGING INSECTS IN CHILD-SENSITIVE AREAS.

Lynn Braband, NYS IPM Program, NYSAES, Geneva, NY 14456, Jody Gangloff-Kaufmann, NYS IPM Program, Cornell Cooperative Extension of Nassau Co., Plainview, NY 11803, Carolyn Klass, Cornell University, Ithaca, NY 14853, and Joyce Rodler, Cornell Cooperative Extension of Suffolk Co., Riverhead, NY 11901.

Stinging insects are among the most frequent and persistent pest problems at schools, parks, and similar locations. Responses for control are usually reactive and involve pesticides. During the past two years, IPM specialists from the NY State Community IPM Program and Cornell Cooperative Extension have worked with proactive, non-toxic, and low toxic approaches to stinging insect management. These demonstrations were held at schools and other sensitive sites throughout New York State. Sites were inspected regularly for nests. Nests were removed with water sprays and other physical methods. Commercially available, low toxic insecticides were also used. Additional techniques included sanitation, exclusion, vacuums, and traps. Effectiveness was evaluated by comparing the results of sites with weekly, semimonthly, and monthly inspections. "Managed" schools were also compared to nest counts at "unmanaged" schools. Nurses at "managed" and "unmanaged" schools were also asked to record the number of reported stinging incidents. Additionally, an experimental trial was conducted to assess the effectiveness of perimeter wasp traps for reducing wasp entry into the perimeter.

Semimonthly inspections were sufficient for maintaining control of paper wasps and locating yellow jacket nests. Physical methods and low toxic sprays were effective in removing paper wasp nests. The removal of yellow jacket nests was more difficult. Vacuums and low toxic insecticides (especially dusts) were among the most promising tools. Physical methods of removing yellow jacket nests were labor intensive. The stinging insect perimeter trap experiment will reveal how effective traps are in maintaining a wasp-free area. The results of this work can be applied to many situations where risks from both pests and pesticides must be minimized, such as schools and day care facilities. (Poster presentation.)

### VENUS FIGURINES: TYPES AND POSSIBLE USES.

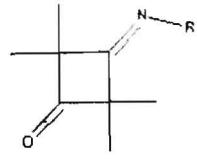
Lauren L. Brandt, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Carvings of women dating between 29,000 and 14,000 B.P. have been found scattered throughout Europe. The women depicted in these carvings sometimes appear to display steatopygia or pregnancy, some even appear thin. The diversity in body forms seen amongst the carvings is perplexing and intriguing; what, if anything, did these carvings symbolize? Perhaps they were fertility symbols, religious worship objects, or possibly even dolls for young

girls. In any case the figurines symbolized something to the people of that time period, and thus have significance for us today in our search to better understand the day-to-day lives of Paleolithic peoples. (Poster presentation.)

## STUDIES OF CIRCUMANNULAR LONE PAIR ELECTRON INTERACTIONS IN IMINOCYCLOBUTANONES: VARIABLE TEMPERATURE NMR.

Allen Chong and James Worman, Department of Chemistry, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.




R = phenyl, *p*-methoxyphenyl, *p*-nitrophenyl

The phenyliminio-2,2,3,3-tetramethylcyclobutanone was first studied by Naik[1] and the free energy of activation for the inversion of the phenyl group through the nitrogen was determined to be 17.7 kcal/mole. To further establish that long range lone pair interaction affects the free energy of activation for the inversion of group on nitrogen; *p*-methoxylphenyl and *p*-nitrophenyl derivatives were synthesized. The structural integrity was determined via NMR and IR spectroscopy, GC/MS, and elemental analysis. Variable Temperature NMR was used to monitor the convergence of the resonance for the non-equivalent methyls on the cyclobutanone ring. The free energy of activation was calculated to be greater for the *p*-methoxylphenyl with the value for the nitrophenyl being the least. This is consistent for the circumannular non-bonding repulsion in the linear transition state.

[1]A. Naik, M. Reffo and J. Worman, Organic letters, 2002, 4(7), 1059. (Oral presentation.)

## *TRUNCATIRAMUS MONROENSIS* (CHELICERATA:EURYPTERIDA), A PTERYGOTID FROM THE PITTSFORD AND VERNON SHALES OF NEW YORK STATE AND ITS IMPLICATIONS FOR PTERYGOTID PHYLOGENY.

Samuel J. Ciurca, Jr., 54 Appleton Street, Rochester, NY 14611, and O. Erik Tetlie, Earth Sciences, University of Bristol, Queen's Road, Bristol BS8 1RJ, U.K.

It is now almost one-hundred years since *Pterygotus monroensis* was described from the Pittsford Shale (Late Ludlovian) of Monroe County, New York State. An almost complete metastoma and partial free ramus of a chelicera from the same assemblage was referred to *Pterygotus* sp. Later, these three specimens were synonymized, assuming only *P.monroensis* was present in the shale. *P. waylandsmithi* and *Acutiramus floweri* later had been described from ca. 70 meters above the base of the Vernon Shale (Late Ludlovian) of Central New York.

We report here on new material, consisting of an almost complete specimen with a bilobed telson and some isolated chelicerae from the Pittsford Member of the Salina Group, and a large carapace from slightly ?older Vernon Shale (Harris Hill Member). This material has major differences from *P. waylandsmithi* and *A. floweri* (Downing Brook Member) and we assign our new material to *P. monroensis*. The chelicerae and metastoma of the new material, therefore, show that the same material from the Pittsford Shale may be referred to *Pterygotus* sp. (partial chelicerae) and ?*Baltoeurypterus* sp. (metastoma).

A phylogenetic analysis of the eight most complete pterygotid species shows the new material to be a sister-taxon to *Truncatiramus osiliensis* (the Ludlovian Rootsikula Horizon of Oesel, Estonia), and allows us to assign it to *Truncatiramus*. The analysis also supports a two-partite basal division of the pterygotids based on telson morphology. The *Erettopterus* clade with bilobed telson, and the *Pterygotus* clade with a paddle-shaped telson. *Truncatiramus* have a more derived position than *Erettopterus* within the *Erettopterus* clade. (Oral presentation.)

## A TABLETOP TRANSMISSION (and/or EMISSION) COMPUTED TOMOGRPHY SCANNER.

Rebekah Clifford, Ursula Brush, Nicholas Kingsley, and Ron Rohe. Department of Physics, Houghton College, One Willard Avenue, Houghton, NY, 14744.

A first generation computed tomography (CT) scanner allows for a cross-sectional slice of the body to be analyzed using thousands of x-ray transmission (or emission) measurement studies of the region. These transmission (or emission) measurements are taken at numerous equally spaced translation positions that are repeated for each of numerous equally-spaced rotation angles from 0° to 180° (or 360°). In this project, the x-ray tube (or gamma source) and single radiation detector are to remain stationary, while the "patient" rotates and translates. During the course of the last year, the rotation and translation table have been assembled using a modified milling chuck and progress has been made towards a program to control the motors of the system. Once this program has been completed, the x-ray (or gamma-ray) source and detector will be installed and data collection will commence. (Poster presentation.)

## DO ZEBRAFISH (*DANIO RERIO*) COMMUNICATE BY CHEMICAL SIGNALING?

K. Fitzgerald and K. Hannam, Department of Biology, One College Circle, SUNY Geneseo Geneseo, NY 14454.

Many organisms, including numerous fish in the minnow family, release chemical signals known as pheromones. Many have been detected to have discernible effects on the behavior and physiology of fishes. These chemical signals are produced within the host fish's body and released through excretion, secretion and rupture of the body wall via the gills, skin slime, urine, feces, or trauma. Since the 1950's, it has been known that chemical communication functions in attraction and recognition of individuals, the opposite sex, offspring or parents. Chemical communication also maintains hierarchies and schools. Aquatic environments have been proven to be excellent mediums in which to study chemical signaling because they are better suited to conduct signals than terrestrial environments. Also, understanding chemical signaling in aquatic ecosystems has become more important than ever as humans continue to change existing aquatic ecosystems. The purpose of this research project is to determine whether or not chemical signaling by itself is enough to induce particular behaviors in zebrafish (*Danio rerio*). This experiment will be carried out in three sections. The fish will be introduced to different environments, some will be placed in a bowl with a fish of the opposite sex and some will be placed in a bowl containing water from the bowl of a fish of the opposite sex. All behaviors will be observed and quantified. Preliminary trials have been run, in which male/female interactions were observed. The data collected from the preliminary trials will be used to compare behaviors seen later in the experiment. (Poster presentation.)

## A SPATIO-FUNCTIONAL ANALYSIS OF OHIO HOPEWELL BLADELETS: THE SPECIALIZED CAMP AT MURPHY IV (33LI233).

Katie L. Gage, Leigh Anne Riley, Richard N. Maxson, and Paul J. Pacheco, Department of Anthropology, SUNY College at Geneseo, 1 College Circle, Geneseo, NY, 14454.

In this poster we examine the spatial and functional variability of a surface collection sample of 211 Ohio Hopewell bladelets and 75 bladelet core/core fragments. These artifacts were collected from a 4 ha area designated the South Block of the Murphy IV site (33Li233), Licking County, Ohio. The analysis includes use of spatial distributions, stereoscope examination of use-wear patterns, and limited use of the SEM. A case is made for the existence of a specialized camp in which Ohio Hopewell craft specialists both made and used bladelets. Acceptance of the idea that Hopewellian people conducted formal craft specialized activities is supported by the analysis. (Poster presentation.)

## CORSETS: BINDING WOMEN IN THE PAST AND THE PRESENT.

Shannon Gates, Saint John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Throughout our history, women have been seen as objects of beauty. But what must a woman look like to be seen in the parameters of this definition? Beauty, it's a relative term, being held in the eye of the beholder. However, as a culture, this is something we have defined; a woman with both an hourglass figure and a small waist is considered the quintessential woman. This definition can be seen not only in the past, but the present as well. For years, women have worn corsets to achieve this definition of beauty. I will examine both the progression of the

corset from a plain binding fabric to a well-ornamented bodice, including the effects the corset has had on the world, and the women wearing them. (Poster presentation.)

## ORGANISMS OF THE SOUTHERN HONEOYE VALLEY, NEW YORK.

Conan Guard, SUNY Brockport, Brockport, NY and Bruce Gilman, Finger Lakes Community College, Canandaigua, NY.

The southern Honeoye Valley consists of Honeoye Lake and its watershed, including the large inlet wetland complex that is home to the Muller Conservation Field Station of Finger Lakes Community College. Significant parcels of land within the Honeoye Valley have been protected by conservation organizations, creating a unique opportunity for the study and management of natural resources by college students.

This poster presents our initial inventory of organisms that have been identified by scientists conducting ecological research in the Honeoye Valley during the last three decades. The checklists are relatively complete for amphibians, reptiles, birds, fish, mammals and vascular plants. The checklists for phytoplankton, zooplankton, molluscs, insects and nonvascular plants are preliminary. All species groups are deserving of further fieldwork and additions are expected to each list.

Ongoing research will provide descriptions of natural communities and result in the production of GIS maps overlain on recent digital images of the watershed. Natural communities will be classified using protocol established by the New York State Natural Heritage Program. (Poster presentation.)

## MACROINVERTEBRATE COMMUNITY RESPONSES TO URBANIZATION.

William L. Hallahan and Kelly Macyczko. Nazareth College, 4245 East Avenue, Rochester, NY 14618.

In a recent review, McKinney (2002) described urban development as the greatest threat to natural habitats and species diversity in the United States. Most of the studies cited, however, monitored terrestrial communities and narrow taxonomic groups (bees, butterflies, lizards, etc.).

In our study, we compared an urban stream with a rural stream using the three macroinvertebrate indices developed by the NYS DEC (Bode, Novak, Abele, 1997): Biotic Index (BI), Percent Model Affinity (PMA) and Ephemeroptera-Plecoptera-Trichoptera species richness index (EPT). We sampled the urban stream at two sites and the rural stream at two sites every two weeks (except for December) from the beginning of September to the middle of May. Of the three indices, the BI and EPT were the most sensitive and revealed a significant difference in our measurement of the impact along the urban-rural gradient. Our conclusion is that urban streams have lower species diversity and indicate a loss of sensitive species. This is similar to the trend reported in terrestrial habitats.

McKinney (2002). Urbanization, Biodiversity and Conservation. *BioScience.* 52(10): 883-890. (Oral presentation.)

## IDENTIFICATION OF THE VIRAL COMPONENTS RESPONSIBLE FOR INDUCTION OF APOPTOSIS IN VESICULAR STOMATITIS-INFECTED CELLS.

H.L. Halton and M.C. Ferran, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Vesicular stomatitis virus (VSV) is a negative sense RNA virus that causes oral lesions in infected domestic livestock. Historically, VSV has been used as an important model virus system. Recently, much VSV-related research has focused its use as a "magic bullet" to combat a wide variety of human aliments as diverse as HIV and cancer. The goal of our research is to investigate the mechanisms used by VSV to bypass important cellular defense systems, including identification of the viral component responsible for the induction of apoptosis, or gene-regulated programmed cell death. Preliminary data indicate that the VSV-M protein is not alone in its ability to induce apoptosis in immortalized mammalian cell lines. Identification of additional viral components responsible for the regulation of apoptosis was investigated by testing the ability of mutant virus strains to induce cell death. In addition, cell-death assays will be conducted after transfection of eukaryotic cells with an expression vector that encodes one of the five VSV genes. The results of these experiments, conducted to determine the virus protein(s) responsible for the regulation of apoptosis in VSV-infected cells, will be presented. (Oral presentation.)

## WHOLE-MOUNT *IN SITU* HYBRIDIZATION WITH LVDELTA AND ETDELTA.

J. Hedrick and H. Sweet. Rochester Institute of Technology, Department of Biological Sciences, College of Science, 85 Lomb Memorial Drive, Rochester, NY 14623-5603.

The two extant subclasses of sea urchins, Cidaroidea and Euechinoidea, are thought to have arisen from the same ancestors. The Cidaroidea are the more primitive of the two groups and unusual features of development in Cidaroidea may provide clues to mechanisms of evolutionary divergence among echinoids. In my project, I will be comparing the spatial expression of the gene Delta in the cidaroid Eucidaris tribuloides and the euechinoid Lytechinus variegatus. The Delta signaling pathway has been found to mediate cell-cell interactions leading to the specification and patterning of a wide array of cell types in both invertebrate and vertebrate development and is thus a very important area of study. To date, I have successfully synthesized digoxigenin-labeled RNA probes for LvDelta. I will use these probes to examine the spatial localization of LvDelta in Lytechinus variegatus with whole-mount in situ hybridization. I will also synthesize digoxigenin-labeled RNA probes for EtDelta. These probes will be used to examine the spatial localization of EtDelta in Eucidaris tribuloides also with whole-mount in situ hybridization. I will then compare the results of the two hybridizations in order to examine how the Delta signaling pathway has evolved over time. (Poster presentation.)

## ISOLATION AND CHARACTERIZATION OF UV-SENSITIVE MUTANTS OF *AGROBACTERIUM TUMEFACIENS.*

Jennifer Jodeksnis and Robert Rothman. Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

*Agrobacterium tumefaciens* is a plant pathogen that causes crown gall disease, a plant tumor. Crown-gall occurs when *Agrobacterium* passes a large plasmid, the Ti plasmid to the plant. The literature on *Agrobacterium* suggests that tumor induction may be influenced by DNA repair. Since *Agrobacterium* is found in the soil and it is continuously exposed to ultraviolet radiation, we decided to examine DNA repair. *Agrobacterium* was treated with nitrosoguandine and 24 ultraviolet sensitive mutants were recovered. The NTI strain of *Agrobacterium* was used because it lacks the Ti-plasmid, eliminating the possibility of the results being caused by plasmid mutations. All mutants showed the same sensitivity to ultraviolet radiation suggesting all of the mutations are found in one gene or in the same pathway. The mutants were then also tested for their ability to support growth of ultraviolet irradiated bacteriophage. All the mutants showed a similar decrease in their ability to promoted survival of the phage. These results are similar to the phenomena of Host Cell Reactivation in *Escherichia coli* suggesting that our DNA mutants affect an excision repair pathway. Ultimately the Ti plasmid will be reintroduced and we will look at the effects of the mutants on crown gall induction. (Poster presentation.)

## THE REAL COST OF DEVELOPMENT: A CASE STUDY AMONG THE YUCATEC MAYA.

E. R. Kintz, Department of Anthropology, Sturges 13, SUNY Geneseo, Geneseo, NY 14454.

What is the real cost of development in the Third World? What are the *economic* costs and what are the *psychological* costs? Focusing on development and change in a small Yucatec Maya village in southern Mexico, this paper details the economic status of small-scale subsistence farmers living in the village and the changes that have transformed the village for the last two decades. The discussion will focus on both gender issues and the questions of equity. The village falls under the shadow of massive tourism development on the eastern coast of Yucatan. How do the villagers respond to this development? What costs and what benefits accrue to the village? How does top-down development on the coast penetrate and impact the villagers? How do village-level or grassroots development projects impact and transform the economic and political structure in the village? In addition, while both the powerless and powerful are engaged in negotiations over development, these conflicting debates appear to result in (1) greater poverty, (2) stripping dignity from the disenfranchised poor under the umbrella of planned programs for development, and (3) greater resistance and revolt from the bottom as land is no longer protected and opportunities for development are reduced or rendered as goals impossible to achieve. Finally, this paper argues that we must not be surprised when with rapidity and with fierce commitment, the subordinate group is moved to mass defiance. It is an explosive and ruthless move that really has nothing to lose if, as some scholars have discovered and villagers world-wide have always known, the real cost of development is to be stifled, suppressed, disenfranchised and forever impoverished. (Oral presentation.)

## PUBLIC ARCHAEOLOGY: DISCOVERING THE PAST TOGETHER.

Kristi J. Krumrine, St. John Fisher College, 3690 East Avenue, Rochester, N.Y. 14618.

Public archaeology seeks to engage local people in uncovering their past through excavation and laboratory opportunities. Rather than being just an enigmatic presence in a community, the archaeologist educates participants in their local history through hands-on activities. This allows for direct interaction between the archaeologist and the local community. All age groups benefit from public archaeology programs, but school age children and young adults are especially important groups. Projects can integrate learning concepts from the classroom with field experience and allow students to contribute to that knowledge through the application of the scientific process. The best projects allow for students to tie their own site experience into a larger historical and cultural context. In addition to the opportunity for students to learn how to apply the scientific method to a particular problem, these projects encourage young people to become interested in their own history and thus become stewards of their cultural heritage. (Poster presentation.)

## CLONING AND EXPRESSION OF PORCINE RELAXIN IN *ARABIDOPSIS THALIANA*.

Joshua Lees, Houghton College, Houghton, NY 14744.

Relaxin is a protein involved in the process of pregnancy in mammals which exerts several diverse physiological effects in the body. Aside from inducing a series of collagenolytic effects, most notably in the uterine region of pregnant females, and repressing collagen synthesis in fibroblasts, relaxin has also been shown to help prevent the onset of premature parturition, induce renal vasodilation, and exhibit interactions with the cytokines of activated type 1 and 2 helper T-lymphocytes, including interferon gamma. A clone containing the gene for porcine relaxin was produced using the *Agrobacterium tumefaciens* binary Ti vector pCAMBIA 1302, with a selectable marker for hygromycin resistance. Columbia ecotype *Arabidopsis thaliana* plants were transformed by dipping the flowers in a suspension of *Agrobacterium tumefaciens* strain GV3101 cells containing the relaxin construct. The seeds resulting from the dip were grown on selective media containing hygromycin and resistant plants were selected and transplanted. Preliminary PCR has shown the presence of the transgene in three lines thus far. DNA blot analysis is being carried out and will provide positive confirmation of this result. Expression of the transgene and correct processing of the protein will be determined by RNA and protein blots. (Poster presentation.)

## WOMEN AS WARRIORS: A LOOK THROUGH HISTORY.

Melinda Lull, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

One of the roles of women that is often overlooked by society is the role of women in fighting and war. Many cultures throughout time show major roles of women as warriors. Archaeological evidence, including statues, paintings, and skeletons themselves, has been found associating women with the acts of war. Along with many other cultures, the Sarmatian women fighters, who emerged in the 4$^{th}$ century B.C., the Dahomey women warriors from West Africa in the 18$^{th}$ and 19$^{th}$ centuries, and American women in the military since the 16$^{th}$ century, are three groups that particularly stand out. Women are very prominently represented in war settings in these three groups, and help represent the importance of women to society. (Poster presentation.)

## A WIND DRIVEN POWER-GENERATING SYSTEM: PRELIMINARY MODELING AND ANALYSIS OF POWER CURVES.

Sonya Marthai, Donald Merriam Jr., and Ron Rohe, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY, 14744.

Most power curves for current wind power systems are created from field measurements. Relationships between the details of the design and power output are therefore unclear. The overall goal of this study is to design and build a low cost, mechanically efficient wind driven power-generating system in the 1 to 5 kilowatt range and to predict and improve its performance based on equations derived from fundamental principles. Initial equations relating blade design and power output to wind velocity have shown consistency with published experimental power trends. A series of MATLAB generated power curves are presented that successively incorporate greater complexity of blade parameters. The aim is to optimize each individual parameter and then generate an efficient blade design based those specifications. (Poster presentation.)

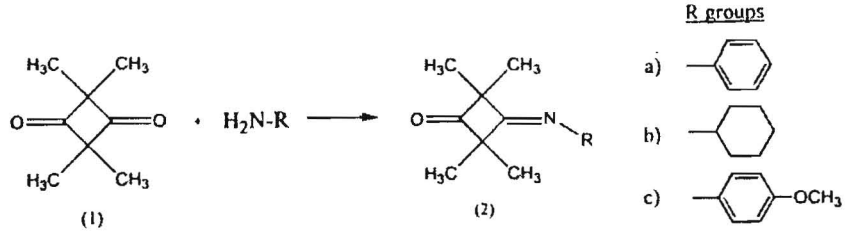
## A WIND DRIVEN POWER-GENERATING SYSTEM: INITIAL DESIGNS AND CONSTRUCTION OF ELECTRICAL POWER GENERATOR.

Donald Merriam Jr., Sonya Marthai, and Ron Rohe, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY, 14744.

The overall goal of this study is to design and build a low cost, mechanically efficient wind driven power-generating system in the 1 to 5 kilowatt range and to predict and improve its performance based on equations derived from fundamental principles. Construction and testing have begun for a directly coupled, low rpm generator consisting of a disk of copper coils sandwiched between two rotating disks of neodymium (NdFeB) magnets to which the blades will be directly mounted. Experimentation and efficiency studies will be done employing a motor system that will control mechanical input and a controllable electronic load to control the power output. Through these experiments and tests, designs will be improved to provide a stable, more efficient generator for the wind power system. (Poster presentation.)

## PREPARATION AND ULTRAVIOLET SPECTROSCOPY OF IMINE DERIVATIVES OF 2,2,4,4-TETRAMETHYLCYCLOBUTANONE.

Akos Mersich and James Worman, Department of Chemistry, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.




The diketone 2,2,4,4-tetramethylcyclobutanone (1) is a $C_{2h}$ symmetric compound with non-equivalent energy levels from lone pair electrons on the oxygens due to circumannular orbital interaction. To study the magnitude of this unusual orbital property, three imine derivatives (2) of TMCB were prepared and their ultraviolet absorption spectra examined. Purification was obtained on all three via a combination of recrystallization, sublimation, and/or vacuum distillation. Structures were verified by IR, NMR, and GC/MS. The ultraviolet absorption spectra of the three compounds was measured from 200–500nm in cyclohexanol and ethanol. The $\lambda_{max}$ and $\varepsilon$ was determined for each compound and the difference between the $b \rightarrow \pi^*$ transitions were compared. The largest separation of 0.5eV was observed for the cyclohexyl derivative, which is consistent with greater electron-electron lone pair repulsion when compared to the phenyl or p-methoxyphenyl derivatives. (Poster presentation.)

## DEVELOPMENT OF A SYSTEM TO DETERMINE THE EFFECT OF VESICULAR STOMATITIS VIRAL INFECTION ON HOST GENE EXPRESSION.

M. S. Miles and M. C. Ferran, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Eukaryotic cells have several antiviral defense systems, including the interferon (IFN) response and apoptosis, that enable the host cell to block unwanted virus infections. Despite these potent defense mechanisms, humans as well as other organisms continue to be infected by viruses. This occurs because most viruses have evolved molecular mechanisms that counteract these important cellular defense systems.

Using microarray analysis we will investigate the mechanisms used by vesicular stomatitis virus (VSV) to escape host cell defenses and to shed new light on cellular antiviral defense systems. We will compare host gene expression patterns in wild-type infected cells to cells infected with T1026R1, a less cytopathic strain of VSV. T1026R1 is less pathogenic because it contains a mutation in the matrix (M) protein that delays its ability to block host antiviral defenses. Microarray analysis will be performed to compare host RNA expression patterns of the two infected cell populations. An inducible eukaryotic expression system will be utilized to address the effect of the

VSV M protein on host RNA expression. Using these approaches, we hope to identify candidate cellular genes involved in regulation of antiviral defense mechanisms that are targeted by VSV. (Poster presentation.)

## GAĂS'IOÑDIE'T'HĂ' THE COMET.

Timothy J. Poulsen, 22 Fourth Ave., Fairport, NY 14450.

I will illustrate the power and importance associated with Gaăs'ioñdie't'hă', which is absent from most of the common or popular materials on Iroquois lore. Gaăs'ioñdie't'hă' was, in fact, the most powerful man-being in the Iroquois pantheon, greater even than Hi'non the Thunderer, second only to Iouskeha. Furthermore, I show that while Gaăs'ioñdie't'hă' is identified as the spirit of the meteor, that association is incorrect. I give evidence, including his roles in various stories, physical characteristics of him and his abode, his impact upon the psyche of the Iroquois peoples, and a comparison of the physical manifestations of comets and meteors, to show that Gaăs'ioñdie't'hă' is instead the spirit of the comet. (Oral presentation.)

## A COMPARISION OF THE TERRESTRIAL ISOPODS OF THE GRASSLAND BIOME AND THE FINGER LAKES REGION.

William F. Rapp. 87 South Main St., Pittsford, NY 14534.

Nine species of isopods are known from the grassland biome of Nebraska and twelve from the Finger Lakes Region. In Nebraska *Trachelipus rathkei* is the dominant species, but in the Finger Lakes Region it is rare. *Onicus asellus* is the dominate species in Finger Lakes region, but rare in Nebraska. Species of *Trichonicus* and *Philoscus* are found in the humus in the Finger Lakes Region, but are absent in the grassland biome. (Oral presentation.)

## MECHANICAL PROPERTIES AND BLOOD COMPONENTS OF PRESSURE ULCER TISSUE FROM PATIENTS OF DIFFERING HEALTH (NON-DIABETIC, TYPE I, TYPE II DIABETICS).

V.L. Redeye, L.E. Edsberg, and K. Fries, Natural & Health Sciences Research Center, Daemen College, 4380 Main Street, Amherst, NY 14226.

Pressure ulcers are commonly found in diabetic patients, bedridden patients, and spinal cord injury patients. Pressure ulcer prevalence is 20–30% in home care patients, 12% in nursing home patients, and 17% in hospitalized patients. Pressure ulcers, especially non-healing ulcers, are associated with increased mortality. There are currently 16 million people in the United States with diabetes (diagnosed and undiagnosed). Due to poor circulation in the extremities diabetics are more likely to develop ulcers. The leading cause of amputations for people ages 18–65 is due to diabetes and its complications, such as pressure ulcers. Limb amputees with diabetes are at an increased risk for further amputations and a 5-year mortality rate of 39–68%.

The objective of this pilot study was to compare the mechanical properties and blood components of diabetic and non-diabetic patients with pressure ulcers. Factors such as diabetes can affect the mechanical properties of skin, such as viscoelasticity. Nine samples of tissue debrided from pressure ulcers of numerous body sites were subjected to uni-axial tension. The blood components and glucose levels of both diabetic and non-diabetic patients were compared. Variations in blood components may be a precursor of mechanical changes in the tissues leading to pressure ulcers.

In this pilot study, no correlation was found between mechanical properties and patients of differing health (non-diabetics, type I, or type II diabetics). There were no significant differences between patients of differing health for albumin levels, protein levels, white blood cell counts, red blood cell counts, and creatine levels. Glucose levels were found to be significantly different ($\chi 2 = 8.257$, $df = 2$, $p = 0.05$) for patients of differing health. (Poster presentation.)

## HYDRODYNAMIC DRAG ON CADDISFLY CASES AS A POSSIBLE DETERMINANT OF LARVAL MICROHABITAT SELECTION.

Peter Reynolds, and Ted Georgian. Department of Biology, St. Bonaventure University, St. Bonaventure, NY 14778.

Larvae of the caddisfly genus *Pycnopsyche* (Trichoptera: Limnephilidae) are typically found in small streams draining forested basins, where they make tubular cases of leaves, twigs, sand, and other materials. We investigated the hydrodynamic properties of cases of *Pycnopsyche* [*luculenta*?] larvae, hypothesizing that the microhabitats occupied by the larvae are limited by their ability to counteract the drag exerted on their cases at high velocities. We measured case drag by 2 methods. Terminal velocity assays (Loudon and Zhang 2002) were conducted at Reynolds numbers (Re) from 1410–1960 and produced measures of drag force (Fd) ranging from 0.5–1.9 mN, with drag coefficients (Cd) of 0.23–0.84. Direct drag measurements at higher velocities in a "water tunnel", with mean Re of 12,600, yielded Fd of 37.5 to 74.1 mN and an average Cd of 0.91. Live larvae held onto bed materials with an average force of 13.6 mN. Fd on a typically sized case would exceed 13.6 mN at a velocity of approximately 0.9–1.0 m/s, indicating that larvae may lose their grip on the substrate at velocities found in the center of the channel of a small stream at elevated flows. These results match our field observations of the maximum flows at which we have observed *Pycnopsyche* larvae moving in the main stream channel. (Poster presentation.)

## A PRELIMINARY DESIGN FOR A SMALL CYCLOTRON.

Jake Roloson, Brian King, and Mark Yuly, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY, 14744.

A small cyclotron is being constructed using a 0.5 T permanent magnet, with 15.2 cm (6.0 inch) diameter pole face and 3.8 cm (1.5 inch) pole separation. An acceleration chamber containing a single brass electrode is being developed. Magnetic field strength may be modified by adjusting the pole separation using iron pole pieces, which are sealed to the chamber using high vacuum grease. The chamber will be filled with low pressure hydrogen gas which will be ionized by electrons released by a cathode located at the center of the chamber. The required 3.6 MHz to 11.5 MHz RF power will be supplied by a commercial RF amplifier. A liquid nitrogen cold trap with a diffusion pump backed by a forepump will be used to evacuate the chamber. Energies between 37.5 keV and 87.7 keV for protons and 18.7 keV and 43.8 keV for deuterons should be obtained. (Poster presentation.)

## VEILINGS.

Mary Souhrada, 423B Garfield Ave.East Rochester, NY 14445.

There are various veiling methods for women used in the Middle East and Western cultures. The different reasons why each particular culture chooses for their women to wear veils varies greatly. Such reasons vary from women wearing veils to cover their evil, seductive character to simply being a matter of showing what class you are in, or whether you are in male ownership at that moment in time. There are also many different levels for which women to cover themselves, from full body veils to just covering your hair. (Poster presentation.)

## TRACING THE LIFE HISTORY OF LOCAL AMPHIPOD SPECIES.

Amy Spinelli and K. Hannam. Department of Biology, 1 College Circle, SUNY Geneseo, Geneseo, NY 14454.

Little is known about the local life history of the amphipod species *Gammarus pseudolimneaus*. This species is prevalent throughout Caledonia, New York's Spring Brook. Recently investigators in other parts of the country have been interested in this species due to its potential as a biological indicator. Its ability to be a good indicator lies in the fact that it survives in a narrow range of dissolved oxygen levels, so fluctuations in DO levels can be monitored by monitoring this species.

We have initiated preliminary research tracing the life history of all amphipod species found in Caledonia's Spring Brook. Beginning in the summer of 2002, an amphipod sample has been collected approximately every six weeks using a randomly placed 0.5 meter quadrat. Through a careful process amphipods are removed from rocks found inside the quadrat and transferred back to the laboratory where they are analyzed. Each amphipod is keyed to species, and sex and length are noted. Other characteristics such as mate pairing, presence of parasites, and presence of eggs also are observed. In addition, physical measurements of the stream such as temperature, water depth, water

flow rate and dissolved oxygen are taken at each sampling. This data will be compiled in hopes that this descriptive data will enable us to formulate hypotheses about the basic ecology and behavior of local amphipods, and answer questions dealing with reproductive success, competition, and host-parasite interactions. (Poster presentation.)

## CONVERTING THE USA TO THE METRIC SYSTEM—ONE PERSON'S EXPERIENCE AND OPINION.

Charles Spoelhof, Astronomy Section, RAS, 5 Mullett Dr., Pittsford, NY 14534.

The rest of the world is well along in converting to the metric system but most U.S. citizens still think in terms of pounds and inches. Although we were one of 18 original signatories of the international Treaty of the Meter (1875), today we are only part way into this extensive, expensive change and slowly making progress. The history, status and benefits of metric conversion will be described as well as the author's experience and opinion on what it will take for our country to become fully metric. (Oral presentation.)

## CHANGES IN FISH AND WILDLIFE ABUNDANCE IN WESTERN NEW YORK FROM 1934 TO PRESENT.

John Van Niel and Liza-Jan Bobseine, Finger Lakes Community College, 4355 Lakeshore Drive, Canandaigua, NY 14424.

Using reports from a Game Protector for the years 1934 and 1935 documenting routine hunter and angler checks and knowledge of the current status of these species, we developed abundance comparisons of numerous species—over 1,700.

Hunters and anglers were interviewed by the Game Protector and all species in possession were recorded. In addition, Game Protectors were charged with killing "vermin" and his kills were all recorded in his reports as well. Current abundance was determined through personal experience, printed data and interviews with DEC personnel. Game species include: fish, small, upland and big game. Vermin include: snakes, owls, hawks and predators. As expected, dramatic changes have occurred in the past 70 years. (Oral presentation.)

## CHARACTERIZATION OF THE SIGNALING MOLECULE DELTA IN THE BRITTLESTAR *OPHIOTHRIX.*

N. Waxmonsky and H. Sweet, Department of Biological Sciences, Rochester Institute of Technology, College of Science, 85 Lomb Memorial Drive, Rochester, NY 14623-5603.

Our lab has a primary focus on creating a better understanding of the evolution of development utilizing the members of the phylum Echinodermata as model organisms. We examine the development of mesoderm (one of the three major animal tissue types) and the expression of the mesoderm signaling molecule, Delta. My primary goal was to begin a project to examine the Delta expression and mesoderm development in one class of echinoderms, the brittlestars. We have accomplished several short term goals such as identifying a suitable species, refining a method for procuring gametes from adult brittlestars, the generation of cDNA from RNA, and the isolation of genomic DNA. We are currently using degenerate PCR to clone the brittlestar homologue of Delta. Designing degenerate PCR primers is a time consuming step, and no reliable bioinformatics programs currently exist to design such primers. Thus, a secondary project was initiated to develop a software program that had the intended purpose of automating and assisting primer design. Project progress, frustrations, and future aims will be discussed. (Poster presentation.)

## NEUTRON CAPTURE ON SAMARIUM-151.

Blake Winter and Mark Yuly, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY, 14744.

Neutron capture cross section measurements for $^{151}$Sm have recently been made at the Los Alamos Neutron Science Center (LANSCE) in Los Alamos, NM, using two $C^6D^6$ detectors. The cross sections have been fit using Breit-Wigner functions and the resonance parameters extracted, including the resonance energies, which tend to be slightly higher than expected from the Evaluated Neutron Data File (ENDF) library. These measurements may be

useful in understanding nuclear processes in stars, accelerator transmutation of waste, and nuclear weapons models. (Poster presentation.)

## CULTURAL ANTHROPOLOGY: THE HMONG CULTURE.

Milly Zayas-Cosme, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

The poster I will be presenting will focus on the cultures and gender differences within the Hmong cultures that have formed in Vietnam, Laos, China, and Thailand. The Hmong are a very unique culture in their choice of migrating, living arrangements, and patrilocal family living environments. Matrilocal families also exist among the Hmong, but its not of first choice or easily accepted. My poster will represent designs created by the Hmong women, the tools used by the men for farming and building, the style of homes, the clothing, and unique appearances the Hmong choose to identify their beliefs, patterns, and culture. (Poster presentation.)

# THIRTIETH ANNUAL SCIENTIFIC PAPER SESSION

## ROCHESTER INSTITUTE OF TECHNOLOGY
## ROCHESTER, N.Y.
## November 15, 2003

## LARRY J. KING MEMORIAL LECTURE

### Galapagos—Darwin's Laboratory of Evolution
**Dr. Robert Rothman, Professor**
**Rochester Institute of Technology, Department of Biological Sciences**
**Rochester, NY**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### THE DYNAMICS OF THE $Ru(bpy)_3^{2+}$ ION ENCAPSULATED IN A SOL-GEL THIN FILM MATRIX.

James Bartlett and Kazushige Yokoyama, Department of Chemistry, SUNY College at Geneseo, Geneseo, NY 14454.

The phosphorescence decay of the metal-ligand-charge transfer (MLCT) state for the $Ru(bpy)_3^{2+}$ ion encapsulated in a sol-gel matrix was observed. The temperature dependence of decay time was analyzed in an Arrhenius type of plot. The activation energy term was determined to be $2.55 \pm 0.01$ kcal/mol, $1.995 \pm 0.003$ kcal/mol, and $2.57 \pm 0.01$ kcal/mol for the aqueous solution, the thin film in water, and the film in ethanol, respectively. This showed that the observed dynamics of the $Ru(bpy)_3^{2+}$ were predominately determined by its environment. However, the dynamics and temperature dependence observed in a freshly prepared bulk sol-gel solution differed from those of the aqueous solution and the thin films. As the thin film in water was aged, the solvent gradually occupied the pores of the matrix and the dynamics approached that of the aqueous solution. (Poster presentation.)

### OBSERVATIONS ON GUT, SKELETAL, AND MESODERM DEVELOPMENT IN THE BRITTLE STAR *OPHIOTHRIX SPICULATA*.

Phil Bechard and Hyla Sweet, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester NY, 14623.

The long-term goal of research in our lab is to understand the evolution of development within the echinoderm phylum. The purpose of this project is to describe the normal development of the gut, skeleton, and mesoderm of early embryos of *Ophiothrix spiculata*, a brittle star with indirect development. Staining for the enzyme alkaline phosphatase was used to observe gut development. Polarized light was used to examine skeletal development in live embryos. The staining for alkaline phosphatase shows that the enzyme is first expressed in the gut by about two days of development and increases in intensity throughout later stages. Polarized light shows the bilateral spicules begin to develop around 36 hours and grow to support the arms of the larva. Propidium iodide, a fluorescent nuclear dye, will be used with laser scanning confocal microscopy to observe mesodermal development. This information on the normal development of this brittle star will be used for future molecular studies on endoderm and mesoderm development. This information will also be used for comparison to the direct-developing brittle star *Ophioplocus esmarki.* (Poster presentation.)

## CONCEPTS OF WATERSHED HYDROLOGY.

Peter E. Black, 712 Ackerman Avenue, Syracuse, NY 13210.

The presentation is a demonstration/introduction to a stand-alone. narrated and animated short course in PowerPoint® on CD with workbook. The purpose of this presentation is to help you give the material to current, continuing, and life-long students, teachers, consultants, regulators, government agency personnel and officials, planning board members, soil and water conservation district personnel, or members of Non-Government Organizations. The material was compiled without unexplained jargon so as to achieve more effective watershed management through participation in water resources policy considerations and particularly non-point sources of pollution (NPS) prevention and control. Its affordable price makes it ideal for lay public and professionals in all walks of life, for the teaching or practicing hydrologist, and for ninth-grade earth science classes and up. (Oral presentation.)

## AN EXPERIMENTAL TEST OF YELLOWJACKET TRAPPING EFFICACY.

Lynn Braband, NYS Community Integrated Pest Management Program at Cornell University, NYS Agricultural Experiment Station, 630 W. North St., Geneva, NY 14456.

Yellowjackets (*Vespula* and *Dolichovesdpula* spp.) are among the most frequent and persistent pest problems at schools, parks, and similar locations. One approach to reducing the risk is the use of baited container traps. Large numbers of yellowjackets can be caught in such traps. Whether the traps actually reduce the risk of being stung has not been experimentally tested.

For three years, we have tested the premise that trapping around a periphery of a plot will reduce the number of yellowjackets in the center of the plot. The assumption was made that the fewer the yellowjackets, the less the risk of being stung. Although variable, initial analysis suggests peripheral trapping did reduce the number of yellowjackets in the center of the plot. However, the data implied that the traps may actually serve as a strong attractant.

Results of our tests will be compared to cases of applied use at community festivals and school playgrounds. Additionally, suggestions for improving the study design in subsequent years will be discussed. (Oral presentation.)

## FEASIBILITY STUDY FOR MEASURING THREE-NUCLEON FORCE EFFECTS IN NEUTRON-DEUTERON BREAKUP REACTION.

Peter Brady, Christopher Wells, Blake Winter, and Mark Yuly. Department of Physics, Houghton College, One Willard Avenue, Houghton, NY 14744.

The feasibility of a measurement of the differential cross-section for the neutron-deuteron breakup reaction d(n,np)n is being studied as a probe of the three-nucleon component of the strong force (3NF). Theoretical calculations predict that the breakup reaction is most sensitive to 3NF effects at forward neutron and proton scattering angles far from quasi-free kinematics. Incident neutrons from the Clinton P. Anderson proton accelerator at the Los Alamos Neutron Science Center (LANSCE) were scattered by a liquid deuterium target. Liquid scintillator neutron detectors and cesium iodide proton detectors were placed at angles ranging from 8° to 24° on either side of the beam line. A neutron detector was also placed at 109.2° for normalization to elastic scattering. Data from this experiment will be collected until the end of November, at which time cross sections will be calculated. (Poster presentation.)

## A SMALL 200 keV ELECTROSTATIC ACCELERATOR.

Peter Brady and Mark Yuly, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY 14744.

A small 200 keV electrostatic electron accelerator is being constructed. The preliminary design used a glass acceleration tube with external copper equipotential rings to provide a uniform electric field, but charge that accumulated on the glass eventually deflected the beam. In order to solve this problem, a new design is being tested which is made up of 51 pairs of alternating aluminum and plastic rings, with inside diameters of 8.9 cm and 10.2 cm respectively. The differing inner radii of the rings ensure that the electrons will only strike the aluminum rings, and can then be removed. (Poster presentation.)

## FORMATION OF F-ACTIN BUNDLES IN GROWTH CONES: ROLE OF FORKED PROTEIN.

S.A. Busch and E.A. Welnhofer, Canisius College Biology Dept., 2001 Main St, Buffalo, NY 14208.

Actin bundles form a radial array in growth cones, extending from the lamellipodial region into filopodia. Because the distribution of actin bundles in growth cones influences directed neurite outgrowth, it is important to investigate the regulation of F-actin bundle formation. Forked protein plays a vital role in non-neuronal cells in the regulation of actin bundle formation and subsequent elongation of *Drosophila* bristles. Recently, forked has been localized within the growth cones of *Helisoma* neurons using a polyclonal antibody. Based on the selective localization of forked protein, we hypothesized that it plays a role in directing actin bundle formation in growth cones. We assessed forked protein colocalization with newly formed actin bundles in growth cones in conditioned medium (CM) or defined medium (DM). To compare the forked protein concentration, we analyzed the ratio of forked protein to F-actin fluorescent intensity. In newly formed DM growth cones, time-lapse DIC microscopy showed actin bundle nucleation occurring continuously around the perimeter of the lamellipodia. Correlative immunofluorescence revealed the highest intensity of forked protein:F-actin colocalized to the region of actin bundle nucleation. This pattern of forked protein was not observed in older growth cones, where actin nucleation is reduced. To determine the localization of forked at specific stages of filopodial extension in CM growth cones, the status of filopodia was determined using correlative time-lapse microscopy. The filopodia were classified as extending, retracting, paused, or newly-formed. Preliminary data suggests that increasing concentrations of forked protein are associated with dynamic filopodia. Additionally, the newly-formed filopodia were observed to have a greater concentration of forked protein at the tip, as compared to paused filopodia. The correlation of forked protein with dynamic or newly-nucleated F-actin bundles suggests a role in regulating actin bundle formation. (Poster presentation.)

## POPULAR SCIENCE BOOKS AND THEIR BENEFIT TO THE READING PUBLIC.

James J. Carr, 114-4 Deerhurst Lane. Webster, NY 14580.

On July 16, 2000 the television news series *Face the Nation* ended its Sunday morning program with the usual closing commentary by host Bob Schieffer. That week the topic was the *New York Times* Bestseller list. It seems that many bestsellers are never read by their purchasers. Schieffer himself confessed to buying a copy of Stephen Hawking's *A Brief History of Time* (100 weeks on the bestseller list), and though he read it, he couldn't understand it. This passing admission by Schieffer, an educated, worldly layman implies that the general reading public does not benefit much from recent science popularizations. In fact it confirms what many in science, particularly the physics community suspect: The difficulty of a science subject like physics makes much of it simply incomprehensible (even omitting the mathematics) without a formal background. A review of literature trends over the past century will be presented and suggestions for a future direction offered. (Oral presentation.)

## REMEMBERING ISAAC ASIMOV—SCIENCE POPULIZER EXTRAORDINAIRE.

James J. Carr, 114-4 Deerhurst Drive, Webster, NY 14580.

Isaac Asimov (January 2, 1920 – April 6, 1992) was the son of a candy store proprietor whose family emigrated to New York City from Petrovichi, USSR in 1923. Isaac became a naturalized American citizen at eight years of age in 1928. In an early autobiographical sketch, Asimov wrote that "...in 1929 he made his first acquaintance with science fiction in Amazing Stories." And that "His encounter with science fiction [at the age of 9] was fateful in three ways: it interested him permanently in not only science fiction...but in science...and writing." And by age 12 he was entertaining thoughts of writing science fiction and deciding on appropriate "five-cent copybooks" (pulp fiction). Having progressed to the use of a typewriter and bond paper, Asimov submitted his first story for publication. The short story "Marooned off Vesta" was published in the March, 1933 issue of Amazing Stories, thus launching a 50-year writing career. Three months later he graduated with a bachelor's degree in chemistry from Columbia University and remained for graduate studies under the famous Harold Urey (awarded the 1934 Nobel Prize in chemistry).

After serving in the armed forces during World War II, Asimov returned in 1946 to complete graduate school at Columbia, earning a PhD in biochemistry in 1948. In Asimov's words, his "...first effort in Science was *Biochemistry and Human Metabolism*, a textbook on biochemistry for medical students...published in 1952." Asimov continued to write science and science fiction, but after 1952 he decided to write science popularizations in

physics, chemistry, biology, astronomy and mathematics. He won the James T. Grady Award from the American Chemical Society in 1965 for major contributions in reporting science progress to the public.

In this presentation a few of Isaac Asimov's many science writings will be discussed, as well as some insights into his motivation. (Oral presentation.)

## EURYPTERIDS, THE 'MARTISCO REEF COMPLEX' AND VISITING EUROPEAN GEOLOGISTS 2003.

Samuel J. Ciurca, Jr., 54 Appleton Street, Rochester, NY 14611.

Many years have been spent tracing a peculiar eurypterid horizon in Central New York State. What makes this horizon so interesting is that it is new, that it not only occurs stratigraphically above the known Bertie Group horizons, but that it occurs within a Late Silurian Reef Complex.

The reef complex is herein named the Martisco Reef Complex. It is highly dolomitized in its type area and is associated with unusual black chert beds. The reef makes its appearance near Marcellus Falls, NY. There, a roadcut exposes the "Cobleskill Formation" and overlying Chrysler Formation. Unfortunately, the lithology exposed here is not typical "Cobleskill Limestone" as described for the type locality in Eastern New York. For the thick beds exposed here, the name Rock Cut Formation is suggested and, at the top of this new unit, occurs the "Martisco Reef."

It is difficult to decide whether the new eurypterid horizon, which overlies the reef, should be included within the overlying Chrysler dolostones, or a redefined Cobleskill Formation. However, based on lithology and the occurrence of black chert within the new eurypterid bed, the strata is included as the uppermost part of the Martisco Reef Complex (MRC) within the Rock Cut Formation. Immediately overlying the MRC are beds of the typical Chrysler Formation (about 40-50 feet thick in this region). Basal Chrysler beds are brecciated and appear to be part of an algal (cyanobacterial stromatolitic) complex with mudcracked? beds also evident. This is a shallowing-up sequence indicating a reef being subjected to burial by exposure? and shallow-water deposition of algal (cyanobacterial) mats.

During August 2003, two eurypterid researchers from England, Prof. Simon Braddy and O. Erik Tetlie from the University of Bristol visited the site. This was an exciting event and, besides showing them the new eurypterid horizon and the Martisco Reef Complex, many of the eurypterid sites in Western New York were also briefly studied. (Photos are shown in the accompanying Poster Session).

The Martisco Reef Complex is overlain and underlain by dolostones with abundant black chert whose origin is unknown. The occurrence of the chert seems to be limited to an areally restricted region of deposition in Central New York. Silicified stromatoporoids are prominent—any other fossil occurring within the reef complex has to be noted carefully—everything is so highly dolomitized. Veins of white dolomite, vugs lined with crystals, and stylolites are quite evident at this exposure.

The eurypterid fauna occurring near the top of the MRC is currently under study. The common form is a wideheaded ?*Eurypterus*, similar to *Eurypterus dekayi*. Ostracods and a possible conulariid are present. More importantly, this faunal interval is present westward at Auburn where it occurs well above the stromatoporoid beds occurring in the blue-black limestone that is regarded to be the "Cobleskill Limestone". There is a great anomaly in this region (a channel?). Eurypterid beds seem to occur within the so-called 'Cobleskill' interval. Very distinctive lithologies immediately overly the thick stromatoporoid beds, yet at the top of the sequence, eurypterid and brachiopod-bearing beds of "Cobleskill-type" reappear. Beds are massive brown dolostones with only occasional black chert.

As interpreted herein, a heretofore unknown fossil reef is preserved within the Marcellus Valley south of Camillus, NY. This reef (MRC) is of Latest Silurian Age, occurring well above the typical Bertie Group *Eurypterus* horizons of New York and below the *Erieopterus*-bearing beds of the Early Devonian. The importance of the MRC lies not only in its stratigraphic occurrence at the top of the very Latest Silurian deposits of the region and its intimate association with a new eurypterid fauna, but also its relevance to the interpretation of the paleoenvironment of the Late Silurian *Eurypterus* faunas. In addition, the MRC occurs near the transition to earliest Devonian sediments (of New York) which, previously, have been suggested to represent a biostratigraphic discontinuity. The 'transition zone' appears to indicate exposure and erosion before Early Devonian sedimentation commenced. In New York, the Late Silurian *Eurypterus* is abruptly replaced by the Early Devonian *Erieopterus*. See: http://eurypterids.net for related material on this subject. (Oral presentation.)

## POLLINATOR ACTIVITY IN THE PRESENCE OF PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*).

Betty J. Colton and Brenda L. Young, Natural Sciences Department, Daemen College, 4380 Main St., Amherst, NY 14226.

Purple Loosestrife (*Lythrum salicaria*) is an invasive species that was introduced as an ornamental from Europe in the 1800's. It has spread rapidly in wetland areas and has seemingly been expanding outward into drier habitats. There has been considerable scientific focus on whether purple loosestrife impacts waterfowl and other wetland species; however, limited attention has been given to its effects on pollinator activity. Purple loosestrife produces numerous flowers with abundant nectar and may attract pollinators away from local species. During the summers of 2002 and 2003, we monitored pollinator activity in mixed plots of purple loosestrife and other flowering species as well as plots with only single species. We documented numbers of insects visiting different plots to determine whether purple loosestrife affected visitation rates to local species. We also collected pollen samples from bumblebees to determine pollinator faithfulness and the degree to which bumblebees collect purple loosestrife pollen. Bumblebee response was variable depending on the plant species present. Bees were captured on a variety of plant species; however, purple loosestrife pollen was present in >80% of the pollen samples collected. (Oral presentation.)

## DETECTING VARIABILITY IN FEATHER SHAPE.

Kristen M. Covino, Joanna M. Panasiewicz, Sara R. Morris and H. David Sheets, Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208.

In avian studies, many aspects of ecology differ between males and females and between age groups, but determining age and sex of many species in the field is difficult and often controversial. Previous studies have shown that the shape of primary feathers may be key in the determination of age and sex. Geometric morphometrics is a set of techniques that quantifies shape for subsequent statistical analysis. We used landmark-based geometric morphometrics to quantify shape of avian primary feathers. We placed landmarks on the periphery of a digital image of a feather and recorded the X and Y coordinates of all landmarks. Specimens were first aligned using a Procrustes superimposition and points along the periphery were repositioned on the periphery to minimize the distance between corresponding points on different specimens. This allowed us to use statistical methods based on the landmark positions to compare the shapes of different individuals. As part of this study, we investigated the variance between operators using a single digitized image and among multiple digitized images of the same specimen. Comparison of 15 individuals of the same species (Red-eyed Vireo, *Vireo olivaceus*) showed greater variation within a species than between operators or among repeated image measurements. This technique will be used to investigate potential differences in shape between groups of known ages and sexes. If differences exist among groups, this method may be used in the field for more accurate determinations of age and sex. Additionally, this method may be employed in the study of the evolution of feather shape and behavioral or functional aspects of feather shape. (Poster presentation.)

## COMPARING APOPTOSIS INDUCED BY ACTINOMYCIN D WITH SERUM-WITHDRAWAL INDUCED APOPTOSIS OF THE TREE CELL LINE.

Dušica Curanović and Irene Evans, Rochester Institute of Techology, College of Science, Rochester Institute of Technology, Rochester, NY 14623.

Hyaloid vasculature is important in the early development of the eye; the hyaloid vasculature regresses postnatally in a 30-day period in the rat. There are three major theories on the causes of regression: decrease in blood flow to the hyaloid after retinal development and vascularization, lack of survival/growth factor(s), particularly VegF, and active killing of endothelial cells by macrophages. However, recent research suggests that VegF is not needed for hyaloid persistence, and there is a lack of strong evidence to support the active killing hypothesis. To test the decrease in blood flow causing apoptosis hypothesis, we made a cell line and subjected the cells to removal of serum from the medium. We found that serum deprivation of the transformed rat eye endothelial cell line (TREE) does not induce significant levels of apoptosis, and here we have investigated the ability of the TREE cell line to undergo apoptosis by treatment with staurosporine, camptothecin, and actinomycin D. The drugs were found to be good apoptotic inducers. The duration of exposure to actinomycin D was found to dictate the

amount of apoptotic bodies found. We conclude that the TREE cell line is not resistant to apoptosis, and that serum deprivation is not a good inducer of apoptosis in the cell line. This could explain why a 30-day period is needed for full hyaloid regression. (Poster presentation.)

## MOLECULAR SEXING OF EASTERN RED-TAIL HAWKS.

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The absence of sexual dimorphism for some avian species makes it problematic or impossible to determine sex using morphological characteristics. Hence, it is also difficult to conduct population studies and field experiments that involve the identification of mating pairs or nesting females. This difficulty exists in both the juvenile and adult stages of Red-tail Hawks within the northeastern United States. A method has been developed to determine sex from small-volume blood samples. This method is being used to study differences in the timing of the natal dispersal of male and female Red-tail Hawks, and to establish morphological correlates of sex for use in sex identification in the field. The method involves PCR amplification of sex-specific DNA markers, specifically a well-characterized intron in the gene encoding the chromo-helicase DNA (CHD) binding protein. Amplification of this intron produces two distinct PCR products in the heterogametic female and a single PCR product in the homogametic male. Results from the employment of this technique have been used to identify some preliminary patterns in sex-biased natal dispersal and morphological correlates of sex in Eastern Red-tail Hawks. (Poster presentation.)

## ORBITS OF OUTLYING STARS IN GLOBULAR CLUSTERS.

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Globular clusters are densely packed, nearly-spherical collections of stars typically numbering in the hundreds of thousands. There are about 200 such clusters in the Milky Way Galaxy and numerous examples have been observed in neighboring galaxies. The Milky Way clusters contain very old stars which serve to correlate models of stellar formation arid aging with cosmological questions concerning the age of the universe. The fact that these clusters have not dispersed, even over their very long lifetimes, attests to their extreme dynamical stability.

The stars most likely to be "evaporated" from globular clusters are those whose orbits carry them to extreme distances from the cluster center, In this paper the orbits of these "outlier" stars are investigated by numerically integrating the differential equations describing their motion. The large number of stars in globular clusters and their spherical symmetry make it possible to simplify the integration through the use of two theorems of Newton regarding the gravitational attraction from massive spherical shells.

Because the outliers are observed to have only very small tangential components of motion, it is found that they plunge through the cluster following highly eccentric elliptical orbits symmetrical with the cluster's mass center. The major axes of these orbits precess slowly in the direction of orbital motion. For typical globular clusters the periods of such orbits are several million earth years. (Oral presentation.)

## THERMIONIC PROPERTIES OF SINGLE WALL CARBON NANOTUBES.

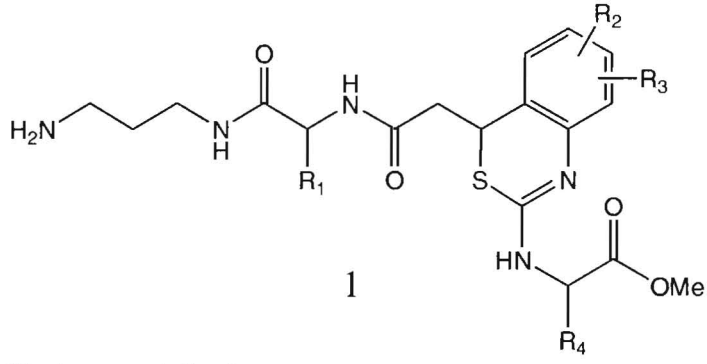
Jeffrey Elich[1], Thomas Gennett[1], Ryne Raffaelle[1], Brian Landi[1], Geoff Landis[2],
Sheila Bailey[2] and Isay Krainsky[2]; [1] NanoPower Research Laboratories, Rochester Institute of Technology, Rochester, NY 14623; [2] NASA Glenn Research Center, Cleveland, OH 44135.

We have been investigating the thermionic properties of high purity single wall carbon nanotube (SWNT) electrodes. The SWNTs are produced via laser vaporization (LV) of pressed graphite targets placed in a high temperature furnace under a flow of argon. The as-produced material from the LV synthesis process is purified using conventional methods that involve nitric acid refluxing followed by thermal oxidation in air. The purification procedure results in a "paper" in which the SWNTs are the fibers. The thermionic properties of these nanotube papers have been investigated as a function of temperature in an ultra high vacuum chamber. The SWNT paper is used as the emitter in a parallel plate configuration with a tantalum collector. The SWNT paper is held in good thermal contact to a ceramic boron nitride heater that is capable of providing measurement temperatures up to 1300°C. The test fixture allows a controllable potential to be applied between the emitter and collector. The thermionic emission of the SWNT papers is discussed. Investigation of the work function of purified SWNT materials is likewise presented. (Poster presentation.)

## SOLID-PHASE COMBINATORIAL SYNTHESIS OF A 2-AMINO-4H-BENZOTHIAZINE LIBRARY.

Christina E. Gallis, Department of Chemistry, Nazareth College, 4245 East Avenue, Rochester, NY 14618; Timm A. Knoerzer, Department of Chemistry, Nazareth College of Rochester; and Benjamin L. Miller, Center for Future Health and Department of Dermatology, University of Rochester School of Medicine and Dentistry.

Solid-phase combinatorial synthesis has been widely utilized as a method for the rapid and efficient production of libraries of diverse compounds. In addition, previous work by our group has demonstrated that substituted 2-nitrocinnamic acids provide an efficient entry to a novel 2-amino-*4H*-benzothiazine nucleus via an aryl thiourea precursor. This relatively unexplored heterocycle remains of interest to us from the standpoint of both its synthetic novelty as well as its potential future biological activity. As such, we now report the solid-phase parallel synthesis of a diverse 125 compound library resulting from elaboration of the benzothiazine nucleus through combinatorial coupling with various amino acids and isothiocyanates to generate 1. We will describe the design, synthesis, confirmation, and evaluation of select final structures.

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(Poster presentation.)

## STRATEGIES TO INHIBIT EGLN GENE EXPRESSION IN NGF-DEPRIVED SYMPATHETIC NEURONS.

Jessica L. Goodman[1,3], Yanan Guo[2], Jennifer A. Straub[3], and Robert S. Freeman[3]; [1]Nazareth College of Rochester, 4245 East Avenue, Rochester, NY 14618; [2]Interdepartmental Program in Neuroscience; and [3]Department of Pharmacology and Physiology, University of Rochester School of Medicine and Dentistry, 601 Elmwood Avenue, Rochester, NY 14642.

Sympathetic neurons deprived of nerve growth factor (NGF) undergo apoptosis that involves increased expression of select genes. The SM-20 gene is upregulated during this process and its over-expression promotes apoptosis in the presence of NGF. SM-20 (EGLN3) is a member of the EGLN prolyl hydroxylase family that also includes EGLN1 and EGLN2. Inhibitors of prolyl hydroxylases delay death caused by NGF deprivation suggesting that the EGLNs may be involved in this process.

To determine if EGLNs are critical for NGF deprivation-induced death, we plan to combine RNA interference (RNAi) with a recombinant adenovirus delivery system to specifically inhibit the expression of the EGLN genes in sympathetic neurons. We have designed 4 distinct RNAi sequences directed against EGLN1 and EGLN2 (RNAi vectors for SM-20/EGLN3 were previously constructed). Each of these potential RNAi sequences were cloned downstream of a RNA polymerase III promoter in the pSHAG vector. To evaluate the efficacy of the RNAi vectors, each vector was transiently transfected into COS-7 cells together with a plasmid encoding EGLN1 or EGLN2.

Preliminary studies indicate that at least 2 of the 4 EGLN1 and EGLN2 RNAi vectors downregulate the expression of exogenous EGLN1 and EGLN2. These RNAi vectors will be used to create replication-deficient adenovirus vectors capable of efficiently infecting postmitotic neurons. Ultimately, the ability of these vectors to inhibit EGLN gene expression in sympathetic neurons will be confirmed and the effect of EGLN downregulation on cell death after NGF withdrawal will be evaluated. (Poster presentation.)

## MICROARRAY ANALYSIS OF PRION POSITIVE AND NEGATIVE YEAST STRAINS: OBTAINING AND ANALYZING DATA.

Andrew Graves, Ingrid Chesnick, Terrence Beresford, and Irene Evans. Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Prions have become increasingly significant over the past several years due to interest in "prion diseases". Bovine spongiform encephalopathy, otherwise known as "Mad Cow Disease", is a prion disease that has made headlines all over the world. But what causes prions to function the way they do? Using yeast as a model organism, differences in gene expression between isogenic prion positive and prion negative yeast strains were analyzed using cDNA microarray technology. The procedure for this high throughput analysis was optimized as a structured academic laboratory experiment and was outlined for that purpose. The procedure includes RNA extraction and reverse transcription, microarray preparation, and evaluation using computer software programs. Microarrays were sent to GCAT (Genome Consortium for Active Teaching) at Davidson College, North Carolina to be scanned and the data posted on the Institute for Systems Biology website. Data was downloaded into a ScanAlyze spot finding program, put into EXCEL, and loaded into GENESPRING for analysis. A protocol was developed listing the step by step methodology for microarray execution and analysis. Many differences in gene expression were detected between the prion positive and negative strains and these will be discussed. (Poster presentation.)

## THE IMPACT OF URBANIZATION AND AGRICULTURE ON STREAM BIOLOGY.

William L. Hallahan, Biology Department, Nazareth College, Rochester, NY.

The purpose of this project was to compare the impact of three different watershed characteristics on stream hydrology, nutrients and macroinvertebrates. Three streams were examined from late May to mid-September, 2003. The urban watershed, Brighton and Henrietta (Allen Creek, East Avenue and below) was compared with a rural watershed, Mendon (Irondequoit Creek, Fishers) and an agricultural watershed, Leicester (Little Beards Creek). This is a report of collaborative research with students and faculty. Despite the small sample sizes, the differences in nutrient loading and macroinvertebrate indices (BI, EPT, PMA) show differences between the three watersheds. The streams in the rural agricultural watershed showed little nutrient impact due to substantial riparian zones. The urban stream showed the greatest impact both in nutrient loading and among the macroinvertebrate indices. (Oral presentation.)

## VESICULAR STOMATITIS VIRUS MATRIX PROTEIN AND ANOTHER VIRAL COMPONENT ARE INVOLVED IN CELLULAR NF-κB REGULATION.

W. Hammond, M.C. Ferran, Department of Biological Sciences, Rochester Institute of Technology.

Interferon (IFN) is a cellular protein produced as part of the innate anti-viral response. Many viruses have evolved mechanisms by which they bypass the cell's ability to activate this antiviral response, thereby allowing a productive infection to occur. The main research focus in our laboratory is to understand the mechanisms used by Vesicular Stomatitis Virus (VSV), the prototype member of the Rhabdovirus family, to block activation of the IFN response. It is known that the viral matrix (M) protein nonspecifically suppresses IFN gene expression by inhibiting global host transcription. Preliminary studies indicate that VSV may also specifically control induction of the IFN gene by regulating activation of a cellular transcription factor called NF-κB. Once activated, NF-κB translocates to the nucleus and becomes part of an enhanceosome complex responsible for IFN gene induction. The goal of this study was to investigate the viral protein(s) responsible for NF-κB activation. L929 cells (mouse fibroblast) were infected with wild type VSV or mutant virus strains that containing various defective proteins (including M protein). After various times post infection, NF-κB nuclear localization was monitored by immunofluorescence and confocal microscopy. Preliminary results indicate that the M protein, as well as another viral component, are involved in the regulation of NF-κB activation. (Oral presentation.)

## EFFECTS OF LAND-USE HISTORY AND BEECH BARK DISEASE ON AMERICAN BEECH SAPLING DENSITY.

Elizabeth N. Hane, Rochester Institute of Technology, Biological Sciences, 85 Lomb Memorial Dr., Rochester, NY 14623.

While an increase in American beech (*Fagus grandifolia*) sapling density has been noted throughout the northeast, few studies have examined the causes of the increase. To examine the role of beech bark disease in the increase of beech sapling density, I assessed adult beech trees for beech bark disease damage, and measured beech sapling density surrounding the adult. By using isolated adults, I was able to ascribe saplings to a specific adult. I also investigated the effects of land-use history on beech bark disease severity and beech sapling density. Adult beech trees with more severe damage from beech bark disease had more saplings around them. Former sugarbushes had less damage from beech bark disease and lower densities of beech saplings than areas that were formerly logged. Thus land-use history and disease severity appear to contribute to higher beech sapling densities. (Poster presentation.)

## ACID AND TEMPERATURE DEPENDENCE OF PYRROLE-2-CARBOXYLATE DECARBOXYLATION AND INTEGRATION INTO THE PHYSICAL CHEMISTRY LABORATORY.

Kelly Hutchinson[1], Howard Mettee[2], Stacey Lowery-Bretz[2], and Jeffrey Smiley[2]; [1] Department of Chemistry, Nazareth College of Rochester, 4245 East Ave. Rochester, NY 14618; [2]Department of Chemistry, Youngstown State University, Youngstown, OH 44555.

The focus of this research is to design a collaborative learning physical chemistry laboratory experiment in kinetics. Both the effects of acid concentration and temperature on the rate of decarboxylation of pyrrole-2-carboxylate (P2C) have been investigated. The reaction of P2C has been found to be acid catalyzed, to be pseudo first order rate, and to have a higher activation energy at lower acid concentrations, higher pH's. This experiment requires students to work in small groups to acquire different portions of the data set, and then collaborate *en masse* by sharing their data to discover how both the rates and activation energies change as a function of acid concentration and as a function of temperature. (Poster presentation.)

## A COMPARISON OF COPPER LEVELS IN MACROINVERTEBRATE TISSUE IN URBAN AND RURAL STREAMS.

Caitlin Jagger, 24 Merchants Road Rochester NY 14609.

Urban runoff has been increasing the variety and amounts of heavy metal pollution in streams. High metal content can have negative impacts on aquatic communities. One of the most common metals found in urban runoff is copper. Copper enters the runoff from brake lining wear, moving engine parts, fungicides, and insecticides.

Copper enters the streams through urban runoff and accumulates in the tissues of some macroinvertebrates. In this investigation, the levels of copper found in freshwater shrimp, oligochetes, and crayfish were compared. Samples were taken at urban and rural streams sites in the Irondequoit Creek watershed. The copper levels in macroinvertebrate tissues from upstream and downstream sample sites were also compared.

The copper levels in the crayfish and freshwater shrimp tissues increased from the upstream to downstream samples. The copper levels were also higher in crayfish and freshwater shrimp at the urban sites than in the rural streams. Low levels of copper in the oligochetes support other studies indicating that copper resides mostly in the food chain and not in the sediment. (Poster presentation.)

## SEQUESTRATION OF DIETARY TERPENOIDS BY THE GOLDENROD BEETLE: A PROPOSED MECHANISM FOR PROTECTION.

Robert H. Johnson, Dept. of Math and Science, Medaille College, Buffalo, NY 14214; Brenda L. Young, Dept. of Natural Sciences, Daemen College, Amherst, NY, 14226; and Robert J. Grebenok, Dept. of Biology, Canisius College, Buffalo, NY 14208.

*Solidago altissima* is known to contain a number of terpene allelochemicals and host the specialist beetle *Trirhabda canadensis*. In areas of persistent *Solidago* occurrence, *Trirhabda* populations may reach high densities

causing defoliation of initial growth by larvae and regrowth by adults; however, little is known about *Trirhabda* population regulation, or if its allelochemical-rich diet plays a role in protection against predators. To test the hypothesis that *Trirhabda* larvae sequester dietary allelochemicals, GC/MS analysis was conducted on leaf samples from eight distinct patches of *Solidago* clones and six actively feeding larvae from each patch. To test the hypothesis that *Trirhabda* larvae are able to deter insect attacks, two-choice feeding bioassays were conducted in June 2003 using both field ants (*Formica sp.)* and spined soldier bugs (*Podisus maculiventris*) with small mealworms as controls. Plant analysis identified five sesquiterpenes and two diterpenes; germacrane-D (Mean $\pm$ 1 SEM; 4.36 $\pm$ 0.66 mg/g dry wt.) and a furan containing cis-clerodane alcohol (5.26 $\pm$ 1.65 mg/g dry wt.) were the major components. Larval terpenoid profiles were less complex; however, germacrane-D (Mean $\pm$ 1 SEM; 0.46 $\pm$ 0.08 mg/g fresh wt.) and the furanyl cis-clerodane (0.73 + 0.17 mg/g fresh wt.) were also identified as the major components. A positive relationship was seen between furanyl cis-clerodane host leaf and whole larvae concentrations ($r^2 = 0.562$, F=10.26, df=1,8, p=0.013). Two-choice bioassays indicated that prolonged ant attacks on *Trirhabda* were deterred relative to controls ($X^2 = 32.6$, df = 1, P<0.0001). Deterrence was scored as a single ant bite followed by retreat and mandible cleaning. In contrast, the soldier bug exhibited no feeding preference or differential mortality. This study suggests that *Trirhabda* larvae selectively retain dietary germacrane-D and a furanyl cis-clerodane alcohol and that biting ants but not sucking insects appear to be deterred from prolonged attacks or feeding. (Poster presentation.)

## FINDING SCIENCE IN FOLKLORE: ANOMALOUS ANIMALS OF THE IROQUOIS.

Russell A. Judkins. Department of Anthropology, SUNY Geneseo, Geneseo, NY 14454.

Traditional Iroquois folklore reflects a substantial body of precise and rational, even scientific, knowledge of the fauna of northeastern North America. This matches a similar body of knowledge of flora, which has been increasingly appreciated for its pharmaceutical insights. However, the Iroquois folklore archive also includes accounts of anomalous creatures which present a strong contrast with the other, familiar animals alongside which they are featured.

Anomalous animals in Iroquois lore may be viewed in either of two categories: (1) those occurring widely throughout Native American and/or world folklore (e.g., lake serpents), and (2) those whose occurrence is clearly localized (e.g., *niagwahe* or Great Naked Bear). By looking at animals from this second set there is a chance to compare folklore and mythic components of their descriptions vs. the scientific—or at least the folk science—nature of such "local" fauna, including characterizations of both appearance and behavior. The case examined here is that of *niagwahe* (an anomalous, bear-like animal). Is there science in this folklore? The evidence suggests that there could be. If an ancient, now extinct, faunal form is the basis of this folklore image, then its status as an "anomalous" creature may be at least partially explained by that fact alone—in this case that of an animal whose appearance and behavior, like those of other animals, may be well understood, but yet an animal which "doesn't exist," (or more precisely, one which simultaneously exists/doesn't exist). Such a creature is "anomalous" by its very nature and, therefore, a likely candidate for inclusion in folklore and mythology—the realms in which cultural meanings of the significant things in a community's collective knowledge-universe are categorized, explored and maintained. (Oral presentation.)

## YOU AND 我 (ME): THE ISSUES OF PRESTIGE AND IDENTITY IN THE CODE-MIXING AND CODE-SWITCHING OF HONG KONG CANTONESE SPEAKERS.

Samuel L. Judkins, Department of Anthropology, SUNY Geneseo, Geneseo, NY 14454.

Hong Kong has gone from small town, to British colony, to a special administrative region in the People's Republic of China all in a matter of about 150 years. In this time, Hong Kong has also become a center for international business in Asia and the world's stepping stone into China. As such, there is a mixture of native and foreign ideas and cultures that permeate every facet of the local culture. In almost no way is this clearer than in the mixing of Cantonese and English by native Cantonese speakers (about 90% of the total population of Hong Kong). This practice shows the fine line that exists between the expressing one's social status through language use, and not alienating the Cantonese community of which one is a part. Even today, after the turn over of Hong Kong back to PRC rule, Cantonese speakers continue to define their role in the world and their status within their own community through the way they mix and switch between Cantonese and English. (Oral presentation.)

## A PRELIMINARY TRANSMISSION COMPUTED TOMOGRAPHY SCANNER.

Nicholas Kingsley and Ronald Rohe, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY 14744.

A preliminary design for a first generation tomography scanner is being made. The scanner uses Na-22 as the radiation source, with gamma rays being detected by shielded NaI detectors. The novel design of the scanner allows a very weak radiation source to be used by taking advantage of the back-to-back 511 keV gamma rays emitted by Na-22 to improve the signal to noise ratio. The object being scanned will be translated and rotated systematically by computerized motor control using two motors attached to a standard rotary table. This presentation will introduce the design along with preliminary measurements. (Oral presentation.)

## HISTORIC ARCHAEOLOGY OF THE CANADICE OUTLET.

Kristi J. Krumrine, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

The Canadice Outlet area of Livingston and Ontario Counties, New York, has a rich cultural history both relating to prehistoric settlement by Native Americans as well as subsequent settlement by historic pioneers. The proximity of a high energy outlet flowing northwest from Canadice Lake provided energy to run the various mills which fueled the local economies of towns like Hemlock and Canadice. Most of this area is now owned by the City of Rochester and is a protected watershed for Hemlock and Canadice Lakes, the drinking water for the City of Rochester. This area provided an ideal setting for doing archaeological fieldwork, both because of its rich history as well as the protection it has been afforded for the past 80 years. The St. John Fisher 2003 summer field school was concentrated on the west side of the outlet. The Adam's Mill site, the remains of a 19$^{th}$ century saw mill, and the Steel Bridge Site, a historic midden near the old Dixon Hollow road, were tested during the 2003 fieldwork and will be discussed. Future excavation will be focused on the remnants of Dixon Hollow, a thriving 19$^{th}$ century village located on the east side of the outlet. (Oral presentation.)

## OVERVIEW OF SINGLE WALL CARBON NANOTUBE-NAFION COMPOSITE ACTUATORS.

B.J. Landi, R.P. Raffaelle, J.M. Elich, and T. Gennett, NanoPower Research Laboratories, Rochester Institute of Technology, Rochester, NY 14623.

The development and characterization of thin film polymeric actuators has been performed for single wall carbon nanotube (SWNT)–Nafion composite systems. A review will be presented on the initial study where incorporation of SWNTs into the Nafion matrix promoted an actuation response at relatively low doping levels. The bimorph cantilever actuator tip deflection was shown to correspond to the composite film's electrical conductivity. In addition, we will describe the effects of frequency and applied voltage on the composite bimorph actuator systems. The results indicate a displacement response that is linearly dependent on voltage and inverse to frequency. (Poster presentation.)

## RELIABLE USE OF MIGRATION BANDING DATA: EFFECT OF SAMPLE SIZE AND CAPTURE HISTORY ON GOODNESS-OF-FIT AND MODEL SELECTION.

Amanda M. Larracuente, Melissa Mustillo, Kathryn E. Mattern, Kristen M. Covino, David A. Liebner, H. David Sheets, and Sara R. Morris, Departments of Biology and Physics, Canisius College, Buffalo, NY 14208.

Migratory stopover sites are known to be important for the successful completion of migration by many birds. However, there are many difficulties in assessing the importance of and the use of individual sites. One method of comparing sites is to determine the number of birds using sites and the length of time migrants remain at a site. Open population models using banding data allow the estimation of both of these parameters. Goodness-of-Fit tests assess the ability of the most complex model to fit the data, and must be passed before models can be fitted to the data. Many factors of a population's capture history including sample size, recapture rates, and number of recaptures affect the ability to fit models to banding data. We investigated the effect these factors had on Goodness-of-Fit and model selection using open population models on banding data. Initial results suggest that Goodness-of-Fit cannot be predicted based on sample size and recapture rate. However, model fitting does appear to be affected by sample

size. Model fitting was reliable for sample sizes greater than 100 individuals and less reliable for smaller sample sizes. (Poster presentation.)

## THE FORMATION OF THE UNIVERSE (BIG BANG) AS A CRYSTALLIZATION PROCESS.

Dr. Ingo H. Leubner, Rochester Institute for Scientific Research, Penfield, NY 14526-2411.

Crystallization is the condensation of material from a dilute into a concentrated form by a phase transition. This is exemplified by the crystallization of water vapor into rain, snow, or hail, or by the crystallization of sugar from an aqueous solution.

Similarly, the process of the Formation of the Universe, the Big Bang, is the condensation of energy into particles. Thus, from a mechanistic view, the Big Bang falls into the category of crystallization. By applying known principles of the process of nucleation and crystallization developed by the author and others, important insights are obtained. Thus, this model predicts the causality between mass and gravity, their interaction, and their energy equivalence.

The model opens the door for a variety of other questions, which will be discussed. For instance, the pure energy state is being approached in the present Universe by the radiative decay of stellar objects. The reaction product of the decay of stellar objects into energy leads to the formation of photons. A question is the concentration of this dilute energy into a concentrated state. A further question arises about mechanisms by which photons contribute to the condensation into the energy singularity. This leads to a discussion of the existence of black mass, which is posed to cause the collapse the Universe back into a singularity. The discussion of the Big Bang, the formation of the universe, as a crystallization process is a contribution to approach a subject that has thus far been thought of as intractable. (Poster presentation.)

## IDENTIFICATION OF THE SECOND VSV COMPONENT INVOLVED IN NF-κB REGULATION.

C. Lubking and M. Ferran. Rochester Institute of Technology, Rochester, NY 14623.

Vesicular Stomatitis Virus (VSV), a member of the Rhabdoviridae family, is a bullet shaped virus that causes oral lesions in livestock. The negative strand RNA genome of VSV encodes five genes: L, M, N, P, and G. Research in our laboratory focuses on the mechanisms used by VSV to bypass an important cellular antiviral defense known as the interferon (IFN) system. VSV nonspecifically inhibits IFN production when the matrix (M) protein turns off general cellular host transcription. We predict that VSV also utilizes a specific mechanism by which it blocks the cells ability to induce the IFN response, thereby blocking the cells ability to save itself from viral infection. Preliminary data support the hypothesis that VSV specifically suppresses IFN gene expression by delaying activation of NF-κB, an important host transcription factor essential for IFN gene expression.

The goal of this project is to identify the viral components responsible for regulation of NF-κB. In order to elucidate the effects of each viral protein on NF-κB activation, each viral gene from an IFN inducing and IFN suppressing strain of VSV will be cloned into an eukaryotic expression vector and expressed in mammalian cell lines. The ability of each viral protein to block NF-κB activation will be monitored using several different methods. Progress on this project will be discussed. (Oral presentation.)

## HYENA SCAVENGING OR HOMINID TOOL USE.

Melinda Lull and Shannon Gates, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Archaeologists today continue to search for evidence of hominid tool use. Bone assemblages from Pleo/Pleistocene times in Africa, have the potential to yield great amounts of information on the subject. Marks on the bones can tell a great deal about what type of object created them. Characteristics of the assemblages themselves can tell about what species created them. However, great caution must be exercised when examining the bones and the sites. It is not easy to tell the difference between the demarcations made by non-human mammals and hominids. Many archaeologists argue over the evidence presented. This poster will illustrate the differences between human and non-human bone collection, and effects on bone in an effort to more clearly examine the evidence of the past. (Poster presentation.)

## THEY'RE STAYING HOW LONG? UNCERTAINTIES ABOUT STOPOVER DURATION OF MIGRANT SONGBIRDS.

Sara R. Morris, Kristen M. Covino, Kathryn E. Mattern, Melissa S. Mustillo, Amanda M. Larracuente, and David A. Liebner, Biology Dept Canisius College, Buffalo, NY; and H. David Sheets, Physics Dept., Canisius College, Buffalo, NY.

The length of time that migrants stay at stopover sites will affect the total length of migration and may affect the ability of birds to obtain quality territories. However, estimating stopover has proven difficult. Minimum stopover, the time between first and last capture, is a conservative statistical estimate of the length of time birds spend at a stopover site, but this estimate only includes recaptured individuals, rather than the entire population sampled. Open population models incorporate all individuals, but require the numerical fitting of complex models to the observed capture histories to produce estimates of the stopover duration. Furthermore, the utility of these models is influenced by the number of individuals captured, the recapture rate, and the length of the trapping period. We examine factors that might contribute to the variation in stopover estimates, including the effects of sample size, the capture history (e.g., the number of days in the capture history, the number of recaptures, and the recapture rate), and the number of parameters estimated in an open population model. We also compare the variation in stopover estimates obtained using these two approaches. (Poster presentation.)

## CORRELATING EPIDERMAL GROWTH FACTOR RECEPTORS AND E-CADHERIN DOWNREGULATION IN RESPONSE TO DEXAMETHASONE IN A431 CELLS.

Lucas B. Murray and Dr. J. E. Lewis, SUNY College at Geneseo, Geneseo, NY 14454-1406.

Epithelial (E)-cadherin is a glycoprotein found in the plasma membrane of epithelial cells. It is responsible for cell-cell adhesion which allows for tissue formation. In the late stages of epithelial tumor development cancer cells gain the ability to metastasize (translocate to other areas of the body). This is often accompanied by a downregulation of E-cadherin. It has been shown that in the vulvar carcinoma cell line, A431, E-cadherin is readily down-regulated in the presence of dexamethasone (dex), a synthetic analog of hydrocortisone. What makes this cell line unique is that it possesses approximately ten times more epidermal growth factor receptor (EGFR) than most epithelial cells. The goal of this research was to try and establish a correlation between the amount of EGFR and the ability of the A431 cells to downregulate E-cadherin in the presence of dex. To accomplish this five subclones of the A431 cell line were treated with a $10^{-7}$ M solution of dex for a period of 30 days. All of the subclones had lower levels of EGFR than the original A431 parent cell line. After 30 days of treatment, immunofluorescence and Western blotting was performed on each of the subclones to assess their ability to downregulate E-cadherin. It was found that all the clones retained the ability to readily downregulate E-cadherin in the presence of dex, regardless of their level of EGFR. This suggested that elevated levels of EGFR in the parent cells were not correlated with the ability of A431 to downregulate E-cadherin in response to dex. (Poster presentation.)

## THE EFFECT OF ELECTRON TRANSFER ON PROTEIN STRUCTURE.

Janine O'Dea and Kazu Yokoyama, Department of Chemistry, SUNY College at Geneseo, Geneseo, NY 14454-1406.

Mixtures of potassium ferro cyanide ion, $[Fe(II)(CN)_6]^{4-}$, and albumin or Cytochrome–*c* were prepared, from which absorption and fluorescence studies were conducted. For both the albumin and Cytochrome–*c* mixtures, no complex formation was observed between $[Fe(II)(CN)_6]^{4-}$ and the proteins, however, a drastic decrease in fluorescence band was observed as the concentration of the ion increased under the excitation of 230 nm. Since the electron detachment from $[Fe(II)(CN)_6]^{4-}$ ion took place at 230 nm, the ejected electrons may have been transferred into proteins causing a structural change. The mechanism of quenching under various conditions will be discussed. (Poster presentation.)

## PROTECTING THE APPLES OF NEW YORK: A STUDY OF FUNGAL RESISTANCE.

Christopher O'Donnell, Nazareth College, 4245 East Avenue, Rochester, N.Y. 14618.

In the United States, the apple scab pathogen *Venturia inaequalis* has developed fungicide resistance to several classes of fungicides. Because of this, scientists have been looking for new fungicides to control apple scab. One of the fungicides being investigated is pyrimethanil, which belongs to the structural class of anilinopyrimidines. The

target site of pyrimethanil is most likely the enzyme cystathionine-β-lyase. *Venturia* sensitivity to pyrimethanil was compared for four orchards that have never been exposed to fungicides and six commercial orchards, five of which had no prior exposure to pyrimethanil and one orchard that had been exposed to pyrimethanil. A seven-day test was used to measure *Venturia* colony size to study its sensitivity against pyrimethanil. This study showed that pyrimethanil was effective in inhibiting *Venturia* growth in the control orchards that had never been exposed to any fungicides, but there was an increase in *Venturia* resistance to pyrimethanil in the orchards that had been previously exposed to other fungicides. This shift in resistance shows that *Venturia* was able to develop a resistance to pyrimethanil due to previous exposure to other structural classes of fungicides. The data suggests that there is a correlation between pyrimethanil resistance and previous myclobutanil exposure. Myclobutanil is a sterol demethylation inhibitor (DMI). A scattered plot graph showed fungal colony size for isolates exposed to pyrimethanil was dependent on myclobutanil exposure. The data indicates an increase in the speed of resistance development to pyrimethanil among *Venturia* phenotypes already resistant to unrelated fungicides. This suggests that the use of pyrimethanil against *Venturia*, especially for those trees previously treated with other fungicides, should be limited and closely maintained to prevent resistance development. (Poster presentation.)

## ASSESSING NEW YORK HUNTERS' KNOWLEDGE OF CHRONIC WASTING DISEASE.

Ed Oldfield, Anne Terninko and Rob Wink, Environmental Conservation Department, Finger Lakes Community College, 4355 Lake Shore Drive, Canandaigua, NY 14424.

Chronic wasting disease (CWD) is one of a group of transmissible spongiform encephalopathies or prion diseases. This fatal disease affects white-tailed deer (*Odocoileus virginianus),* mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*). Weight loss, head tremors, excessive salivation, extreme thirst, excessive urination and stupor are characteristic symptoms. CWD was first discovered in 1967, and has now been documented in ten states and two Canadian Provinces in either farm or wild populations. At this time CWD has not been found in New York State, however the New York State Department of Environmental Conservation (NYSDEC) has implemented new regulations to prevent the import of this disease from affected areas.

On September 27 and 28 of 2003, a survey of New York State deer hunters was conducted at National Hunting and Fishing Days at the NYSDEC offices in Avon, NY. Participants were asked to complete a survey to demonstrate their knowledge of the disease, the new NYSDEC regulations, the impact the disease would have on their hunting activities if found in New York State, and their perception of CWD as a threat to the New York State deer population. The survey was restricted to deer hunters. A total of 152 surveys were completed. (Oral presentation.)

## GENETIC DIVERSITY AMONG ISOLATED AMERICAN BEECH (*FAGUS GRANDIFOLIA)* AND EASTERN HEMLOCK (*TSUGA CANADENSIS).*

Sandra Quick and Cheryld Emmons, Division of Biology, Alfred University, Alfred, NY 14802.

Beech bark disease and hemlock disease are invading the Northeast and threatening to eliminate the beech and hemlock populations. This experiment was designed to estimate genetic diversity among and between isolated beech and hemlock populations.in New York State. The results will be used as a basis for further testing and observations of the diseases.

Five or six trees were sampled from each population of beech and hemlock. Three beech stands were chosen from Allegany County, one from neighboring Steuben County, and one from Oswego County, all in New York. Two hemlock stands were chosen in Allegany County, one in Steuben County, and one in Oswego County. The stands in Allegany and Steuben Counties were chosen to represent closely located populations and the stand in Oswego County was chosen to represent populations from a greater distance. All of the individual stands were chosen for their degree of isolation from other beech or hemlock populations.

After the samples were collected, the DNA was extracted using a Biorad Quantum Prep Aquapure Genomic DNA Isolation kit. Extracted DNA was amplified by PCR using Promega Master mix and two pairs of random primers (Qiagen). Amplified fragments were separated by electrophoresis and visualized using Sybergold stain and a UVP BioImaging system.

Two pairs of random primers resulted in eight loci showing heterozygosity among and within populations of both species. Within population heterozygosity varied, with the Steuben County hemlock population showing greater heterozygosity than all other hemlock populations and the Oswego County beech population showing higher heterozygosity than all other beech populations.

There was genetic diversity present within all of the stands and among the stands; however, the difference in heterozygosity was not statistically significantly, which could be due to the limited sample size. This research should be continued with the use of a greater sample size and variety and number of primers used, which would better determine the total amount of genetic diversity. These results and future results are important to the research of the effects and impact of the invading beech bark disease and hemlock disease. (Poster presentation.)

## REGULATION OF THE HOST-CELL INTERFERON RESPONSE IN VESICULAR STOMATITIS VIRUS-INFECTED CELLS AT THE POINT OF IKB DEGRADATION.

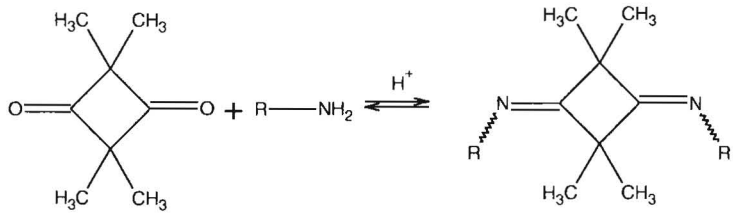
M. Quinn and M. C. Ferran, Rochester Institute of Technology, Rochester, NY.

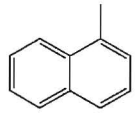
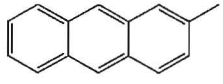
One of the primary host defenses that is triggered in virally infected cells is the induction of type I interferons (IFN α and β). The IFN response causes infected and surrounding cells to enter into an antiviral state thereby blocking virus replication. In response, many viruses have evolved mechanisms that block the IFN response. The goal of this project was to study the mechanisms used by vesicular stomatitis virus (VSV) to regulate IFN gene expression. When inactive, NF-κB, a host transcription factor required for induction of the IFN gene, is found in the cytoplasm bound to its inhibitor, IκB. Upon viral infection, IκB is phosphorylated and degraded, allowing nuclear translocation of NF-κB. We are comparing the fate of IκB in cells infected with the IFN suppressing wild type VSV, and VSV mutants that are defective in their interferon suppressing abilities. Via Western Blot analysis, we were able to determine which strains of VSV are effective at preventing transcription of the interferon gene, and which strains are defective in this ability. Once we obtain the sequences of our viral genes, we will be better able to target the mutations that are causing the differences in regulation. (Oral presentation.)

## 1,3-BISAROMATIC-IMINO-2,2,4,4-TETRAMETHYLCYCLOBUTANES: POTENTIAL NEW ORGANIC LIGHT EMITTING DIODE MATERIALS.

R. M. Rohring (C. Maggiulli Fellow and Pasto Co-op Research Fellow), A. Chong and J.J. Worman, Department of Chemistry, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

The α-bisnapthyl and β-bisanthryl derivatives were prepared using a standard synthetic procedure.




R =  or 

Compounds were purified by removal of the starting diketone through sublimation followed by standard recrystalization. Spectral properties and elemental analysis were consistent for the structures shown. Fluorescence spectra show the n→π* emissions occur in the visible region, with the more conjugated β-bisanthryl emitting at lower energy. Derivatives of these compounds when compared to the properties of known OLEDs offer significant potential for visible light emitting applications. (Oral presentation.)

## EATERS OF THE DEAD.

Amberly Rounds and Natalie Saxton, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Recent evidence suggests that the Anasazi tribe of the American southwest engaged in cannibalistic behavior. Microwear studies have been used to evaluate the presence of cannibalistic behavior at these sites. These techniques will be discussed, as well as recent controversies surrounding the suggested practice of cannibalism among the

Anasazi people. The development of microwear analysis on human remains provides a set of objective criteria for evaluating cannibalistic behavior in bone assemblages. (Poster presentation.)

## IMPLEMENTING GAP ANALYSIS TO EXPLAIN LOW MACROINVERTEBRATE POPULATIONS IN CORBETT'S GLENN AT ALLEN CREEK.

Shannon H. Schuchart and Dr. William L. Hallahan. Biology Department, Nazareth College, 4245 East Avenue, Rochester, N.Y. 14618.

Allen Creek at Corbett's Glenn, located within the Irondequoit watershed, was recently acquired by the town of Brighton and designated a park. Initial testing of this location has shown reduced biodiversity in the macroinvertebrate species present. Corbett's Glenn first attracted interest as a park site due to its beauty and expected species diversity. Although the biodiversity of the terrestrial environment remains high, the biodiversity among current stream macroinvertebrate populations is low. The purpose of this project was to implement Gap Analysis to explore the existing gap between the actual and expected species.

In order to confirm and possibly explain the gap, Corbett's Glenn was compared to other stream sites using various physical and chemical parameters. These parameters included: pH, temperature, oxygen, discharge, phosphates, nitrates, TSS, TDS, and macroinvertebrate samples. This study presents data from three urban stream sites along Allen Creek and compares them with three similar rural stream sites located in both the Irondequoit and Genesee watersheds.

A difference in macroinvertebrate diversity between the three urban sites versus the three rural sites was found. Comparison of the water quality data from all sites showed little difference among the chemical and physical parameters of the streams. This indicates, that despite its pristine appearance, Corbett's Glenn may be suffering from other effects of its urban watershed environment outside of the park. (Poster presentation.)

## QUORUM SENSING SIGNALS FROM NON-PATHOGENIC AND PATHOGENIC ISOLATES OF *AGROBACTERIUM VITIS*.

R. A. Scott[1], J. Kim[1], T. J .Burr[2] and M. A. Savka[1]. [1]Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623; and [2]Department of Plant Pathology, NYSAES, Cornell University, Geneva, NY 14456.

Quorum-sensing (QS) is a gene regulatory mechanism by which a bacterial population measures its cell density and / or physical confinement. Two main processes govern a QS system: (1) production of small diffusible molecules (QS signals) known as *N*-acyl-homoserine lactones (acyl-HSLs) and (2) signal detection via QS-responsive regulators. Acyl-HSLs contain a homoserine lactone moiety ligated to an acyl chain. The specificity determinants of acyl-HSLs include the length of the acyl chain and specific substitutions at the third carbon on the acyl chain. Acyl-HSLs with greater than eight carbons in the acyl chain are known as long-chain acyl-HSLs and those with eight or less carbons in the acyl chain are referred to as short-chain acyl-HSLs. As the cell density and / or physical confinement of a bacterial population increases, the constitutively produced acyl-HSLs reach a threshold concentration. At this concentration the QS regulator detects acyl-HSLs and induces expression of specialized gene sets.

In this study, 15 pathogenic isolates of *A. vitis*, the causal agent of crown gall disease on grape, and 72 non-pathogenic saprophytic isolates of *A. vitis* were tested for their ability to synthesize acyl-HSLs. *A. vitis* isolates were grown to late log / early stationary phase and ethyl acetate extractions of cultures were prepared and concentrated. Well-diffusion assays with acyl-HSL biosensor strain NTL4 (pZLR4) showed all *A. vitis* isolates tested except one synthesized acyl-HSLs. To determine the number of and sizes of acyl-HSLs produced, selected acyl-HSL-positive isolates were further characterized by thin layer chromatography (TLC) following signal detection using an overlay of biosensor strain NTL4 (pZLR4). Of the 15 pathogenic isolates tested using TLC, 13 isolates synthesize a long-chain acyl-HSL, while 8 of the 13 isolates produced one or more additional short-chain acyl-HSLs. TLC analysis of 19 non-pathogenic isolates showed all produce a long-chain signal and one or more short-chain signal(s) with some isolates producing a total of 5 different acyl-HSL signals. The synthesis of QS signals by non-pathogenic and pathogenic isolates of *A. vitis* suggest that gene regulation by QS may be a common feature of this Gram-negative soil bacterium. (Poster presentation.)

## POPULATION STRUCTURE OF ZEBRA MUSSELS (*DREISSENA POLYMORPHA*) IN CANANDAIGUA LAKE.

Ed Sensor and Bruce Gilman, Department of Environmental Conservation, Finger Lakes Community College, 4355 Lakeshore Drive, Canandaigua, NY 14424.

Zebra mussels invaded Canandaigua Lake in the early 1990's and immediately affected water quality. Lake clarity ($z_{sd}$) increased and algal productivity (ug/L chlorophyll *a*) decreased until the year 2000. The following year, clarity deteriorated and algal abundance recovered, suggesting a change in the effectiveness of filter feeding by the mussel population. Coincidently, large streaks of persistent foam appeared on the lake surface waters. We hypothesized that the mussel population had outgrown its food supply leading to massive die-off, and predicted that a subsequent inventory of population structure would reveal dominance by a recolonizing first year age class. Fifteen samples were collected by PONAR dredge from five sites on the lake. All mussels were counted and weighed, and a subsample of up to 100 mussels were measured for shell length. Data analyses supported a very young population structure. (Oral presentation.)

## THE EFFECT OF THE SUP35 PRION PROTEIN ON GENE EXPRESSION IN *SACCHARCHAROMYCES CERVISIAE*.

Amanda M. Sitterly and Irene M. Evans, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

A prion protein is a protein that can change into an alternative conformation. This alternative conformation can form aggregates and cause proteins in the original shape to fold into this secondary shape. Prion proteins are known to cause diseases such as "mad cow" disease in cattle and Creutzfeldt-Jakob disease in humans. In yeast, the Sup35 protein acts as a prion, which is called [psi-] in its original form and [PSI+] in its prion conformation. The [PSI+] protein seems to cause an increase in our yeast strain's growth rate, rather than causing disease as in other organisms. The Sup35 protein is involved in translational termination and in its [PSI+] form acts as a suppressor and reads through stop codons. The possible differences in gene expression were studied by extracting RNA from [PSI+] and [psi-] yeast, reverse transcribing the RNA into cDNA, labeling each with a different dye, and hybridizing onto a microarray printed with all of the *S. cerevisiae genes*. The microarrays were then scanned and the images produced were analyzed. Definite differences in gene expression exist between the [PSI+] and [psi-] strains. We are currently analyzing the degree of gene expression in each strain, as well as the reproducibility of the data. (Poster presentation.)

## POSITIONAL CLONING OF THE TT9 LOCUS OF *ARABIDOPSIS THALIANA*.

Emily Smithers, Blair MacDonald, and Matthew Pelletier, Department of Biology, Houghton College, One Willard Avenue, Houghton, NY 14744.

Many different mutants have been isolated from *Arabidopsis thaliana*, including one class affecting the production of seed coat pigmentation. These plants are known as *transparent testa* (*tt*) mutants. The *tt9* mutant is characterized by pale yellow-brown seeds, which are generally smaller than the brown seeds of *Lansberg erecta* (the ecotype from which the mutant was isolated). Decreased germination rates are also an effect of *tt9*, leading researchers to believe this gene is involved in the ability to overcome dormancy as well as seed-coat pigmentation. Therefore, cloning this gene may lead to a further understanding of seed physiology. Previous experiments, using a small plant population and a limited number of phenotypic genetic markers, determined that the location of *tt9* is on chromosome 3, approximately 5 centiMorgans from the marker *GL1*. Positional cloning is currently being used to find the exact location of the mutated gene so as to ascertain which gene has been mutated in *tt9*. The *tt9* mutant was crossed to the ecotype *Columbia* and an $F_2$ mapping population was generated. In this population, approximately 400 plants displaying the *tt9* phenotype have been obtained thus far. These plants must be homozygous Ler at the tt9 locus and the polymerase chain reaction (PCR) is being used to determine the map distances of simple sequence length polymorphic (SSLP) markers. The SSLP's MKP 11.1 and ciw11 have been found to flank *tt9*, with it being roughly 5 cM from either marker. Once the position on the genetic map is narrowed to an interval of 0.1 to 1 map units, prospective genes will be analyzed to determine which gene is responsible for the *tt9* phenotype and complementation will be carried out. (Poster presentation.)

## OPTICAL DEVICES FOR OBSERVING ADJACENT OBJECTS OF GREATLY DIFFERENT BRIGHTNESS.

Charles Spoelhof, 5 Mullett Drive, Pittsford, NY 14534.

The recent close approach of Mars raised the prospect of observing its tiny moons with modest size telescopes. The moons, Deimos and Phobos, were discovered by Asaph Hall in 1877 with a large refracting telescope. With amateur reflecting telescopes, observing these moons that are very close to the planet Mars that is nearly a million times brighter requires clear weather, clean optics and a few optical tricks. A light trap for the image of Mars was successfully used to observe the outer satellite Phobos. A mathematical analysis of diffracted light from the planet using a shaped telescope aperture indicates that the location of the diffracted light can be controlled to darken the sky where the satellite is predicted to be. This technique should also help to observe close double stars of widely different magnitude. (Oral presentation.)

## NEW ANTIBACTERIALS THROUGH INHIBITION OF QUORUM SENSING.

Nicky Stephenson and Scott Ulrich, Ithaca College, Ithaca, NY.

Certain strains of gram-negative bacteria control their collective behavior through hormones called autoinducers. Autoinducer concentration is proportional to cell density, allowing bacteria to initiate certain behaviours at high cell density. This system is termed "Quorum sensing". Examples of autoinducer-controlled behaviors include bioluminescence in *Vibrio harveyi*, as well as the onset of virulence in certain pathogenic strains of *E. coli*, *Salmonella*, and *Vibrio cholerae* among others. There are two main types of autoinducers, AI-1 and AI-2. AI-1 autoinducers are homoserine (gamma-) lactones with appended aliphatic groups, and are well characterized. The structure of AI-2 was only recently elucidated. It has been shown that a gene called LuxS is required for the production of AI-2 and is essential for behaviors induced by AI-2, such as the transition to virulence. Therefore, blocking production of AI-2 by inhibiting the LuxS enzyme represents a new strategy to treat bacterial infection. We have cloned, expressed and purified LuxS and have developed an assay for its activity. We have begun screening molecules for LuxS inhibition and will show the preliminary results from these screens. (Poster presentation.)

## IGUANID RELATIONSHIPS: NEW EVIDENCE FROM THE NUCLEAR GENE C-*MOS*.

Robert C. Thomson, 36 Ballantyne Rd. Rochester, NY 14623.

The phylogenetic relationships of the lizard family Iguanidae are the subject of considerable disagreement, with multiple competing phylogenies based on different data types (i.e. morphology, mitochondrial DNA) present in the literature. One reason for the conflict is the lack of an independent data set with which to compare the previously proposed phylogenies. In this study, a new data set, based on the nuclear gene C-*mos*, is used to fill this need. A 375 base-pair fragment of C-*mos* was amplified and sequenced from representatives of all 8 genera of iguanids. These sequences were used to reconstruct a phylogeny of the Iguanidae, which was subsequently compared with existing phylogenies in order to establish a robust hypothesis of iguanid relationships. (Oral presentation.)

## A STRATIFIED ARCHAEOLOGICAL SITE IN MOUNT MORRIS.

Justin A. Tubiolo, 67 Midland Drive, Webster, NY 14580-1852.

Major General William Augustus Mills (N.Y. Militia, War of 1812) founded the Village of Mt. Morris and built his home upon a sandy promontory overlooking the Genesee River near the Letchworth gorge. His 1838 brick Federal style house was rescued from impending demolition during the American Bicentennial. Since its inception as a museum, the Mount Morris Historical Society has applied archaeological research as an integral element of its study and restoration.

Extensive excavations have located many original features of the nineteenth century homestead, including the well and front fenceline. Later residents also left their detectable marks in the ground. Ongoing archaeological investigation aids the historical society in accurately reconstructing exterior elements of the homestead, and recovered artifacts guide the growth of collections for the inventory of the restored interior and its exhibits. The Mills Mansion (its current appellation) is listed on the National Register of Historic Places and is accredited by the American Association for State and Local History.

During the last two field seasons (2002-2003), the archaeological team discovered a far earlier cultural horizon below the nineteenth century strata. An undisturbed hearth area of native origin was studied; its design and

associated lithic artifacts indicating a pre-ceramic culture of the Archaic period. In addition, a number of artifacts from a previously disturbed context suggest a second, later pre-Columbian component had once also existed on the site. (Oral presentation.)

## CAN ASSEMBLAGES OF MIGRATING BIRDS BE DETECTED USING SHEBI ANALYSIS?

Jennifer M. Urbanski, Jerry D. Dudziak, Sara R. Morris, and H. David Sheets, Departments of Biology and Physics, Canisius College, 2001 Main Street, Buffalo, NY 14208.

Many species of migrant birds utilize temporary stopover sites between breeding and wintering grounds. Because birds are arriving and leaving continuously during the migratory season, temporary assemblages may form and change. By applying the SHEBI analysis method to bird banding data from Appledore Island, Maine, we investigated the use of this method to detect different assemblages of migratory birds. Additionally, we were interested in determining whether certain assemblages recurred across seasons and among years. Putative assemblages could be identified by detecting increases in a species evenness parameter derived from species abundance data. For this study, we extended conventional SHEBI analysis by including bootstrap estimates of significance, variable boundary widths and pooling intervals, as well as reverse transect analysis. Our migration banding data did not show repeatable patterns of species assemblages using these methods. Although several putative assemblages were detected, they were not robust to changes in the procedure. (Poster presentation.)

## THERMAL DYNAMICS OF AMYLOID BETA$_{1\text{-}40}$–CONGO RED COMPLEX.

Daniel Welchons, Christina Germani, Kazu Yokoyama, Department of Chemistry, Greene 305, SUNY-Geneseo, Geneseo NY 14454.

Proteinaceous inclusions have been associated with several neurodegenerative diseases, particularly Alzheimer's disease (AD). A hallmark of AD is the aggregation of the protein Amyloid β (Aβ). When this protein aggregates in the brain, it becomes cytotoxic to surrounding cells, resulting in neurological damage. Understanding the folding dynamics of this protein is essential to elucidating the folding mechanism and preventing aggregation. Intercalation of Congo Red dye with antiparallel beta sheet of Aβ fibrils, allows us to study the conformational changes of the protein through spectroscopic means. Fluorescence and absorbance spectrums were taken under conditions of varying temperature. Our study showed that Aβ –CR complex exhibited significant temperature dependence in spectroscopic features. The fluorescence spectrum revealed a monotonic increase in the Aβ–CR complex fluorescence band at 540nm, when excited at 485nm and 310nm, as temperature increased. Absorbance spectrums were taken of Aβ –CR complex and quantization of the aggregated complex was analyzed. From the absorbance analysis, a temperature dependence of the thermal dynamics in the Aβ–CR complex could be observed. (Poster presentation.)

## ANALYSIS OF DEVELOPMENT IN *OPHIOPLOCUS ESMARKI*, A DIRECT DEVELOPING BRITTLE STAR.

Rachel Woltman and Hyla Sweet, Rochester Institute of Technology, College of Science, 85 Lomb Memorial Drive, Rochester, NY 14623.

Direct developing invertebrates quickly develop into a juvenile form, largely bypassing a bilaterally symmetrical, free-swimming, feeding larval stage. In this study, the modified larval form of a direct developing brittle star, *Ophioplocus esmarki*, was examined to determine which larval features have been retained or lost through evolution. The external features and general developmental patterns were observed using light microscopy. The embryos and juveniles were also stained for endogenous alkaline phosphatase to examine the developing gut. In addition, birefringent skeleton development was examined using polarized light. Alkaline phosphatase first appears during gastrulation, well before juvenile feeding begins, suggesting that the modified form has a similar gut developmental program as a feeding larva. Examination of skeleton development suggests there are no remnants of bilateral larval spicules. The first skeletal elements that form are the juvenile skeletal plates that have pentamerous symmetry. Further studies of *Ophioplocus esmarki* are being conducted to examine remnants of the ciliary band that is normally used for feeding and swimming in larval forms. We are also examining the formation of the mesoderm using confocal microscopy. In the future we will examine further how the development of this species has evolved using molecular markers of these different tissues. (Poster presentation.)

# THIRTY-FIRST ANNUAL SCIENTIFIC PAPER SESSION

## MONROE COMMUNITY COLLEGE
## ROCHESTER, N.Y.
## November 6, 2004

## LARRY J. KING MEMORIAL LECTURE

### The Cardiff Giant—the Gypsum Sculpture That Became America's Greatest Hoax
**Richard D. Hamell, Associate Professor, Geosciences**
**Monroe Community College**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### FLASH-BASED ViIDEO ANALYSIS SYSTEM FOR VISUAL PHYSICS EXPERIMENTS.
Dmitriy Bekker and Robert B. Teese, Department of Physics, Rochester Institute of Technology, 54 Lomb Memorial Dr., Rochester, NY 14623.

Most universities and high schools throughout the country provide laboratory experience for students studying physics. It is much less common for students to do laboratory experiments as part of their homework. The LivePhoto Physics project is developing a system that allows students to analyze real experimental data on any personal computer at any time, thus enhancing the learning experience. Using short videos of various physics experiments, the Flash-based video analysis system designed for the LivePhoto Physics project is capable of accurately measuring and modeling quantities such as the position and velocity of moving objects. The program analyzes and plots data as the user tracks objects in the video with a mouse. All physical phenomena such as gravity and friction are preserved in the videos, thus providing real-life rather than simulated results.

Currently, the system allows for accurate analysis of the position and velocity of a single moving object. Work is being done to introduce differential equation modeling into the system and implement functionality that would allow for the tracking of two objects simultaneously. The LivePhoto Physics project is integrating this video analysis system into an online homework submission system, thus providing students with a convenient and effective way to learn physics anywhere. (Poster presentation.)

### ASSESSMENTt OF TRAF-6 LOCALIZATION IN INTESTINAL EPITHELIAL CELLS AFTER IL-1 STIMULATION.
Dr. Donald Blake, Binghamton University, BRIDGES Principal Investigator, Binghamton, NY 13902, and Pierce White, Monroe Community College, 1000 East Henrietta Road, Rochester, NY 14623.

Inflammatory Bowel Disease (IBD) and Crohn's Disease are two diseases that affect the bowel of 1–10 per 100,000 people annually. There is no known cause for these two diseases; however the inflammatory response and Interleukin-1 (IL-1) are thought to play a key role. IL-1 is a potent pro-inflammatory cytokine, an extracellular signal protein or peptide that acts as a local mediator in cell to cell communication (Alberts, 2002). Characterization of the IL-1 pathway in Intestinal Epithelial Cells (IEC) is not complete; therefore we investigated the localization of a signaling intermediate of this pathway. Tumor Necrosis Factor Associated Factor 6 (TRAF-6) has been shown to be localized to the membrane upon stimulation with IL-1 in a variety of cells (Akira, 2003). Our goal was to determine if in fact TRAF-6 would localize to the membrane of human colon carcinoma cells (Caco-2), upon IL-1 stimulation. Localization of TRAF-6 would be assessed by immunofluorescent staining with an anti-TRAF-6 primary Antibody followed by staining with an Alexa 488-conjugated secondary antibody.

We found that in determining the proper dilution for the secondary antibody, Alexa 488 conjugated secondary antibody, a 1:4000 dilution optimally minimized background staining. Once the Caco-2 cells had been stimulated with IL-1 for 30 minutes and had been view with argon lasers we learned that TRAF-6 does not localize to the membrane of the cell. Evaluation of the IL-1 pathway at a wider range of time points will help to determine when TRAF-6 localizes to the membrane. (Poster presentation.)

## VISUALIZATION OF THE HYALOID VASCULATURE IN THE NEWBORN RAT USING FITC/DEXTRAN.

Brian Bucher, Anthony Ocon, Jason Tapley, and Irene Evans, Department of Biological Sciences, College of Science, Rochester Institute of Technology, Rochester, NY 14623.

Much effort has gone into developing effective methods of visualizing vascular systems. Newborn mouse and rat eyes are good models for observing both the development of and the regression of the hyaloid fetal vascular system. This is because at birth a complicated network of vessels is present nourishing developing eye structures like the lens. The hylaoid vasculature in the newborn rat eye consists of the pupillary membrane that covers the front of the lens, the hyaloid artery that comes into the back of the eye through the optic disk and which branches into the *vasa hyaloidia propria* and the *tunica vasculosa lentis*. As the rodent matures, the early hyaloid vasculature regresses and disappears, and the adult vasculature including the vessels of the retina are formed. In the present study, a suspension consisting of the dye fluorescin bound to high molecular weight dextran (FITC), was injected intracardially into postnatal rats to visualize the hyaloid and adult vasculatures. After a short wait to allow the heart time to pump the dye throughout the body, the eyes were dissected out and visualized using both a fluorescent and a confocal microscope. Interestingly, it appears that remnants of the hyaloid vasculature persist up until Postnatal day 21, much longer than reported in the literature. The order of regression appears to be loss of the pupillary membrane followed by loss of the *vasa hyaloidea propria* and later the *tunica vasculosa lentis.* Remnants of the hyaloid artery may persist up to six weeks. We plan to study the regression of the hyaloid fetal system and the development of the retinal vascular system using the FITC/Dextran technology. (Poster presentation.)

## WHAT THE SPACE AGENCIES HAVEN'T TOLD US...YET.

James J. Carr, 114-4 Deerhurst Lane, Webster, NY 14580.

On January 14, 2004 President George W. Bush formally announced intentions to initiate a revolutionary new space exploration program. The project under consideration is unprecedented in its scope: cost, time, technology, risk...and, perhaps, eventual rewards if successful.

After a vague, sketchy description from the one and only public announcement so far, it seems that the grand program is tentatively planned in four stages. The first stage consists of completion and full implementation of the International Space Station. The second stage involves reviving manned moon landings (assumed to be an international endeavor this time). Just reaching the end of stage two would qualify as an enormous undertaking of historic proportions, but certainly achievable nevertheless.

Stage three is the emphasis of the program—a monumental ambition to launch manned missions to Mars! And stage four is almost a necessity, concomitant with three, as a backup for logistics and emergencies—an orbiting space station space station around Mars or a ground-based station. Finally, near the close of the announcement, if I am not mistaken, was an implied fifth stage that employs the Mars station as a preparation and launch platform for exploration to the Jovian planets.

This talk will present three fundamental considerations for the future of manned interplanetary space exploration which have yet to be aired in a public forum by any of the "big three" space agencies (NASA, JPL, KSC). (Oral presentation.)

## A NEW EURYPTERID (Carcinosomatidae) FROM THE SILURIAN CLINTON GROUP OF WESTERN NEW YORK STATE.

Samuel J. Ciurca, 54 Appleton Street, Rochester, NY 14611; and O. Erik Tetlie, Department of Earth Sciences, University of Bristol, Wills Memorial Building, Queen's Road, Bristol BS8 1RJ, U.K.

The Medina and Clinton Groups of New York have yielded scant eurypterid remains after over 150 years of investigations. Very fragmentary eurypterid remains have been reported from the Whirlpool Sandstone in the

Niagara Falls Region and Ontario, Canada, from the lower Clinton Maplewood Shale of the Genesee River Gorge at Rochester, and from the Rochester Shale near Middleport, NY.

We report here the discovery of an exceptionally well-preserved carapace belonging to a new species of *Carcinosoma* from the Wenlock Rochester Formation (Clinton Group) of western Orleans County, Town of Shelby, NY. The specimen was recovered by fossil collector Tod Clements (Brockport, NY) from near the top of a 25 cm interval of calcareous shale associated with cephalopods (e.g., *Dawsonoceras*) and fragmentary trilobite remains (e.g., *Dalmanites, Trimerus*). Dendroid graptolites, conulariids and other typically marine forms were also noted, though much of the interval is barren. The bed is immediately overlain by an intensely crowded bed of brachiopods (*Striispirifer?*) and other fossils (Twin Shell Bed). The site is a commercial fossil quarry that was started in 1989 and has yielded thousands of complete trilobites from various layers. Most notable, aside from the trilobites mentioned above, are complete *Arctinurus, Calymene,* relatively rare *Radnoria* and others. Other horizons exposed in this quarry, rich in bryozoans and brachiopods, are quite typical of the Rochester Shale in this area. A stratigraphic chart of part of the quarry, showing key beds, is currently being prepared to more accurately delineate, within the sequence, the horizon that yielded the eurypterid carapace.

The eurypterid specimen recorded here, to be formally described elsewhere, comprises a carapace measuring 5.2 cm in length, and 5.4 cm basal width. It was found ventral side up within 1 foot of a large *Dawsonoceras.* Many of the partial trilobites recovered from this bed were also found upside down. The fragmentary remains, including the *Carcinosoma* carapace, indicate that the material was transported, possibly only a short distance, into an area of relatively unfossiliferous calcareous mud. The occurrence of yet another carcinosomatid in a fully marine environment supports their reputation as the most marine group of eurypterids. (Poster presentation.)

## GAIT ABNORMALITIES IN PATIENTS WITH ACHONDROPLASIA.

Dolores Conklin, P.O. Box 905, Keuka Park, NY 14478.

The main purpose of this study was to characterize the gait patterns of children with achondroplasia. In the study there were twelve patients who ranged in age from 3 to 17 years old. The data collection process took place in the Gait Laboratory of the Alfred I duPont Hospital for Children. Patients' gaits were recorded on video. The kinematics and kinetics were collected by an infrared camera system, and force plates were used to measure foot pressures. All the data was processed using different computer programs. Each patient had graphs printed out of the data, which were entered into a database. From the study we concluded that the children with achondroplasia have pain because of deviations and malalignments of their lower extremities. Patients have 3D malalignments of their lower extremities consisting primarily of knee varus and torsion. All the patients have varus knees and varus foot pressures. In the study we also compared the calculated data with measured angles from the X-rays. Further studies will be done to investigate the usefulness of gait analysis to treat children with achondroplasia. (Oral presentation.)

## IN MALES SHAPE MATTERS: AGE AND SEX DIMORPHISM IN THE FEATHER SHAPE OF RED-EYED VIREOS.

Kristen M. Covino, Joanna M. Panasiewicz, Sara R. Morris, and H. David Sheets, Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208.

Many aspects of avian ecology differ between males and females and between age groups. However, determining the age and sex of many live birds in the field, as well as in the laboratory, has proven difficult and often time-consuming or expensive. Previous studies have shown that the shape of primary feathers may differ among age and sex groups. Geometric morphometries is a set of techniques that quantifies shape for statistical analysis. We used semi-landmark-based geometric morphometries with both perpendicular projection and bending energy alignment to quantify the shape of Red-eyed Vireo (*Vireo olivaceus*) primary feathers by placing landmarks on the periphery of a digital image of a feather and recording the x- and y- coordinates of all landmarks. The results indicated that dimorphism is exhibited in the shape of the left eighth primary feather. The two methods produced conflicting results for which groups show significantly different feather shapes. The perpendicular projection method depicted after-hatch-year males as different from all other groups while the bending energy alignment showed both hatch-year and after-hatch-year males as different from all females. There is some indication that the bending energy alignment increases the variance beyond what the perpendicular projection exhibits causing the results to be less accurate. (Poster presentation.)

## GRAVITATIONAL BOOST: A TUTORIAL.

L. Nevil Davy, 504 Panorama Trail, Rochester, NY 14625.

The successful completion of the Galileo's long trip to Saturn has publicized the use of gravitational boost to propel spacecraft to the outer reaches of the solar system. There seems to be widespread misconception on how the gravitational potential well of a planet can transfer kinetic energy to a low-mass object. Other possibilities exist: the spacecraft can be decelerated or even captured by the planet. In this tutorial talk the solutions of the equations of motion of the three-body problem (sun, planet, spacecraft) are displayed graphically, and the various possibilities for using planetary gravitation to modify spacecraft trajectories are investigated. (Oral presentation.)

## INVESTIGATING POLYMORPHISMS IN THE HUMAN MITOCHONDRIAL GENOME FOR ASSOCIATION WITH AGE-RELATED HEARING LOSS.

R. P. de Vitry, C. D. Middlebrooks, K. D. Raish and D. L. Newman, Department of Biological Sciences, 85 Lomb Memorial Dr., Rochester Institute of Technology, Rochester, NY 14623.

Mutations in many genes have been identified that cause congenital deafness. Environmental factors such as noise exposure or ototoxic drugs can also result in hearing loss. Studies have concluded that genetic differences in the 12S rRNA gene in the mitochondrial genome result in differences in sensitivity to certain antibiotics that lead to hearing loss. Age-related hearing loss, or presbycusis, is known to have a strong genetic component, but the actual genes involved are unknown. Family studies have demonstrated that presbycusis shows a higher correlation between mothers and their children than between fathers and their children. One explanation for this phenomenon would be mitochondrial variation influencing hearing loss. We have begun examining the mitochondrial genome for genetic variation in presbycusic human subjects, beginning with the 12S rRNA gene. Thus far, we have validated numerous polymorphisms in 22 presbycusic individuals in the 12S rRNA and 16S rRNA genes as well as in the hypervariable region of the mitochondrial genome. Several of these single nucleotide polymorphisms (SNPs) can be genotyped by restriction fragment length polymorphism analysis (RFLP). We have selected some of these SNPs for further analysis in a set of 50 presbycusic cases and 50 controls with good hearing (all over age 58) to search for correlations between genotype at these loci and hearing ability in aged subjects. Associations will be determined by chi-square analysis. (Poster presentation.)

## A COMPARATIVE STUDY OF A NUCLEAR AND MITOCHONDRIAL APOPTOSIS STAIN.

Adrienne Drollinger, Sarah Van Cor-Hosmer, and Irene Evans. Department of Biological Sciences, College of Science, Rochester Institute of Technology, Rochester, NY 14623.

Apoptosis is a form of cell death involved in many biological processes. We are studying the regression of the hyaloid fetal vascular system in the newborn rat by labeling apoptotic cells in a cell line developed from the blood vessels surrounding the developing lens. Apoptosis was induced in the TREE (Transformed Rat Eye Endothelial) cell line by application of camptothecin or other apoptotic-inducing stimulus. Apoptotic cells were detected by the application of Hoechst DNA stain and the JC-1 mitochondrial stain. Using Hoechst stain, apoptotic cells were identified by the presence of condensed, fragmented brightly staining chromatin bodies.

JC-1 stain detects the mitochondrial potential in intact living cells. JC-1 dye can form J-aggregates that fluoresce red; regions of the cell with less dense staining by JC-1 fluoresce green. Cells with an intact mitochondrial membrane potential actively pump the dye into the mitochondria where the JC-1 dye aggregates cause the mitochondria to fluoresce red. Apoptotic cells lose their membrane potential allowing dye to leak out. Thus mitochondria in apoptotic cells fluoresce green.

Both the Hoechst dye method and the JC-1 staining method were used to quantitate apoptosis in the TREE cell line after apoptosis induction. The JC-1 apoptosis test appeared to be more sensitive in that it identified more cells undergoing apoptosis than did the Hoechst dye staining. These results may be due to the fact that JC-1 identifies cells in the early potentially reversible stages of apoptosis while Hoechst dye staining identifies late stage apoptotic cells. (Poster presentation.)

## THE CHALCONE SYNTHASE GENE IN AFRICAN VIOLETS.

Jacklyn Finocchio and Michael Kotarski, Department of Biology, DePaul Hall, Lewiston Rd, Niagara University, NY 14109.

Genomic DNA was prepared from leaf tissue of *Saintpaulia ionantha* (African violet). PCR was used to amplify a small region of the *chalcone synthase* (*CHS*) gene and the fragment size was compared to the genes from other plant species. Although there are up to three different *CHS* genes present in some species, the results of the PCR and a Southern analysis suggest that there is only one *CHS* gene in *Saintpaulia.* (Oral presentation.)

## IS THE INABILITY OF DEXAMETHASONE TO DOWNREGULATE E-CADHERIN IN A431 CELLS DUE TO A DYSFUNCTIONAL GLUCOCORTOID RECEPTOR?

Danielle M. Foti and Jani E. Lewis, Department of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

E-cadherin is a glycoprotein found in the plasma membrane of epithelial cells, and is crucial for proper regulation of cell growth and adhesion. Loss of E-cadherin by epithelial cells is often associated with increased carcinogenesis. Vimentin is a cytoskeletal protein associated with mesenchymal cells as well as some advanced stage carcinomas. A431 cells are a squamous epithelial carcinoma of vulvar origin. It appears to be a mixed population of cells since some of the cells downregulate E-cadherin and upregulate vimentin when treated with the glucocortoid analog dexamethasone (Dex) while others are not affected by Dex. To examine for possible dominance to phenotype, A431 cells that had downregulated E-cadherin and upregulated vimentin in response to Dex were fused with A431 cells that were insensitive to Dex treatment. The resulting cells showed no E-cadherin expression but definite expression of vimentin. Based on this result it appeared that loss of E-cadherin and gain of vimentin expression resulting from Dex treatment is a dominant phenotype. Both populations have the glucocortoid receptor, but the question remains whether it is functional in the population that is not affected by Dex. This project is designed to test glucocortoid receptor function. To do this a plasmid containing the glucocortoid-binding promoter MMTV upstream of the Enhanced Green Fluorescent Protein (EGFP) gene was created and transfected into A431 cells. If the glucocortoid receptor is working it will bind to the dexamethasone and this complex will bind to the glucocortois promoter. When this happens it should cause the EGFP to be made by the cells. Cells producing EGFP will fluoresce green when exposed to the proper light wavelength. The plasmid also contains a gene that codes for neomycin resistance. Transfections are presently being screened for resistance to neomycin and, once identified, will be tested for sensitivity to Dex and expression of EGFP. We expect that if a nonfunctional glucocortoid receptor is responsible for the lack of Dex sensitivity these cells will not express EGFP whereas all cells that show sensitivity to Dex regulation of E-cadherin will express EGFP. (Poster presentation.)

## MODIFICATION OF THE SWERN OXIDATION FOR THE SYNTHESIS OF α-HALO UNSATURATED KETONES.

Christina E. Gallis[1] and John D. Chisholm[2], [1]Nazareth College of Rochester, 4245 East Avenue, Rochester, NY 14618; and [2]Syracuse University, Center for Science and Technology, Syracuse, NY 13244.

The Swern oxidation is a well-known and reliable reaction commonly used in the field of organic chemistry to oxidize an alcohol to a ketone. However, when the reagents of the Swern oxidation are in excess, the reaction produces a previously unseen halogenation at the alpha carbon to the carbonyl. Thus, in order to determine if the halogenation was a general occurrence, we employed the Swern oxidation with reagents in excess to several aryl vinyl alcohols. It was determined that when exposed to two times as much reagents, halogenation occurred as predicted. Nonetheless, it was concluded that further research must be completed to elucidate the exact mechanism for the halogenation process. (Poster presentation.)

## CHARACTERIZATION OF VSV INDIANA HR GENES FROM INTERFERON-SUPRESSING AND INTERFERON-INDUCING STRAINS OF VSV.

Lisa Golebiewski, Evan Santo, and Maureen Ferran, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Interferon is considered one of the primary and most powerful host defenses triggered upon viral infection of mammalian cells. This interferon response involves production of the cytokines IFN α and β whose cellular effects collectively result in the formation of an "antiviral state." In this antiviral state, host cells limit macromolecular synthesis thereby inhibiting virus infection and replication. To counter this resistance viruses have evolved mechanisms that block the IFN system. For example Vesicular Stomatitis Virus (VSV) bypasses this antiviral defense by suppressing transcription of the IFN gene, allowing a successful infection to occur. Experiments in our laboratory indicate that VSV may do so by blocking activation of NF-κB, a transcription factor that is essential for transcription of the IFN gene.

VSV contains an 11 kilobase RNA genome that encodes five viral proteins: nucleocapsid (N), phosphoprotein (P), glycoprotein (G), polymerase (L) and the matrix protein (M). Preliminary evidence suggests that two viral components are involved, the M protein and a second, unidentified viral protein. The goal of this study is to identify the viral components responsible for regulation of NF-κB activation by comparing the genomic sequences of two IFN suppressing (wild type and 22-25) and IFN inducing (T1026R1 and 22-20) strains of VSV, producing novel DNA sequence information. The sequences of the IFN-suppressing strains (wild type and 22-25) were compared with the IFN-inducing strains (T1026R1 and 22-20) and several mutations were found between the strains. Preliminary data indicate there is a previously unrecorded mutation in the M protein of 22-20, as well as several mutations upstream from the protein encoding regions. The implications of these mutations will be discussed further at the presentation. (Oral presentation.)

## THE EFFECTS OF DIFFERENT SALT CONCENTRATIONS ON PURPLE LOOSESTRIFE GROWTH AND REPRODUCTION.

Kathryn M. Graczyk and Brenda L. Young, Natural Sciences Department, Daemen College, 4380 Main St., Amherst, NY 14226.

Invasive plants have become a threat to plant communities, competing with native plants for resources, changing community structure and displacing native species. Purple loosestrife (*Lythrum salicaria*) is a locally abundant, relentless invader as it flourishes in a variety of conditions. In addition to the species' establishment in low-lying marshes and wetlands, *L. salicaria* grows in roadside ditches. Roadside conditions are highly unfavorable for plant species due to car pollutants and chemicals like road salt in run-offs. This study investigated the effects of road salt on *L. salicaria*. Water was collected from Western New York roadside ditches to assess the concentrations of road salt in run-off. Plants were grown under the following salt concentrations: 0g/L, 1g/L, 5g/L and 15g/L. These concentrations were selected to reflect the range observed locally. Above-ground growth was determined from measures of initial and final shoot heights of plants. The number of capsules and average seed number were also determined for each plant. There were no significant differences ($p>0.05$) in plant growth between salt treatments; however, there was a consistent decrease in height with exposure to salt. This experiment provides a basis for additional research on purple loosestrife's tolerance to salinity. (Oral presentation.)

## CURRENT DISTRIBUTION AND STATUS OF PLANT COMMUNITIES IN THE BERGEN SWAMP, NY.

Aaron Hall, Paul Shipman, and Elizabeth Hane, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

No taxonomic survey of plant communities has been performed recently in the Bergen Swamp, NY, a unique strongly minerotrophic mire with active marl deposition. In summer 2004, we established an array of randomly placed plots throughout the Bergen Swamp to survey plant communities and record habitat data. The plant surveys included stem counts of herbaceous plant species and shrubs in four 1-m X 1-m subplots and basal area of tree species along a transect that bisected the plot. Habitat data recorded at each plot included soil moisture, percent canopy cover, percent down woody debris, soil pH, soil moisture, and percent water on plot. We are also using geographic information system data to extract important landscape features of the Bergen Swamp and the

surrounding area. Our goals are to identify and compare the prevalence of major plant communities that we find with those defined in historical surveys. To this end, we used an indirect gradient analysis, detrended canonical correspondence analysis, to infer major communities and predict important local and landscape environmental gradients. Other aims of our study are to determine the extent to which non-native plants have invaded the preserved area and identify factors associated with browsing by whitetail deer. (Oral presentation.)

## EXAMINATION OF SNAIL AND SIP-1 INVOLVEMENT IN THE REGULATION OF E-CADHERIN EXPRESSION BY DEXAMETHASONE.

Miriam N. Hamouche and Jani E. Lewis. Dept. of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

Epithelial cells express epithelial or E-cadherin, a molecule important in holding cells together and maintaining proper tissue architecture. They also have the highest mitotic rate of any cell in the body making them prone to the damaging effects of mutagens. Epithelial cells that have become cancerous often experience a down-regulation (loss) of E-cadherin. The vulvar carcinoma cell line, A431, down-regulates E-cadherin in the presence of the glucocorticoid analog, dexamethesone (DEX) at the level of transcription. The transcription factors Snail and Sip-1 have already been published as playing a role in E-cadherin down-regulation in some carcinomas. The purpose of this work is determine if Snail and Sip-1 transcription factors are involved in the down-regulation of E-cadherin in A431 cells as a result of treatment with DEX. The expression levels of these transcription factors in DEX treated versus untreated A431 will be compared using Real Time (RT) PCR and primers for Snail and Sip-1. Presently we are working out the parameters for this technique using E-cadherin primers. (Poster presentation.)

## STATISTICAL ISSUES IN THE COORDINATED STASIS DEBATE.

John C. Handley, 68 Roselawn Ave., Fairport, NY 14450.

In 1992, paleontologists Brett and Baird first proposed coordinated stasis as a extension of punctuated equilibrium. Coordinated stasis is an empirical pattern of co-existing species persisting for millions of years bracketed by an abrupt turnover. During a period of stasis, species exhibit non-directional morphological change. What makes this different from punctuated equilibrium running in parallel is that an organizational entity persists in the form of communities rather than individual species.

There is ongoing debate about whether coordinated stasis is observed in the fossil record, including that found in Central and Western New York. Much of the controversy centers on what constitutes statistical proof and attempts are made to standardize techniques. In this presentation, these statistical issues are explained and illustrated with species abundance data taken from the literature. (Oral presentation.)

## HALOCARBONS: NATURAL VS. INDUSTRIAL SOURCES. †

J. Brian Harmon and James J. Worman, Department of Chemistry, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623; and Gordon W. Gribble, Department of Chemistry, Dartmouth College, 6128 Burke Laboratory, Hanover, NH 03755.

Halogenated organics are a part of our everyday lives. Organohalogens possess a plethora of practical uses in developed societies; most notably they function as pharmaceuticals, fungicides and pesticides. To the lay public, halogenated organics are primarily recognized for their detrimental effects on our environmental health. Their negative environmental effects range from ozone depletion to soil sediment contamination. While the environmental presence of anthropogenic organohalogens is widely acknowledged, the comprehensive breadth of their natural production is largely unknown and ignored. Nearly every halocarbon compound synthesized by industry has an identical or similar naturally synthesized counterpart. In fact, there are greater numbers of halogenated organic compounds produced in nature than all anthropogenic sources combined. For example, compounds such as CFC-11 ($CCl_3F$), 2,4-dichlorophenol ($C_6H_4OCl_2$), chloroform ($CHCl_3$), methyl bromide ($CH_3Br$) and dioxin occur naturally in relatively high quantities. Some more recently discovered organohalogens include vinyl chloride ($CH_2CHCl$), fluorinated acids and bromoethers. Halogenated organics have been a part of our environment since the dawning of time, and remain so today. In order to appropriately regulate halogenated organics prepared in industry we, as a society, must fully grasp the magnitude nature's contribution. (Oral presentation.)

†Presented, in part, as a poster at the Northeast Regional American Chemical Society Meeting, Rochester, NY, 2004.

## FROM FRENCH FRIES TO FUEL: BIODIESEL RESEARCH IN THE UNDERGRADUATE CHEMISTRY CURRICULUM.

Richard Hartmann, Nazareth College of Rochester, 4245 East Ave., Rochester, NY 14618.

With oil prices at record levels, alternate sources of fuel have once again become viable. While the process of converting waste cooking oil into a substitute for diesel fuel is not a new concept, the introduction of the process and the chemical analyses of the finished product into the undergraduate chemistry curriculum has not been recorded in the literature. This talk will discuss the chemistry involved in converting waste vegetable oil into biodiesel, the incorporation of this process into undergraduate research, and future plans for use in the chemistry curriculum. (Oral presentation.)

## CHARACTERIZATION OF CaMKII EXPRESSING NEURONS IN THE AVIAN BASAL GANGLIA.

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Vocal learning in birds offers some powerful advantages for investigating the cellular and molecular bases of learning and memory. This complex form of sensorimotor plasticity is mediated by a discrete, well characterized neural system, exhibits highly specific stimulus requirements for learning, and often is restricted to a sensitive period in development. Recent work indicates that birdsong learning may engage an N-methyl-D-aspartate (NMDA) receptor-dependent form of synaptic strengthening within a corticostriatal pathway implicated in vocal learning. Song learning is impaired by disrupting NMDAR function in this pathway and in one region, Area X, the phosphorylation of calcium calmodulin-dependent kinase (CaMKII), a downstream marker of NMDA receptor-dependent plasticity, is markedly increased in young birds exposed to familiar song.

Identifying the specific cell types exhibiting this molecular response to tutoring is critical for understanding how and where vocal learning is represented in the brain. Interestingly, Area X shares many similarities with mammalian basal ganglia, brain circuitry involved in motor control and motor learning. Electrophysiology, immunohistochemistry (IHC), axonal tracing studies, and morphology have revealed that Area X contains both striatal and pallidal neurons. Here, I use fluorescent immunhistochemistry for LANT6, PARV, DARPP-32, and CaMKII to identify which cellular subpopulations within Area X could mount the pCaMKII response to song. Virtually all cells expressing DARPP-32 (a marker for dopamine receptivity) also expressed CaMKII, suggesting that these medium, striatal spiny neurons in Area X are responsible for mounting the pCaMKII response to tutoring. Also, some of the smaller LANT6+ interneurons and a few of the PARV+ interneurons stained for CaMKII, allowing for the LANT6+/PARV+ interneurons to play a role in CaMKII activity. However, most of the smaller interneurons that stained for PARV did not stain for CaMkII and none of the large projection neurons that stained for LANT6 colocalized with CaMKII, excluding these neuron populations from CaMKII signaling. Using IHC to label for SP, somatostatin, and ChAT proteins could further distinguish differences in the cell populations that mount the pCaMKII response. (Oral presentation.)

## USING THE AUTOMATIC POSITION REPORTING SYSTEM (APRS) FOR REAL-TIME TRACKING OF WILDLIFE.

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The acquisition of wildlife movement data is fundamental to our understanding of the relationships between animals and their environments. The trade-offs in the current methodologies range from relatively inexpensive, but labor-intensive and lower resolution radio telemetry to expensive real-time satellite tracking. We are investigating the application of technology available via the amateur radio community for inexpensive real-time wildlife movement tracking. Our concept is to adapt the currently existing protocols and nation-wide network of digipeaters used in the Automatic Position Reporting System (APRS) to track wildlife using a custom-designed tracking collar. By combining a solar panel, 9V batteries, GPS receiver, VHF transmitter, and antenna, we are creating a unit that

will transmit accurate position data to the APRS network for an extended period of time. Our collar will transmit data over a specified nation-wide frequency which will then travel along digipeaters to an IGATE connected to a specified server, enabling us to access the data using a standard internet connection. The telemetry data can be observed in real-time and is logged on the server for later retrieval. The cost for this real-time tracking system is under $300 per unit, and there is no cost for using the APRS network, although you must have a technician class amateur radio license. (Oral presentation.)

## POSITIONAL CLONING OF THE TT9 MUTATION IN *ARABIDOPSIS THALIANA*.

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This project was initiated with the purpose of identifying the gene defective in the *transparent testa nine* (*tt9*) mutant of *Arabidopsis thaliana*. The *tt9* mutant produces yellow, small seeds that fail to germinate as efficiently as wild-type seeds. The seed color phenotype results from a lack of tannins (a type of flavonoid) within the testa that causes it to be transparent. The seeds appear yellow due to the color of the underlying yellow cotyledons. Plants from the Landsberg *erecta (Ler)* ecotype background having the *tt9* mutation were crossed with wild type plants from the Columbia (*Col*) ecotype and allowed to self-fertilize. The $F_2$ generation resulting from the above cross was used as a mapping population. Plants homozygous recessive for the *tt9* mutation were identified based on seed color, and DNA isolated from these plants was used for positional cloning.

Several markers for use in the polymerase chain reaction were developed to take advantage of polymorphic loci between *Ler* and *Col*. SSLP markers at 8.62Mbp and 11.1 Mbp on chromosome 3 were initially shown to flank the region containing the *TT9* locus. Derived cleaved amplified polymorphic sequence (dCAPS) markers were also recently developed within this region and used to further analyze those lines identified as being heterozygous for either flanking marker. The *TT9* locus has been narrowed to a region containing approximately 150,000bp of DNA on chromosome 3. Candidate genes within this interval are currently being assessed as to their involvement in flavonoid biosynthesis. (Poster presentation.)

## A NEW MODE OF NUCLEAR DISINTEGRATION.

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The Nuclear Science group at the University of Rochester studies heavy-ion reactions at intermediate energies. In particular, we look at the process of nuclear multi-fragmentation (or clustering) for clues about the behavior of nuclear matter. The many large clusters emitted from hot nuclei present a mystery that has its grounds in the dynamics of the reaction itself, the properties of nuclear matter, and the statistical behavior of the reaction participants long after the reaction. A new theory emphasizing surface entropy and thermal expansion has been suggested, and experiments are being carried out using the CHIMERA multi-detector at LNS in Catania, Italy. (Oral presentation.)

## STOPOVER ECOLOGY OF NORTHERN SAW-WHET OWLS IN PENNSYLVANIA.

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Migratory Northern Saw-whet Owls (*Aegolius acadicus*) banded at the Ned Smith Center for Nature and Art during the fall 1999 migration season exhibited low recapture rates (< 5%), with long minimum stopover durations (~7 days). Despite a sample size of nearly 700 individuals, there were only 12 same day recaptures and 21 recaptures on subsequent days, making use of sophisticated open population models impossible due to parameter inestimability. Examination of the data yielded some intriguing results, particularly with respect to the low recapture rate. One explanation of low recapture rates is trap shyness, but the evidence for this was not statistically significant. One concern about the use of the minimum stopover statistic is that recaptured birds may not be representative of the entire migrant population. An examination of measured indicators of condition revealed that the owls recaptured on the same day showed significantly higher fat scores than those owls that were never recaptured and those captured

on later days. This indicates that owls with higher condition measures are more likely to be immediately recaptured perhaps due to a higher responsiveness to audio lures. (Poster presentation.)

## EXPRESSION OF FCR-LIKE GENES DURING METAMORPHOSIS OF THE AMPHIBIAN *Xenopus*.

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Amphibian metamorphosis is a unique and challenging developmental process for the immune system. While it has to retain some capabilities to defend against pathogen, it must tolerate newly expressed adult-specific self-antigens. The regulatory mechanisms preventing deleterious autoimmune reactions at this developmental stage remain poorly understood. It is now commonly recognized that the leukocyte functions are regulated through a fine balance of positive and negative signals delivered by cell surface receptors. A well-established example is leukocyte regulation by inhibitory and activating receptors of the FcR family. Here, we report that the frog species *Xenopus laevis* and *Xenopus tropicalis* possess a large (at least 20 members) and diverse family of proteins that are structurally related to leukocyte FcRs, as well as to the recently described human and mouse FcR-like receptors (IFGP/IRTA/FcRH/). This *Xenopus* family, designated XFL, includes cell surface and secreted molecules with the extracellular regions composed of one to six Ig-like domains. Most of the XFL receptors contain the ITIM-like tyrosine-based motifs in their cytoplasmic tails. A few genes code for receptors with very short intracellular regions and a distinct type of the transmembrane region, suggesting their assembly with the ITAM-bearing signal subunits. Northern blotting and RT-PCR reveal prominent expression of the *X. laevis* XFL genes in lymphoid tissues. To further investigate the role of XFL genes we have designed specific primers to monitor their expression during development by RT-PCR. Our preliminary results suggest that, a large proportion of XFL genes are silent in adults but strongly expressed at the metamorphic and larval stages. It is interesting to speculate that members of the XFL family may participate in regulatory mechanisms preventing autoimmunity during *Xenopus* metamorphosis. Our final goal is to observe effects of silencing XFL genes by RNAi technology. (Poster presentation.)

## CORN PRODUCE ANTAGONISTIC SUBSTANCES THAT INHIBIT BACTERIAL QUORUM SENSING COMMUNICATION.

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*Pantoea stewartii* ssp. *stewartii* (*Pss*) is the bacterial pathogen of Stewart's wilt and leaf blight diseases on sweet corn and maize. Disease exhibit symptoms of wilting followed by death as a result of xylem vessel blockage by *Pss* extracellular polysaccharide (EPS) capsule. EPS capsule synthesis occurs at high *Pss* cell densities and is controlled by diffusible signals called *N*-acyl-homoserine lactones (acyl-HSLs) in a mechanism called quorum sensing (QS). Improved sweet, flour and dent corn exhibit tolerance to *Pss*, but mechanism(s) of *Pss* resistance remains elusive. Perhaps maize genotypes produce QS antagonists, which contribute to useful *Pss* field tolerance. We have evaluated maize accessions for mimics of QS signals through the use of bacterial acyl-HSL sensors. Leaf and stem cell extracts of certain genotypes of sweet, white food grade and dent corn exhibited antagonistic activity with acyl-HSL sensor CV026. Cell extracts of the genotypes failed to exhibit agonist activity in CV026 indicating extract components do not substitute for authentic *Pss* QS signal. A second acyl-HSL sensor, JM109 (pSB401), failed to induce a QS regulated phenotype in presence of cell extracts, confirming maize varieties do not contain QS agonists. However, extracts antagonized activation by authentic acyl-HSL signal in sensor JM109 (pSB401) up to eighty seven percent in comparison to activation in assays containing only purified *Pss* QS signal. This antagonistic interaction can be reversed by additional concentrations of authentic acyl-HSL signal during the assay. These results suggest that certain genotypes produce substances that antagonize QS regulated activity in *Pss* and that constituents of leaf extract directly interact with the *Pss* QS receptor, EsaR homologs, in biosensor strains JM109 (pSB401) and CV026. Our findings could suggest that *Pss* tolerant genotypes evade disease progression by producing substances that interfere with QS-regulated processes. (Poster presentation.)

## SOLAR SYSTEM (IN)STABILITY : WHY AND WHEN AN EARLY WET MARS.

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Experimental evidence indicates that liquid water existed on Mars about 2.9–3.4 billion years (Byr) ago, when Mars has been considered to have been too cold to sustain liquid water. One of the hottest problems in planetary science is why and when Mars sustained liquid water. The when and why of an early wet Mars is derived from a new model of the stability of the solar system.

Since its beginning, the solar system has been dissociating due to the steady radiative and solar wind mass losses of the Sun. The solar mass loss was modeled as a first-order, exponential process and the necessary constants were derived from published experimental data. The model predicts that Pluto, Earth, and Mercury will separate from the solar system in 1.34, 52.8, and 137.0 billion years (Byr). The present separation rate for these planetary orbits is predicted to 4.42, 2.84E–03, and 4.21E–04 km/yr and the rate is increasing with time. The orbital periods of Pluto, Earth, and Mercury are increasing by 15.9, 9.09 E–04, and 8.35 E–05 s/year.

The same model allows calculating the planetary orbits prior to present. As an example, Mars' orbit is calculated at its formation five billion years ago at 198 to 206 million Km (presently 228 million Km). The correlation between the solar (radiative) constant and planetary orbit estimates the transition from liquid water to ice (273K) at about 3.4–3.8 billion years before the present time. This is in excellent agreement with the experimental estimate of 2.9–3.4 Byr.

Additional effects are expected to extend higher Mars surface temperatures closer to the present like the planetary cooling rate after formation, effects due to hothouse gases, like carbon dioxide and water vapor, and orbit variability dependent on variations in solar volume.

The Models of solar planetary decay and Mars temperature have been submitted for publication. (Oral presentation.)

## PREPARATION OF SILVER-COATED $TIO_2$ AS AN ANTIMICROBIAL AGENT FOR SURFACES IN PUBLIC FACILITIES.

Dr. Yuzhuo Li, Clarkson University, Potsdam, NY, 13699, and Kendra Denson, Monroe Community College, Rochester, NY 14623.

Bacteria are ubiquitous in society and continue to contribute to the spread of microbial and nosocomial infections. An effective solution to decrease the prevalence of bacterial infections is to use silver metal (Ag) as an antimicrobial agent to coat surfaces in public facilities. Although silver has excellent bactericidal properties, it is also quite expensive when used alone. A cost effective and innovative solution to this problem is to create a silver-coated particle by photo-reacting silver nitrate onto a semiconductor. According to analysis by transmission electron microscopy, titanium dioxide ($TiO_2$) is an optimal carrier for silver (Zhang *et al.* (submitted for publication); Keleher *et al.* (2002)). Preliminary studies (Keleher *et al.* (2002)) indicate that silver-coated titanium dioxide ($Ag/TiO_2$) particles produce sizeable quantities of silver aggregations that affect both particle size and surface area dispersion. The goal of this study is to produce $Ag/TiO_2$ particles with smaller, well-dispersed silver clusters that would have equally effective antibacterial properties to silver alone. Minimum inhibitory concentrations (MIC) and zones of inhibition were studied to determine the inhibitory effects of newly formed Ag/TiO2 particles on various strains of *Escherichia coli* (*E. coli*) . These results were compared to results using a silver nitrate solution ($AgNO_3$) and the original $Ag/TiO_2$ particles; both the solution and the particles served as study controls. Several variables considered in this research were: pH, centrifuge time in conjunction with number washings of particles, photo reaction time, and the age of $AgNO_3$ used. MIC and zone of inhibition results should show that the newer $Ag/TiO_2$ particles are comparable in their antibacterial properties as those made with larger clumps of silver. In addition, smaller $Ag/TiO_2$ particles should be more stable and would provide an adequate surface area as a reservoir for silver ions. Research will continue in the preparation of optimal $Ag/TiO_2$ particles. These particles would be a creative and inexpensive method to coat surfaces in public facilities for antibacterial purposes. (Oral presentation.)

## EFFECTS OF DISTURBANCE ON THE HERBACEOUS LAYER IN A NORTHERN HARDWOOD FOREST: DIFFERENCES IN VEGETATION ALONG TRAILS AND UNPAVED ROADS THROUGHOUT THE GROWING SEASON.

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The effects of disturbance along forest edges are often reflected in the species composition and distribution of the herbaceous plant layer. These plants can be heavily impacted by alterations in light availability, wind velocity, soil disturbance, and the introduction of exotic species. This experiment examined the effects of anthropogenic disturbance along nature trails (lesser disturbances) and unpaved roads (large disturbances) which occur throughout a seasonal wetland hardwood forest located at the Rochester Institute of Technology, in Henrietta, NY. We hypothesized that a higher amount of herbaceous species diversity existed in closer proximity to the disturbance than in the interior forest, and that greater diversity of herbaceous species existed along unpaved roads. Three trails and three unpaved utility roads were selected, and five transect were set up along each. The vegetation coverage in a $1m^2$ study plot was recorded at 1, 10, and 30 m from the edge of the disturbance.

Results reflected that disturbance type and distance from the disturbance both have a positive correlation on the species composition and coverage of the RIT forested wetland system, and that these hypotheses were correct. The correlation between total coverage and disturbance type ($p = 0.0180$) as well as distance from disturbance ($p= 0.0047$) reflected that a greater amount of total coverage existed closest to the disturbance and unpaved roads. This greater herbaceous abundance could be due to increased resource availability in regions closest to the disturbance. (Poster presentation.)

## UTILITY OF OPEN POPULATION MODELS ON BANDING DATA TO ESTIMATE STOPOVER.

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Capture mark recapture (CMR) data has been used in conjunction with open population models in a wide range of ecological and evolutionary contexts. The conditions under which open population models may be effectively employed need to be addressed when using CMR approaches in novel contexts. We examined the challenges posed to the use of CMR based models in the study of avian stopover ecology. Specifically, we used banding data (188 capture histories, representing 34 different species) to examine parameter inestimability, adequacy of descriptive power (Goodness-of-Fit or GOF), and parameter uncertainty. In our study of avian stopover duration, these factors pose challenges when using capture histories with limited observations. Parameter estimability, specifically with failures in GOF and high parameter uncertainty, posed the greatest restriction on the applicability of open population models to our migration banding data. In these data sets, a minimum of ten observations per estimated parameter was needed to have a reasonable chance of successfully estimating all model parameters. (Poster presentation.)

## THIAZOLE ORANGE FOR USE AS DETECTION SUBSTRATE IN NEW COLORIMETERIC ASSAY OF VANADIUM BROMOPEROXIDASE.

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Vanadium bromoperoxidase, part of a larger family of haloperoxidases, is a commonly used enzyme isolated from the seaweed *Ascophyllum nodosum*. Haloperoxidases have been shown to be extremely thermostable and may prove to be commercially valuable in the production/biosynthesis of unique compounds in the pharmacological industry. Previous colorimetric assays to determine enzyme activity used phenol red as the indicator substrate. However, this method is not without shortcomings. Due to multiple bromination sites on the compound, phenol red cannot be used to quantitatively determine enzyme activity. This paper presents a new colorimetric method for quantitatively determining enzyme activity. Thiazole orange was examined as a possible alternate detection substrate for use in colorimetric assays due to its singular bromination site which produces a direct relationship between the amount of substrate used and the change in absorbance. It is an efficient way to analyze enzyme activity that goes beyond the capabilities of phenol red because it can be used both qualitatively and quantitatively. Optimum conditions for the assay were defined and thiazole orange was determined to be a viable indicator for use

in the quantitative analysis of enzyme activity. The possibilities for this quantitative assay are intriguing and future research will examine using the assay for coupled enzyme reactions. (Poster presentation.)

## ARTICULATING THE AUTOMOBILE SUBURB: EARLY SUBURBAN ARCHITECTURAL STYLES AROUND BRIGHTON'S TWELVE CORNERS.

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Beginning in 1911 in the Homeacres subdivision, close to three thousand homes were built close to Twelve Corners by the mid-1950s. The visual vocabulary of these homes evolved from retrospective references to vernacular and stylistic norms established by 1910 to a narrower interweaving of three dominant influences by the late 1920s. These were Colonial Revival, Tudor, and neo-vernacular forms with associated levels of individual, street and neighborhood cachet. Post World War Two shifting circumstances augmented and modified this visual vocabulary, the social context and meaning of which also changed given parallel changes in the occupational and social profile of Twelve Corners homeowners. (Oral presentation.)

## THE EFFECT OF TEMPERATURE AND pH ON OVALBUMIN-DYE COMPLEX STABILITY.

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We studied how ovalbumin's quaternary structure changed with varying temperature and pH. As temperatures rose from 16–40°C, the absorption and fluorescence intensity of ovalbumin-dye complexes decreased, whereas from approximately 55–75°C, ovalbumin-CR absorbance increased. In addition when excited at 490 nm, the fluorescence intensity of ovalbumin-CR complexes increased in from 42–68°C. These findings imply that native ovalbumin tightened its folds as temperature rose from 16°C until it reached 42–55°C. Then the protein denatured, exposing more β–sheet regions for CR binding. In a comparative study of the fluorescence intensity of native and heat-treated ovalbumin-ANS complexes, when excited at 370nm the fluorescence intensity increased as more ANS attached to hydrophobic surfaces. Since heat-treated ovalbumin had a much higher integrated area of fluorescence than native ovalbumin, the protein may expose more hydrophobic aromatic amino acids at relatively high temperatures. Ovalbumin's fluorescence peeked at pH 7, indicating that at only neutral pH was the protein in its native form. (Poster presentation.)

## A LOOK AT THE NITROGEN CYCLE IN THE ADIRONDACKS: A RELATIONSHIP INVOLVING SOIL CALCIUM, TREES SPECIES, AND WATER QUALITY.

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The nitrogen cycle has been identified as an important factor influencing both soil fertility and water quality. While nitrogen is an essential element for the growth of all biota, when it is present in the soil in excess of biotic demand, nitrogen "saturation" can result. Some potential consequences of this excess nitrogen include the stripping of minerals such as calcium and magnesium from the soil, acidification of soil and water in the affected areas, and altered biotic communities resulting from pH and other elemental concentrations (e.g., aluminum and mercury) that exceed tolerance levels of various species. In many regions of the country, acid deposition is a significant contributor of additional nitrogen to various ecosystems.

In the Adirondack Mountains, relatively thin soil horizons have exacerbated the effects of excess nitrogen. Recent work in the Adirondacks has indicated that acid deposition alone cannot account for the variability of nitrogen export from watersheds. We have identified two nearly adjacent watershed catchments in the central Adirondacks with significantly different levels of soil calcium and stream water nitrogen. Vegetation species also appear to play a role in affecting nitrogen cycling rates through their metabolic requirements and the chemical quality of the litter produced.

Our research is examining the effects of soil calcium availability on nitrogen cycling in forested watersheds. The data suggest that potential net nitrification rates in the organic horizon are significantly related to calcium availability and moisture content but not to pH. We are currently examining variations in leaf litter chemistry across a calcium gradient to identify a causal link between available calcium and nitrogen cycling rates. (Oral presentation.)

## THE EFFECTS OF pH ON TURTLE HATCHLINGS.

Madeline Patterson, 102 Sonnet Drive Rochester, NY 14626.

One way humans change the environment is by releasing sulfur dioxide and nitrogen monoxide into the air which combines with water vapor and becomes acid precipitation. This leeches into the soil and concentrates in ponds and lakes and harms many organisms. Currently, little is known about the direct effects of the low pH alone on turtles and their terrestrial laid eggs. A logical hypothesis is that a low pH should have a harmful direct effect on developing turtle embryos. The extent of damage to turtle populations will be analyzed by comparing two groups of *Trachemys scripta elegans*, one exposed to a more acidic pH around 4.5, and the other at the pH of more natural rain water at around 5.5, using hydrochloric acid. Statistical analysis will be used to determine if there are significant differences in hatching rates, sex determination, and weight between the two groups. (Poster presentation.)

## COEXPRESSION OF VIMENTIN AND CYTOKERATINS 8 AND 18 IN EPITHELIAL CELLS TREATED WITH DEXAMETHASONE.

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A common characteristic of malignant carcinoma cells is the misexpression of structural and membrane marker proteins such that the cells appear to undergo an epithelial to mesenchymal transition [EMT]. This misexpression of certain marker proteins is also associated with poor prognosis. One example is the loss or down regulation of the cell adhesion protein E-cadherin and the up regulation of the cytoskeletal intermediate filament protein vimentin. The vulvar carcinoma cell line A431 exhibits this transition when treated with the glucocorticoid derivative dexamethasone (Dex). A431 cells are of epithelial origin and normally express E-cadherin as well as the intermediate filament proteins cytokeratin 8 and 18. After 4 to 7 days of Dex exposure, a population of the cells downregulate E-cadherin. These cells are referred to as A431D. After 31 days, some of the A431D cells begin to express vimentin. Previous research showed that the untreated A431 cell line normally express cytokeratins 8 and 18. We have found that despite loss of E-cadherin and gain of vimentin expression, the A431D cells continue to express cytokeratin 8 and 18.

In order to examine any direct link between E-cadherin expression and the production of vimentin A431D, cells were forced to express E-cadherin protein to see if reexpression of E-cadherin would turn off expression of vimentin. The E-cadherin transfected cells continued to express vimentin despite the forced reexpression of E-cadherin. They also continued to express cytokeratins 8 and 18. Thus E-cadherin does not appear to play any direct roles in the expression of the cytoskeletal proteins, cytokeratin 8 and 18 or vimentin. (Poster presentation.)

## THE AMINOPEPTIDASES OF SOYBEAN SEEDLINGS.

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While the role of endopeptidases and carboxypeptidases in storage protein degradation in the soybean has been the subject of extensive investigation, the aminopeptidases have not yet been well studied. The objective of this study is to identify the number and specificity of the aminopeptidases present in the cotyledons of germinating soybean seeds and seedlings. Polyacrylamide gel electrophoresis was performed following the Davis method to separate aminopeptidases present in extracts of cotyledons harvested 1 to 14 days after the start of seed inhibition (dai). Gels were loaded and run 5°C to help preserve protease activity. Aminopeptidase activity was detected by activity staining by reacting with amino-acyl-β-naphthylamides followed by Fast Garnet GBC to detect the liberated β. This method visualizes the aminopeptidase activity as a red band on the gel. Two distinct aminopeptidase species could be distinguished by PAGE/activity staining. AP1 is present from 2 to 6 dai (peaking at 4 dai) and hydrolyzes N-terminal alanine residues. AP2 is appears on 2 dai, increasing in level to approximately 6 dai, and then remaining high thereafter. AP2 cleaves the peptide bond involving a number of large hydrophobic amino acid residues, including leucine, phenylalanine, and tyrosine. (Poster presentation.)

## STANDING CROP BIOMASS OF MACROPHYTE COMMUNITIES IN HONEOYE LAKE, NEW YORK.

Kevin Poole, John Foust and Bruce Gilman, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 4355 Lakeshore Drive, Canandaigua, NY 14424.

Macrophyte communities were sampled along 20 transects through use of SCUBA. Plants were harvested from 5 sites along each transect, then sorted by species and air-dried in the college greenhouse. Individual sites varied in species composition, richness and standing crop biomass. Dry weights ranged from less than 100 $g/m^2$ to over 400 $g/m^2$.

Similar investigations in 1984 and 1994 allow for long term trends in macrophyte community structure and function to be analyzed. These trends result, in part, from changes in water quality following the installation of a perimeter sewer system in 1980 as well as the introduction of the invasive zebra mussel (*Dreissena polymorpha*) in 1997. Community response to improving water clarity ($Z_{sd}$) has extended the littoral zone into deeper waters, especially favoring certain submerged species. In the last 10 years some species, like Eurasian milfoil (*Myriophyllum spicatum*) have locally declined in abundance while other species, like water stargrass (*Heteranthera dubia*) have increased. Changes in the macrophyte communities will be described and a discussion of possible causes considered. (Oral presentation.)

## A COMPARISON OF THE OSTEOLYTIC RESPONSE TO TITANIUM AND ALUMINA PARTICLES.

Katherine A. Rider and Lisa M. Flick, Alfred University, One Saxon Drive, Alfred, NY 14802.

Osteolysis is characterized by an inflammatory response to foreign material which results in bone erosion. This study involved a comparison of the osteolytic response to alumina and titanium particles, using in vitro and in vivo techniques. Cultured cells were treated with numerous doses of either titanium or alumina particles for various times. The presence of cytokines in the cell supernatant was then determined through ELISA testing. It was observed that titanium particles induced the largest concentration of TNF, IL-1, and RANTES cytokines. The *in vivo* response was assayed using a mouse model which involved implanting particles on the calvariae. Along with the titanium and alumina-treated calvariae, baseline samples were also tested for comparison. After 10 days, bone samples were removed, sectioned and stained. The amount of bone deterioration was measured using computer imaging after Methylene Blue and Acid Fuchsin staining of the calvariae. Immunohistochemistry staining allowed for the identification of T-cells present in the bone samples, and the presence of osteoclasts was quantified using the TRAP stain. Compared to alumina, titanium-treated calvariae showed the highest degree of bone deterioration, and the largest concentration of T-cells and osteoclasts. However, some osteolysis in response to alumina treatment did occur since more deterioration, T-cells, and osteoclasts, were observed than in the baseline samples. (Poster presentation.)

## TO SEE OR NOT TO SEE: VISUAL ACUITY WITH AND WITHOUT ADAPTIVE OPTICS.

Austin Roorda and Siddarth Poonja, University of Houston, 4800 Calhoun Road, Houston, TX 77204, and Luis Henry, Monroe Community College, 1000 East Henrietta Road, Rochester, NY 14623.

Aberrations degrade image quality in the human eye and limit the amount of detail a person can resolve from an image with their retinal cones. The goal of this project is to measure the effects of aberrations on visual performance with the Adaptive Optics Scanning Laser Ophthalmoscope (AOSLO). As images get smaller, resolution decreases and images can become blurred. One measure of the smallest detail that can be resolved is visual acuity (VA). To measure VA, a four-alternative forced-choice tumbling E method was used. Using this method, VA is defined as the smallest letter size for which the tumbling E's orientation (up, down, left, right) can be correctly identified 72.4% of the time. We modulated the scanning beam to project an Adaptive Optics (AO) corrected letter "E" directly onto the human retina using the AOSLO. The E was presented at 7 different sizes ranging from 20/20 to as small as 20/5. VA was measured for three different conditions: (i) 6-mm pupil with AO, (ii) 6-mm pupil without AO, and (iii) 3-mm pupil with AO. For each subject, VA was best with a 6-mm AO corrected pupil (average VA = 20/11.61), followed by a 3-mm AO-corrected pupil (average VA = 20/12.88). A 6-mm uncorrected pupil provided the worst VA (average VA = 20/17.11). This experiment demonstrates that an aberration-corrected eye will show a significant improvement in VA. After the optical limits to VA are overcome,

photoreceptor sampling and possibly neural factors provide the next strongest limitation for further improving VA. (Poster presentation.)

## CELL DENSITY-DEPENDENT SYNTHESIS AND HIERARCHY OF QUORUM SENSING SIGNALS IN *AGROBACTERIUM VITIS* STRAINS.

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*Agrobacterium vitis*, the causal agent of crown gall disease on grape, employs a mechanism called bacterial quorum sensing (QS) to regulate necrosis on grape and a hypersensitive response in tobacco. QS in Gram-negative bacteria, such as *A. vitis*, is a gene regulatory mechanism that acts by measuring the concentration of diffusible N-acyl homoserine lactone (acyl-HSL) signal molecules. Acyl-HSLs contain a homoserine lactone moiety ligated to an acyl chain. The specificity determinants of acyl-HSLs include length of the acyl side chain (4 to 18 carbons) and substitutions on the acyl chain. Acyl-HSLs with greater than eight carbons are known as long-chain and those with eight or less are referred to as short-chain. In previous studies, we screened a collection of 111 *A. vitis* strains for acyl-HSL production. All but two strains produced acyl-HSLs. Thirty-seven strains were characterized in detail and all produced a long-chain signal while thirty-one strains produced at least one additional shorter-chain signal, with some strains producing up to five. In current work, cell density-dependent patterns of acyl-HSL production are being followed in four selected *A. vitis* strains that produce two or more acyl-HSL signals. This has revealed that the long-chain signal is produced constitutively in three of four strains, but appears to be produced by a mechanism called autoinduction in the fourth strain. Furthermore, two strains have shown an ability to decrease abundance of their long-chain signal while still increasing abundance of a short-chain signal upon entering death phase. The specificity of this disappearance suggests an enzymatic catalyst. The reproducibility of signal synthesis / disappearance results also allows for further experimentation concerning possible production hierarchy among multiple acyl-HSLs. Continuation of this research may provide insights to the role of long-chain signal production, disappearance, and hierarchy in regulating genes responsible for saprophytic and pathogenic behaviors of *A. vitis*. (Poster presentation.)

## A PROBE OF THREE-NUCLEON FORCE EFFECTS IN THE NEUTRON DEUTERON BREAKUP REACTION.

P. Matthew Sinesi, Christopher Wells, Blake Winter, and Mark Yuly, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY 14744.

This poster describes the most recent in a series of experiments at the Los Alamos Neutron Science Center (LANSCE) designed to explore the contribution of three-nucleon force (3NF) effects to the d(n, np)n deuteron breakup reaction. Previous experiments, which relied on scintillation detectors to detect protons, suffered from low count rates and detector to detector scattering. In order to remedy these problems, a pair of proton spectrometers located at approximately 15° to the right and 110° to the left of the beam line, each consisting of a $\Delta E$ scintillator, forward drift chamber, SmCo permanent bending magnet, rear drift chamber and scintillator detector will be used to detect protons and measure their energies. An array of 20, two meter long plastic scintillator bars, oriented vertically, located at forward scattering angles (0–15°) on each side of the beam line will be used to detect neutrons. We plan to begin collecting data in the spring of 2005. (Poster presentation.)

## EVOLUTION OF SEXUAL SIZE DIMORPHISM IN AMERICAN MINKS (*MUSTELA VISON*).

Richard T. Stevens, Department of Biology, Monroe Community College, DCC, 228 E. Main St., Rochester, NY 14604, and Michael L. Kennedy, Department of Biology, The University of Memphis, Memphis, TN, 38152.

Sexual size dimorphism in American minks (*Mustela vison*) from 35 localities in North America was examined using 25 cranial characters to test predictions of the resource partitioning hypothesis and evaluate the relationship between patterns of sexual dimorphism and 16 environmental variables. Specific hypotheses evaluated were that trophic structures would be among the most dimorphic and would not be strongly correlated to body size characters. Twenty of 25 characters were significantly larger in males, and significant spatial variation in degree of dimorphism was found. Predictions of the resource partitioning hypothesis were not supported as canine diameter, a widely used

indicator of resource partitioning, was not sexually dimorphic. The patterns of sexual dimorphism from principal components analysis indicated that largest degrees of sexual dimorphism were found in minks from Pennsylvania and Florida, and least degrees of dimorphism were in minks from Alaska and Quebec. Sexual dimorphism may have an important temporal component which should be investigated in further studies. (Oral presentation.)

## BIOSENSORS.

Dr. Ian Suni, Clarkson Univeristy, 8 Clarkson Ave., Potsdam, NY 13699, and Sharlita Hayden, Monroe Community College, 1000 East Henrietta Road, Rochester, NY 14623.

The project will develop an innovative new design concept and detection scheme for biosensing. This involves both biosensor transduction by electrochemical impedance spectroscopy (EIS) and surface immobilization of genetically modified receptor proteins. Self- assembled monolayer will be constructed onto the gold electrode to hold the protein (GGR) that binds with glucose close to the gold surface. The interface will prevent activity occurring at the gold electrode. Chemically engineering a protein to contain thiol moieties that bond to gold is another method that is currently being used to attach a protein to a gold electrode but it is a less stable sensing surface compared to a self-assembled monolayer. In this research alcoholic and aqueous solutions are being tested to learn which constructs a higher quality self-assembled monolayer (S.A.M). Current experiments are still being conducted on this approach. Binding of D-glucose/galactose induces a global conformational change in the GGR; therefore changing the impedance on the GGR modified Au electrodes. These methods can also be used in other applications with the binding between proteins and its ligands such as with some hormones. (Poster presentation.)

## DETECTING SINGLE-NUCLEOTIDE POLYMORPHISMS IN GJA1, A CANDIDATE GENE FOR AGE-RELATED HEARING LOSS.

Ryan M. Susa[1,2], Karissa D. Raish[1], and Dina L. Newman[1]; [1]Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623; and [2]Otolaryngology Division, University of Rochester Medical Center, 601 Elmwood Avenue, Rochester, NY 14624.

Age-related hearing loss, or presbycusis, is a major public health problem. Although studies have shown that presbycusis has a strong genetic component, no susceptibility alleles have yet been identified. However, many genetic causes of congenital deafness have been well characterized. For example, mutations in *GJA1*, the gene that codes for the subunit connexin 43 (Cx43) of a gap junction protein, have been associated with congenital non-syndromic autosomal recessive deafness. Cx43 may play a vital role in auditory mechanotransduction by assisting in the $K^+$ recycling process. Because of its functional significance and link to congenital hearing loss, *GJA1* is a prime candidate susceptibility gene for presbycusis. We are screening 20 human subjects for variation in *GJA1* via DNA amplification and sequencing using the VariantSEQr™ primer set. We have identified several single-nucleotide polymorphisms (SNPs) and one single-nucleotide insertion in the regulatory region of this gene, and are continuing to examine the entire gene for variation. In the future we will select SNPs to genotype in a set of 50 presbycusic cases and 50 controls with good hearing (all over age 58) to search for associations between genotype at these loci and hearing ability in aged subjects, using chi-square analysis. (Oral presentation.)

## YZGD FROM *PAENIBACILLUS THIAMINOLYTICUS*, A NOVEL PYRIDOXAL PHOSPHATASE OF THE HALOACID DEHALOGENASE (HAD) SUPERFAMILY AND NOVEL CDP-ALCOHOL, TDP-SUGAR, AND ADP-X HYDROLASE OF THE NUDIX HYDROLASE SUPERFAMILY.

Isaac Tirrell, Christopher Daley, Sarah Denial, and Suzanne O'Handley, Department of Chemistry, Rochester Institute of Technology, Rochester, NY 14623.

YZGD from *Paenibacillus thiaminolyticus* is both a member of the Haloacid Dehalogenase (HAD) superfamily with phosphatase activity specific for pyridoxal phosphate as well as a member of the Nudix Hydrolase superfamily with activity on a number of Nudix substrates including CDP-alcohols, TDP-sugars, ADP-sugars, and ADP coenzymes, and to a lesser extent GDP-sugars and UDP-sugars. The HAD superfamily is a ubiquitous superfamily with a wide variety of hydrolases especially phosphatases. The Nudix Hydrolases degrade substrates consisting of a nucleoside diphosphate linked to some moiety, x, hence the acronym "NUDIX". YZGD is the only

enzyme known to belong to both superfamilies. YZGD is also the only identified Nudix hydrolase with the ability to hydrolyze derivatives of all of the nucleotides. Thus it is interesting to speculate that YZGD is an evolutionarily ancient Nudix hydrolase with rather non-specific activity from which evolved all of the more specific Nudix hydrolases seen today. The pyridoxal phosphatase activity is optimized with 5 mM $Co^{+2}$ at pH 5, while the Nudix activity is $Mn^{+2}$ specific with optimal activity at pH 8.5, yet both activities can be achieved at pH 7. YZGD may be important in nucleotide salvage generating the NMPs necessary for RNA and DNA biosynthesis. (Poster presentation.)

## CAN TRUNCATION EFFECTIVELY INCREASE THE UTILITY OF OPEN POPULATION MODELS IN THE STUDY OF AVIAN MIGRATION?

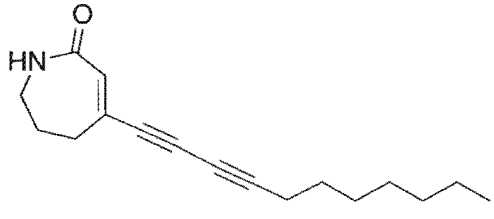
Jennifer M. Urbanski, Jerry D. Dudziak, Sara R. Morris, and H. David Sheets, Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208.

Although open population models have been recommended to provide realistic estimates of stopover duration by migrating birds, limitations to the utility of open population models for estimating stopover from avian migratory banding data have been identified. Inestimability may occur for capture histories due to an unevenness of captures or an extended period of time with only a few captures. In this study, we explore the possibility of data truncation as a method to salvage previously inestimable data sets. Our research addressed two primary questions. Does truncation of previously inestimable data allow analysis of these sets? Does truncation bias the stopover estimate? Raw banding data was collected from stopover sites in Braddock Bay, New York, and Appledore Island, Maine. Several inestimable files were truncated using an ad hoc method to achieve a desirable ratio of observations to parameters (ideally $\geq 10$). Some previously estimable files were also truncated using the same method to test for stopover length distortion due to this method. Many (46%) of inestimable capture histories became estimable after truncation. While truncation did produce changes in stopover estimates in previously estimable data, the observed changes were within one standard deviation of the original estimate. Truncation also resulted in decreasing the stopover length variance. While truncation seems promising, more extensive empirical and theoretical research may help determine the effects of location and species on the ability to use this approach with migration banding data. (Poster presentation.)

## STUDIES TOWARD THE TOTAL SYNTHESIS OF THE CYTOTOXIC DIACETYLENE MONTIPORYNE E.

Ryan Walvoord, Jian Chen, and Christina Collison, Rochester Institute of Technology, 85 Lomb Memorial Dr. Rochester, NY 14623.

Montiporyne E, 1, was recently isolated from the stony coral *Montipora* sp. This novel diacetylenic seven-membered lactam has shown some cytotoxicity against various human solid tumor cells. While other montiporynes have been made successfully, montiporyne E has not yet been synthesized. Montiporyne E does not bear any stereocenters, although the formation of the lactam and the diacetylene coupling present reasonable challenges for a synthetic chemist. Our efforts are focused on using the Beckmann Rearrangement to afford the lactam and exploring the most efficient methods for coupling the diacetylene chain.




(Poster presentation.)

## CHARACTERIZING THE MESODERM-SIGNALING MOLECULE DELTA IN THE SEA URCHIN, EUCIDARIS TRIBULOIDES.

N. Waxmonsky, J. Hedrick, B. Tebbets, and H. Sweet, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The primary focus of research in the laboratory is to use echinoderms as model organisms in order to further understand molecular, evolutionary, and cellular aspects of development. A long-term goal is to examine the expression of the mesoderm-signaling molecule, Delta, and the development of mesoderm, a major tissue type. My project was initiated in order to discern the expression of Delta in one class of echinoderms, the sea urchin. My primary goal was to isolate the Delta homologue (EtDelta) and characterize it in a primitive sea urchin, *Eucidaris tribuloides*. A few short-term goals have been accomplished such as isolating a fragment of EtDelta, and sequencing the 5' and 3' ends. Currently, we are working toward sequencing a full-length clone and examining spatial and temporal expression. (Poster presentation.)

## EXAMINATION OF GJB3 FOR POLYMORPHISMS IN PRESBYCUSIC SUBJECTS.

Erin M. Wells, Karissa D. Raish, and Dina L. Newman, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Age related hearing loss, or presbycusis, is a prevalent disease among aging populations, and there has been evidence of a genetic effect on the inheritance of presbycusis. Several chromosomal loci have been identified as influencing the hearing loss, and these regions overlap with some genes known to be responsible for congenital deafness, but no specific susceptibility alleles have yet been identified. The most common cause of inherited deafness is mutation of one or more connexin genes. Connexins are a family of gap junction proteins responsible for ion gradient maintenance and other intercellular communications, which are essential elements in auditory function. *GJB3* is the gene which codes for connexin 31. It has been shown that mutations in *GJB3* that cause structural abnormalities in the connexin 31 protein result in both dominantly and recessively inherited forms of congenital deafness. We hypothesize that less severe mutations in the *GJB3* gene or severe mutations in the heterozygous state could contribute to the development of presbycusis. Six sets of primers were designed to exclusively amplify specific portions the *GJB3* gene and surrounding sequence using PCR. A sample set of 20 individuals, 10 with presbycusis and 10 with good hearing, were chosen as a screening set. The *GJB3* genes in six different fragments are being amplified and analyzed by sequence analysis for polymorphisms. Several polymorphic sites have been identified. We will genotype 40 additional cases and 40 additional controls and test the statistical significance of differences between the groups using Chi-Square analysis to determine if the gene variations are an influencing factor or cause of the hearing loss. It is thought that by identifying the genetic causes of presbycusis, medical advances could be made in the diagnosis, prevention and treatment of the disease. (Poster presentation.)

## EFFECT OF ATMOSPHERIC CONDITIONS, SPACE WEATHER, AND TIME OF DAY ON COSMIC RAY MUON RATE.

Joseph Willie, Jeffrey Melville, and the 2003–2004 Regents Physics-Honors Classes, Pittsford Mendon High School, 472 Mendon Road, Pittsford, NY 14534.

The Regents Physics-Honors classes at Mendon High School operate an on-site detector that monitors cosmic ray muons. Muon rates are recorded and analyzed to establish connections with other measurable variables. For this experiment, the muon detector was run from September 18, 2003 until February 4, 2004. Muon rates were recorded hourly. During this time, nearly fifty million muon hits were recorded, at an average frequency of approximately 4 Hz. A drum-style barometer was used in recording the atmospheric pressure along with muon rate. The resulting data was analyzed by the three Regents Physics-Honors classes. Mendon data was compared to data from both the National Oceanic and Atmospheric Administration (NOAA) and from the University of Adelaide Cosmic Ray Muon Monitor.

A dramatic (roughly 10%) decrease in the cosmic ray muon rate at both Mendon and Adelaide was observed on October 29, the day following an X17 magnitude solar flare, one of the largest ever recorded. The muon rate took about two weeks to return to normal following the event. Analysis of data not related to this event revealed anticorrelations between barometric pressure and surface muon rate, between surface muon rate and solar wind

speed. and between surface muon rate and the estimated planetary K index ($K_p$), a measure of geomagnetic activity. Finally, a similar daily cycle of muon rate was observed in both Mendon and Adelaide data. (Poster presentation.)

## THE LIFETIME OF ORTHOPOSITRONIUM.

Blake Winter and Mark Yuly, Department of Physics, Houghton College, One Willard Avenue, Houghton, NY 14744.

Until recently, measurements of the orthopositronium lifetime disagreed with the value predicted by quantum electrodynamics. In the proposed experiment, positrons from the decay of Na-22 will be slowed in a vacuum chamber containing a sample of aerogel. The porous nature of the aerogel will allow positronium to form in the thin cell membranes, then drift into the evacuated regions between the membranes before decaying. The release of a positron by the Na-22 source will be signaled by the detection of a 1.27 MeV gamma ray by a plastic scintillation detector. Orthopositronium typically decays into three gamma rays, which will be detected by three NaI detectors. Data collection is expected to begin next semester. (Poster presentation.)

## CHANGES IN THE TROPHIC STATUS OF STAR LAKE IN THE NORTHWESTERN ADIRONDACK PARK.

James Wolfe, Seth Nichols, and Jason Shambach, Department of Biology, Houghton College, Houghton, N.Y. 14744.

A continuing study of Star Lake, adjacent to Houghton's campus, was performed, starting in 2001, to determine the sensitivity of the lake to changes in its trophic status. Star Lake is one of a select group of Adirondack lakes which are alkaline (pH = 7.4) and supports a significant population of trout. The hamlet of Star Lake has a vested interest in the trophic status of the lake as it depends on the lake as a source for its municipal water supply. While the lake is has no surface outlets or inlets, the private ownership of the shoreline (7.40 km) makes the lake dependent on strict control of nutrient addition. The lake was stratified in during the summers of 2001–2004 with winter stratification shown in winter 2003. Summer stratification in 2003 showed a thermocline at 9 meters and low oxygen levels in the hypolimnion. A metalimnetic oxygen maximum was observed in summer 2004.

Alkalinity (10 mg/L calcium carbonate) and hardness (as 15 mg/L calcium carbonate) values reflect the contribution of groundwater through adjacent calcareous sands. Chloride levels measured in summer 2004 were 8 mg/L, higher than samples taken by the ALSC in 1985. Historically Star Lake has had good water clarity (Secchi depths of 4–7 m) and low amounts of phytoplankton. Phosphorus levels measured in winter 2003 showed extremely low levels (< 5 ppb) indicating an oligotrophic state. *In situ* bottle studies in October 2003 with additions of phosphorus and nitrogen showed a significant increase ($p < 0.05$) in chlorophyll a levels over controls. Further bottle experiments in summer 2004 confirmed phytoplankton response to added nutrients (N and P), but only if both N and P were added. Zooplankton observed in summer 2004 included *Daphnia retrocurva*, *Bosmina* sp., *Arthrocyclops robustus*, and *Schistodiaptomus* sp. The development of an anoxic hypolimnion each summer and immediate response to added nitrogen and phosphorus indicates the sensitivity of Star Lake to changes in trophic status. (Oral presentation.)

## EXAMINATION OF NORMAL MESODERM DEVELOPMENT IN THE SEA URCHIN EUCIDARIS TRIBULOIDES.

Maureen Wood and Hyla Sweet, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

We examined development of three mesodermally derived cell types, skeletogenic cells, pigment cells, and muscle tissue in the primitive sea urchin *Eucidaris tribuloides*. Antibody staining was used to observe skeletogenic cell development. UV light and blue light radiation were used to observe pigment cells. Phallacidin staining was used to observe development of muscle tissue. Skeletogenic cells were seen as early as 44h post-fertilization in ventrolateral clusters. At 7 days, the developing sea urchin is at the early pluteus stage, and it is difficult to distinguish skeletogenic cell bodies from the triradiate spicules of the pluteal arms. Phallacidin staining shows distinct bands of muscle around the esophagus of the early pluteus, as well as muscle tissue in the sphincter of the intestine. Future studies will need to be done to obtain a more complete timeline of development for these mesodermally derived tissues. Also, fate-mapping will be done to determine from where in the embryo these tissues

originate. This description of normal mesoderm development is a critical step in our long-term goal of examining the molecular pathways involved in mesoderm development, especially the Delta/Notch signaling pathway. (Poster presentation.)

## STUDY OF DEVELOPMENT OF THE DIRECT DEVELOPING SEA CUCUMBER, *THYONE BRIAREUS.*

Maureen Wood and Hyla Sweet, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The direct developing sea cucumber, *Thyone briareus*, was examined to characterize its normal development. This study and future work with *Thyone* will be used to create a new model system to aid in the study of the evolution of mesoderm development in echinoderms. Light microscopy was used to examine external morphology of the developing larva. Propidium iodide staining was used to examine the development of mesenchyme tissue. Plane polarized light was used to examine skeletal development. Phallacidin staining was used to examine development of muscle tissue. Mesoderm begins to form during gastrulation, 20 hours after fertilization. Skeletal elements appear between four and six days of development, about the same time that the primary tentacles begin to emerge. Muscle fibers can be seen as early as four days into development at the budding tentacles, and continue to grow extensively as the organism reaches the pentactula stage. Future work may include fate mapping, molecular studies, and comparing the development of *Parastichopus californicus* (an indirect developing sea cucumber) to that of *Thyone briareus*. (Poster presentation.)

# THIRTY-SECOND ANNUAL SCIENTIFIC PAPER SESSION.

## FINGER LAKES COMMUNITY COLLEGE.
## CANANDAIGUA, N.Y.
## November 5, 2005

## LARRY J. KING MEMORIAL LECTURE

### Social Behavior of American Crows in New York State: Flitting from Families to Flocks and Back Again
**Dr. Kevin J. McGowan**
**Department of Natural Resources at Cornell University, Ithaca, NY**

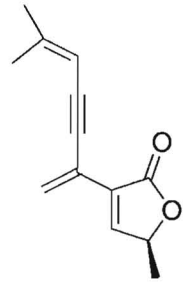
## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### STUDIES TOWARD THE TOTAL SYNTHESIS OF A NOVEL γ-LACTONE.
Moni Agusto, Ian Cawthray and Christina Collison. Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The γ-lactone **1** was recently isolated from the Red Sea soft coral *S. trocheliophorum* that has been shown to inhibit the growth of certain bacteria. Our efforts are focused on using palladium coupling methods to facilitate a convergent construction of the lactone with the unsaturated side chain.

The chiral center on the lactone ring will conveniently be installed via the use of commercially available (S)-ethyl lactate as a starting material.

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(Poster presentation.)

### REFINING FATE-MAPPING TECHNIQUES AND ANTIBODY STAINING IN THE EMBRYOS OF *EUCIDARIS TRIBULOIDES*.
Dyane Bailey and Hyla Sweet. Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester NY 14623.

One of the early steps involved in examining the development of any organism is the construction of a fate map, which is a diagram of a larval or adult structure mapped onto the region of the embryo from which it arose. Our lab is interested in the evolution of mesoderm induction in echinoderms. By fate mapping the primitive sea urchin, *Eucidaris tribuloides*, we can compare and contrast its development to other echinoderms.

One fate-mapping technique involves the pressurized injection of a dye into a cell of an embryo at a specific stage of cleavage. In our experiments we injected a dye called rhodamine dextran (a large sugar molecule with an

attached fluorescent probe). The descendants of only that specific labeled cell were followed through development. Tracking was visualized by the fluorescence of the attached probe.

We are currently still trouble-shooting several parts of the procedure that have to be specialized for the embryos of this species. We are also using antibody staining to label pigment cells derived from the mesoderm. In the future we will combine the fate mapping technique with the antibody staining to determine the identity of the labeled cells. (Poster presentation.)

## DEVELOPMENT OF A NON-RADIOACTIVE, FLOW CYTOMETRY BASED ASSAY TO MEASURE GRAFT VS. HOST CELL ACTIVITY.

Justine Beck, Hartwick College, Oneonta, NY 13820; and Kris Lambert and Craig Mullen, Strong Children's Research Center, University of Rochester, Rochester, NY 14627.

After a bone marrow transplant in a leukemia patient the graft vs. host reaction can result in graft vs. host disease (GVHD), but it can also exert a graft vs. leukemia effect that decreases risk of relapse of leukemia in the patient. In order to better understand this process in vivo it is important to study specific cellular interactions between graft T cells and host leukemia cells in vitro. The conventional assay available is a radioactive 51-chromium release assay. It involves loading leukemia target cells with 51-Cr and measuring release of the isotope following co-incubation with potential killer cells. Limitations of this approach include high background due to erratic labeling with Cr and the fact that only a 4 hour co-incubation is possible. After this period spontaneous release of 51-Cr occurs. Finally, 51-Cr is a gamma emitting isotope that can be cumbersome and expensive to work with. The goal of this project was to develop an assay that could reliably measure the effect of donor cells on leukemia cells and avoid the limitations of the 51-Cr release assay.

It was reasoned that the flow cytometer could measure cell activity by utilizing its ability to sort cells based on characteristics such as size, density and fluorescence. Specifically, the transgenic leukemia cells were genetically engineered to express a green fluorescent protein that allows the differentiation between leukemia cells and T cells, which do not possess the GFP. When the leukemia population proliferates the new cells will continue to express the GFP, whereas if cell death occurs the GFP will no longer fluorescence providing a clear distinction between the live and dead leukemia populations.

The flow cytometry based assay was successful in its ability to measure graft vs. leukemia cell activity. The assay proved to be sensitive enough to measure this response at low effector to target (E/T) ratios and was reproducible in three out of four trials. The effects of a full allogeneic response as well as a minor histocompatibility antigen (mHAg) response were successfully measured using the flow cytometer based assay. (Poster presentation.)

## NUTRIENT ADDITION EFFECTS ON PHYTOPLANKTON GROWTH RATES IN KEUKA LAKE.

Matthew Beckwith and Tim Sellers, Center for Aquatic Research, Keuka College, Keuka Park, NY 14478.

Our research group is interested in the experimental quantification and modeling of ecosystem-level carbon dynamics within the Finger Lakes. It is typically assumed that primary production in oligo-, meso-trophic systems such as Keuka Lake are phosphorus limited, but the relationship between phytoplankton and nutrients has not been extensively quantified within these systems. We conducted three nutrient addition bioassays (control, +P, +N and +NP) between June and September of 2005 in order to identify nutrient limitations and to determine phytoplankton growth rates in response to nutrient inputs that occur within the Keuka Lake watershed. In the July and September, increases in phytoplankton abundance and growth rates were significantly higher in response to +P additions than +N additions suggesting that phytoplankton were P-limited. We observed the highest mean growth rate (0.60 $day^{-1}$) in response to our +P additions during the June experiment, but we were unable to detect any statistical differences among the treatment groups. The lowest mean growth rate, (0.19 $day^{-1}$) calculated from our +P treatment, was observed in September suggesting a seasonal decline in sensitivity to +P additions. Furthermore, the seasonal trend in phytoplankton responses to +P additions did not correlate with Redfield ratio data estimated from dissolved nutrient data supplied by the Keuka Lake Association, suggesting that nutrient specific growth rates may not be indicative of the degree to which Keuka Lake is a phosphorus limited system. The nutrient specific growth rates that we have calculated from the results of these bioassays will be incorporated into a predictive model along with

density-dependent, grazer interaction, and light specific growth rates to better understand phytoplankton dynamics within Keuka Lake. (Poster presentation.)

## FUNCTIONAL ANALYSIS OF A STRATIFIN MUTATION IDENTIFIED IN REPEATED EPILATION MICE.

Ashley J. Bigelow, Nazareth College of Rochester, 4245 East Avenue, Rochester, NY 14618 and Bruce Herron, Genomics Institute, Wadsworth Center NYS DOH, 465 Jordan Road, Albany, NY 12108.

14-3-3 proteins are signaling molecules that play an important role in cell signaling events that control progress through the cell cycle, changes in transcription, and apoptosis. 14-3-3 proteins contain seven different forms in mammals which include β, γ, ε, η, σ, τ, and ζ . Of particular interest to this study is the 14-3-3σ isotype. 14-3-3 σ or stratifin (sfn) is found primarily in stratified epithelial cells and it is very important in the regulation of the G2/M checkpoint in the cell cycle. Somatic cells that lack 14-3-3σ are able to initiate this checkpoint after DNA damage has occurred, but they are not able to complete M phase and die mitotic catastrophe. Stratifin can be found distributed throughout the cytoplasm. Differentiated keratinocytes are able to secrete this protein which stimulates the expression of collagenase in dermal fibroblasts.

The repeated epilation mutation (Er) causes abnormal hair and skin development and it also increases the chance that skin cancer will occur. Homozygous mutant mice (Er/Er) die prior to birth due to severe defects in skin development. Sequencing of the stratifin gene has revealed that there is an insertion that results in a truncated form of the protein. The mutated gene is phenotypically semi-dominant. It causes abnormal hair growth and increases the chance of forming epithelial tumors.

In this study we attempted to evaluate the activity of mutant form of sfn in cell culture. We determined that HeLa cells have endogenous expression levels of stratifin, but following transient transfection with stratifin constructs, expression is enhanced. Similar to keratinocytes, HeLa cells also secrete stratifin into the culture media they are growing in. Preliminary results suggest that secreted sfn can alter the expression of extracellular matrix proteins in dermal fibroblasts. Namely, the mutant form of stratifin causes an increase in collagenase expression. (Oral presentation.)

## SHARING? WHAT'S THAT? BEGGING TACTICS OF HOUSE WREN NESTLINGS.

Jennifer Byrnes and Kristina Hannam. Dept. of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY, 14454.

Competition between nestlings for parental food allocation can be viewed in their behaviors and strategies. It is usually thought that increasing the number of individuals in a nest will intensify competition, therefore changing strategies. The parent's decision on who is to be fed may depend on these behaviors, because this may signal of who is hungriest. The offspring may use these signals as strategies to take advantage over siblings in the nest to increase their food intake and their own chance of survival. The behaviors exhibited by House Wren (*Troglodytes aedon)* nestlings were video recorded for one hour at three different nestling ages (early, middle, late). During the summer of 2005, these videos were watched and the behaviors that were recorded were number of times the parent visited, which nestling was fed, who was the closest to the parent, who was the first to beg, and how many times the nestlings begged without the presence of the parent. Preliminary analysis shows there are differences between nestling stages in how many begging bouts occurred without the parent present, also the nestling that was either closest and/or first to beg was found to be fed more often. (Poster presentation.)

## MOLECULAR PHYLOGENY IN THE GENUS *SAINTPAULIA.*

Sarah E. Caro, Jessica M. Stampfle, Michael J. Greene and Michael A. Kotarski, Department of Biology, Niagara University, NY 14109.

The plant genus *Saintpaulia* (African violet) is endemic to northeastern Tanzania and has undergone a recent radiation producing species which are difficult to distinguish morphologically. Previous molecular work identified a group of eleven species of the *ionantha* complex that are indistinguishable using sequence analysis of the internal transcribed spacer (ITS) of the ribosomal RNA gene. Exon 2 of the chalcone synthase (*CHS)* gene was PCR amplified producing 21 sequences from *Sa. ionantha* and 11 sequences from four other *Saintpaulia* species. The

data suggest that the genus *Saintpaulia* has five *CHS* genes. *CHS-D* was used to construct a gene tree of six species and the analysis clearly distinguishes the closely related species of the *ionantha* complex. (Oral presentation.)

## AGE-RELATED DIFFERENCES IN THE FALL MIGRATION OF NORTHERN SAW-WHET OWLS.

Emily A. Caruana[1], Sarah M. Musilli[1], Michael S. Hurban[1], Scott Weidensaul[2], H. David Sheets[1] and Sara R. Morris[1]; [1]Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208; and [2]Ned Smith Center for Nature and Art, P.O. Box 33, Millersburg, PA 17061.Age-related differences in the fall migration of Northern Saw-whet Owls (*Aegolius acadicus*) in Pennsylvania were investigated during 1998–2003. Overall, 55.5% ($n$ = 2,369) of owls captured during mist netting were hatch-year (young). During the six years of the study, the average date of arrival was significantly earlier for young owls than adult owls at these sites. Similar analyses of the annual timing of migration revealed significant differences in 1998, 1999, and 2001, but no significant difference in timing of migration for 2000, 2002, and 2003. Adult owls had significantly higher mass, and longer wing chords, but also had lower keel score (indicating a lower condition) than young owls. Analyses of fat scores and condition indices did not reveal any significant differences between the age groups. A significantly higher percentage of adult owls was recaptured than young owls. Additionally, minimum stopover was longer for adult owls at 5.6 days than for young owls at 3.5 days. Both adult and young owls lost mass between captures, although this was only significant among adult owls, and the difference between the age groups was not significant. Our results indicate that there are substantial differences in some aspects of migration and stopover ecology between age groups, but reasons for these differences are unclear. (Poster presentation.)

## INVESTIGATING THE INTERACTIONS OF CONJUGATED POLYMERS AND CARBON NANOTUBES THROUGH SPECTROSCOPIC MEASUREMENT.

April Colleton, Steven Pellizzeri and Christopher Collison, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Organic photovoltaic solar cells are an attractive source of renewable energy. Yet they suffer from lower efficiencies when compared to their more expensive silicon based counterparts. One successful approach towards increasing the efficiency of the devices involves doping a hole-conducting conjugated polymer with inorganic nanoparticles, and carbon nanotubes that act as the electron transfer material. However there is a limited amount of understanding about the interactions between the nanotubes and typical conjugated polymers targeted for use in these photovoltaic devices. We will present data on the interaction of a soluble phenylene-vinylene based conjugated polymer, poly(2-methoxy,5-(2'-ethylhexoxy)-paraphenylene-vinylene (MEH-PPV), and single wall carbon nanotubes (SWNT's) in solution. Physical interaction can be inferred from changes in the SWNT dispersion limit demonstrated by UV-Vis absorption data of blends in solution, and also by microscopy data of blends in films and MEH-PPV nanoparticles. We will also describe how the interactions that lead to energy transfer from the photoexcited polymer to the SWNT's can be probed by steady-state fluorescence spectroscopy. (Poster presentation.)

## THE CTPASE NUDIX HYDROLASES FROM *E. COLI* AND *M. TUBERCULOSIS*, POTENTIAL REGULATORS OF PYRIDINE AND LIPID BIOSYNTHESIS.

Sarah Denial, Christopher Daley, Emmanuella Delva, Elizabeth Richter, Brent Cotman, and Suzanne O'Handley, Department of Chemistry, Rochester Institute of Technology, Rochester, NY, 14623.

Orf135 from *E. coli* and Rv1160 from *M. tuberculosis* are CTPases and members of the Nudix hydrolase family, a family of enzymes identified by the common signature sequence GX5EX7REUXEEXGU (U=I, L, or V) that hydrolyze substrates containing a nucleoside diphosphate linked to some moiety, x. Orf135 and Rv1160 have been cloned, expressed, purified, and characterized. CTP is the feedback inhibitor of pyrimidine biosynthesis and a precursor to lipid biosynthesis, thus Orf135 and Rv1160 may help regulate these pathways through degradation of CTP. To definitively establish Orf135's role in the cell, we are in the process of creating a knock-out mutant of Orf135. To establish Rv1160's role in the cell, we will do complementation studies in the Orf135 *E. coli* knock-out mutant. Proving the significance of Orf135 and Rv1160 will help establish the potential of these enzymes as novel antibiotic targets in pathogenic *E. coli* and *M. tuberculosis*. (Poster presentation.)

## EFFECTS OF CYCLIC-ADP-RIBOSE, ATP, AMP, AND CYCLIC-AMP ON CONJUGATION IN *TETRAHYMENA THERMOPHILA.*

Luke R. Donius and Joel H. Benington, Department of Biology, St. Bonaventure University, St. Bonaventure, NY 14778.

The aquatic protist *Tetrahymena thermophila* is normally an asexual reproducer, but when adverse conditions such as starvation arise, it can conjugate and exchange half of its DNA with another *Tetrahymena*. This study investigated the hypothesis that cyclic-adenosine diphosphate – ribose (cADP-ribose) a common cellular signaling molecule, was a signaling molecule for *Tetrahymena* to conjugate. It also looked at whether ATP would inhibit conjugation and to what extent AMP increases conjugation. Due to the expense of cADP-ribose these experiments were done on a small scale. 25µl drops of cells ($10^5$ cells/ml) were put in small plastic centrifuge tubes with Tris buffer (pH 7.4) containing either cADP-ribose (0.5mM or 5mM), ATP (5mM), or AMP (5mM). The small fluid volume or some other unknown reason caused the results to vary greatly. Even 5mM cyclic AMP, a previously supported signaling molecule for *Tetrahymena* conjugation, had varied results when done on this scale. (Poster presentation.)

## HPLC MEASUREMENTS OF ATP:ADP RATIO DURING STARVATION IN *TETRAHYMENA THERMOPHILA.*

Luke R. Donius and Joel H. Benington, Department of Biology, St. Bonaventure University, St. Bonaventure, NY 14778.

The aquatic protist *Tetrahymena thermophila* is normally an asexual reproducer, but when adverse conditions such as starvation arise, it can conjugate and exchange half of its DNA with another *Tetrahymena*. Previous studies have supported cyclic-adenosine monophosphate (cAMP) as the signaling molecule for conjugation. A drop in the cellular ATP:ADP ratio, which should come with starvation, should produce an increase in cAMP levels. The hypothesis of this study was that a lower ATP:ADP ratio would be present in starved cells than cells provided with glucose and that it would decrease further as the hours of starvation increased, providing more evidence for cAMP as the signaling molecule for conjugation. High Performance Liquid Chromatography (HPLC) was used to find ATP and ADP levels in samples of cellular fluid from starved and glucose-provided cells. Starvation was found to have no effect on the ATP:ADP ratio and increased time of starvation also was found to have no effect on the ATP:ADP ratio. (Poster presentation.)

## THE INFLUENCE OF THE EXTRACELLULAR SIGNALLING MOLECULE AMP ON THE RATE OF CONJUNCTION IN *TETRAHYMENA THERMOPHILA.*

Patrick T. Doret and Joel H. Benington, Department of Biology, St. Bonaventure University, St. Bonaventure N.Y. 14778.

The protozoa *Tetrahymena thermophila* exchange DNA under stressful conditions when necessary nutrients for survival are unavailable. Molecules involved in energy metabolism may initiate conjugation between differing mating types during starvation, thus allowing the exchange of haploid genomes. We have tested the hypothesis that *Tetrahymena thermophila* release cyclic AMP; a signaling molecule which induces surrounding cells to conjugate. We have determined the effects of two variables on conjugation rates: (1) the concentration of cells in the starvation medium and (2) the application of cAMP in various concentrations to the starvation medium. We found that conjugation occurs more rapidly when cell density is greater, and when cells are exposed to added cyclic AMP. (Poster presentation.)

## MICROTUBULE STEADY-STATE DYNAMICS.

Mitra S. Feizabadi, 120 Horan O' Donnell Science Building, Canisius College, 2001 Main Street, Buffalo, NY, 14208.

Dynamic instability describes microtubule assembly in which individual microtubule exhibits alternating phases of elongation and rapid shortening. This dynamic is significantly different for the plus ends and minus ends of a microtubule. In this work, it is assumed that there is an excess of guanosine triphosphate (GTP) available in the solution, and that D-tubulin in the solution will exchange its unit of guanosine diphosphate (GDP) with a unit of

GTP. By numerical analysis, the concentration of T-tubulin in the treadmilling steady state as a function of regeneration rate was investigated in the presence and absence of free minus ends of microtubule. (Poster presentation.)

## FULL-LENGTH GENOME ANALYSIS OF INTERFERON-INDUCING AND INTERFERON - SUPPRESSING STRAINS OF VESICULAR STOMATITIS VIRUS.

J. Filby, L. Golebiewski and M. C. Ferran, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Type I interferons, IFN $\alpha$ and $\beta$, are cytokines, which constitute the primary antiviral response of the mammalian immune system. Once the host cell detects that a viral infection has occurred, a complicated signal transduction cascade is activated, which results in transcription of the IFN gene. IFN is then secreted and binds to adjacent cells' chemical receptors, activating a cascade of antiviral genes. To counteract this host antiviral response, viruses have evolved ways to prevent IFN expression, including blocking IFN receptors and inhibiting host transcription. Wild Type VSV successfully blocks IFN expression in host cells, whereas VSV mutant R1 is a good inducer of IFN. Data collected in our laboratory demonstrates that Wt VSV might block IFN gene expression by preventing activation of NF-$\kappa$B, a host transcription factor that is essential for induction of the IFN gene. Several virus strains (R1 for example) that contain a mutation in the Matrix protein induce IFN, and we have shown that these viruses also activate NF-$\kappa$B. These results suggest that the M protein is solely responsible for regulation of IFN production. Two other mutants, 22-20 and 22-25, which were isolated from the same plaque, vary in their ability to regulate IFN production. 22-20 is a good inducer of IFN, whereas 22-25 suppresses IFN production. It has been reported that the sequence of the Matrix protein in 22-20 and 22-25 are identical, indicating that another viral protein is involved in regulation of IFN production in VSV-infected cells. Interestingly, sequencing results generated in our laboratory demonstrated that the M protein of the IFN-inducing 22-20 strain does contain a mutation. The goal of the project was to clone genes from VSV mutants 22-20 and 22-25 and sequence them in order to identify if a second protein is also be responsible for inhibiting IFN production. Verification of the mutation in the Matrix proteins by sequencing would support the hypothesis that the M protein is responsible for preventing IFN expression by the host. (Poster presentation.)

## LONG-TERM EFFECTS OF LIME ADDITION ON FOREST UNDERSTORY BIODIVERSITY IN NEW ENGLAND FORESTS.

Valerie George and Elizabeth Hane, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

There has been increasing concern about the status of calcium and other base cations in the forest soils of northern New England and New York, much of which naturally has very acidic soils. Forest health is believed to be negatively impacted by calcium losses attributable to chronic exposure to acid rain, making this an important forest management issue. One way that land managers have attempted to augment soil is through the addition of lime (CaCO3). Three sites in New England that were fertilized with lime in the past were evaluated to determine if the effects on the vegetation were persistent after >15 years (Proctor Maple Research Center, Underhill Center, VT, 16 yrs; Harvard Forest, Petersham, MA, 21 yrs; Bartlett Experimental Forest, Bartlett, NH, 42 yrs). We measured herbaceous and woody diversity in treated and control plots at each of the three sites, and found Bartlett has the lowest average species richness (3 species/$m^2$) followed by Harvard Forest (3.9/$m^2$) and then Proctor (6.5/$m^2$). At Harvard Forest, the control area has higher species richness than the limed area, while at the other two sites, there was no difference. Interestingly, there appears to be a relationship between the density of *Dennstaedtia punctilobia* (hay-scented fern) and species richness, such that intermediate densities of the fern tend to coincide with plots that have higher species richness ($p < 0.001$). Some species were found exclusively on the limed or control plots; at Harvard Forest, *D. punctilobia* and *Kalmia latifolia* (mountain laurel) occurred frequently in the control, but not in the limed area. Differences in species composition were also found at Proctor, where fern species in particular seemed to be sensitive to liming. These findings show that although the effects on soil chemistry are thought to fade quickly, there are lasting effects on vegetation dynamics in limed sites. (Poster presentation.)

## MACRO-INVERTEBRATE SURVEY OF HONEOYE LAKE SEDIMENT.

Bruce Gilman and John Foust, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 4355 Lakeshore Drive, Canandaigua, NY 14424.

Alum inactivation of sediment phosphorus has been proposed for spring 2006 in Honeoye Lake. A pre-treatment survey of benthic organisms was conducted in summer 2005 to assess species richness and total abundance. Replicate samples were collected by PONAR dredge within the 325 hectare proposed treatment zone and in immediately adjacent areas.

Deep sediment (9m) had the lowest richness but good abundance. Midge fly larvae (*Chironomus* sp.) and annelid worms (*Branchiura sowerbyi*) dominated. Moderately deep sediment (7m) also contained abundant midge fly larvae and annelids, as well as finger nail clams (Sphaeriidae) and statoblasts of the bryozoan, *Pectinatella magnifica*. Shallow sites (5m) approaching the outer edge of the littoral zone had the highest species richness. In addition to midge fly larvae and annelids, we collected adult zebra mussels (*Dreissena polymorpha*), banded mystery snails (*Viviparous georgianus*), another snail (*Valvata tricarinata*), a leech (Hirudinea), aquatic sowbugs (*Asellus* sp.), scuds (*Gammarus* sp.) and alder fly larvae (*Sialis* sp.).

Future surveys that will be conducted after alum treatment may reveal changes in benthic community structure related to the treatment, and could also document community recovery time. (Oral presentation.)

## INVESTIGATION OF PROTEIN EXPRESSION FOR THE KT2440 STRAIN OF *PSEUDOMONAS PUTIDA* GROWN ON BENZOIC ACID UTILIZING TWO DIMENSIONAL ELECTROPHORESIS.

Nikole Greeson, Paul Craig and Laura Tubbs, Department of Chemistry, Rochester Institute of Technology, Rochester, NY 14623.

As a way of developing a new method for determining the presence and toxicity of carcinogenic and mutagenic compounds through protein expression, we are investigating these effects on the KT2440 strain of the bacteria *Pseudomonas putida* (PpKT2440). The growth of the bacteria on benzoic acid was monitored by visible spectroscopy in order to construct a growth curve. The growth curve was utilized to determine the time at the mid-log phase of growth, which was found to be about 435 ± 28.71 minutes. PpKT2440 was then grown and harvested at the mid-log and analyzed by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) to determine protein expression which was compared to previous research involving PpKT2440 grown on succinic acid. (Oral presentation.)

## FREQUENCY OF BENTHIC ANOXIA AND ITS ROLE IN PHOSPHORUS DYNAMICS OF HONEOYE LAKE.

Terry Gronwall and Bruce Gilman, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 4355 Lakeshore Drive, Canandaigua, NY 14424.

Freshwater lake productivity is supported by phosphorus originating in the watershed that typically enters the lake during storm events, and by phosphorus recycling from deep sediments that occasionally experience anoxic conditions. Previous work by Gilman (2001) determined extremely high levels of mean total phosphorus (855.33 mg/L) and mean available phosphorus (2.90 mg/L) in Honeoye Lake sediment cores suggesting a potentially significant internal load of phosphorus to the lake's nutrient budget.

Under oxic sediment conditions, phosphorus is bound to iron and, therefore, seldom enters nutrient cycles. However, changes in the redox potential of iron when sediment goes anoxic will reverse this trap and release phosphorus to the water column. It may then recycle to the surface waters and enhance the lake's primary productivity.

We studied the monthly frequency of benthic anoxia as revealed in dissolved oxygen profiles taken in Honeoye Lake between 1984 and 2005. Over 50% of the profiles from July and August had documented bouts of benthic anoxia where dissolved oxygen was less than 1 mg/L. Some benthic anoxia was also detected beneath the thick winter ice cover.

The shallow nature of the Honeoye Lake basin (maximum depth = 9.2m) allows for only weakly stratified conditions during the summer months. Without wind, phosphorus released from deep sediment may remain beneath the thermocline; with wind, the fragile thermocline is disrupted and phosphorus will mix freely to the surface where

it may stimulate algal growth. The complex relationship among internal phosphorus loading, algal productivity, mixing events and lake clarity will be explored in this presentation.

Reference: Gilman, B.A. 2001. Significance of deep bottom sediment to phosphorus dynamics in Honeoye Lake. Finger Lakes Community College. Canandaigua, NY. 23p. (Oral presentation.)

## DENSITY AND DISTRIBUTION OF ENTERIC NEURONS AND SMOOTH MUSCLE CELLS IN THE GASTROINTESTINAL TRACT OF WILD-TYPE AND SPARSE MUTANT ZEBRAFISH.

Stephanie Gross, Sarah Blake, Scott Leddon and Adam Rich, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

Zebrafish larvae are transparent for several days allowing direct visualization of the gastrointestinal (GI) tract. Eggs are fertilized externally, and by 96 hours the GI tract is functional. Larvae begin feeding and spontaneous GI contractions develop at this stage. Spontaneous contractions are coordinated and result in the highly ordered mixing and propulsion of intestinal contents in an oral-to-anal direction, a process termed GI motility. Smooth muscle, enteric neurons, and interstitial cells of Cajal (ICC) control GI motility. However, the cellular and molecular details by which these cell types interact are currently unknown. The zebrafish GI tract anatomy is similar to humans, and function is easily observed in intact larvae. Therefore the zebrafish may be an ideal model system to elucidate cellular and molecular details of GI motility. The overall objective of the laboratory is to develop a new zebrafish-based model system for GI motility. This work will characterize one mutant zebrafish, *sparse*, that may lack the interstitial cell of Cajal. Although *sparse* mutants survive, GI motility appears disorganized. *Sparse* may provide important information regarding the role of ICC in GI motility, but it is necessary to examine smooth muscles and enteric neurons for potential compensatory responses to the genetic modification. The aim of this work is to visualize smooth muscles and enteric neurons in the *sparse* mutant zebrafish using immunohistochemical techniques. (Poster presentation.)

## COMPARATIVE LIMNOLOGY OF HONEOYE, CANANDAIGUA, KEUKA, SENECA, CAYUGA, OWASCO AND SKANEATELES LAKES—2005.

John D. Halfman, Department of Geoscience, Environmental Studies Program, and Finger Lakes Institute, Hobart and William Smith Colleges, Geneva, NY 14456.

Honeoye, Canandaigua, Keuka, Seneca, Cayuga, Owasco and Skaneateles Lakes were sampled on a monthly basis this past summer (2005) to investigate the temporal and spatial limnological variability within and between lakes. At two deepwater sites in each lake, we collected a water-column profile of conductivity, temperature, light transmission, pH and dissolved oxygen vs. water depth; horizontal and vertical plankton tows, and surface and bottom water samples. The water samples were filtered for chlorophyll-a, total suspended solids, nutrient analyses (soluble reactive phosphate, silica, and nitrate), major ions, and total coliform and *E. coli* bacteria analyses in the laboratory. This work initiates the collection and dissemination of basic water quality data by the Finger Lakes Institute at HWS. The preliminary results follow.

Surface water temperatures were coldest in mid-June (17-20°C), and warmest in the end of July (22-24°C). Bottom water temperatures were near 4°C in all but Honeoye Lake, which remained well mixed. Specific Conductance data ranged from 230 µS/cm in Honeoye Lake to 730 µS/cm Seneca Lake. The early September profiles in all (especially Owasco Lake) but Honeoye and Keuka Lakes revealed the smallest epilimnion conductivities, a deviation that may reflect the input of dilute runoff from the heavy rainfall associated with hurricane Katrina. Light Transmission data revealed surface, near surface and bottom water zones of increased turbidity probably reflecting surface water autochthonous (plankton) and bottom water allochthonous material.

Date averaged secchi disk depths were deepest in Canandaigua and Skaneateles Lakes, and shallowest in Cayuga, Owasco, Honeoye and Seneca Lakes. This variability mimicked variability in chlorophyll-a and total suspended solids concentration between lakes.

Nutrient data suggest that nitrates are not the limiting nutrient in all but Honeoye Lake. Input of nitrate from agricultural activities, municipal wastewater treatment facilities, septic systems, and atmospheric fallout (acid rain) are probably sources of excess nitrates. Soluble reactive phosphate (SRP) concentrations were largest in Honeoye Lake, and typically below 1 µg/L in the other lakes. Surface water soluble reactive silica (SRSi) concentrations were largest in Canandaigua, Honeoye and Keuka Lakes, and smallest in Seneca and Skaneateles Lakes.

## CAN THE FRACTAL DIMENSION BE USED TO QUANTIFY HABITAT HETEROGENEITY?

W. Hallahan, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

Mandelbrot (1983) introduced the concept of fractal-like patterns in nature. His observations pointed out that there appear to be repeated patterns in nature along the borders of landscape features and biological objects. Turner, Gardner and O'Neill (2001) review a dozen metrics used to quantify landscape pattern. One of these is called the fractal dimension developed by Mandelbrot. Other ecologists (e.g. Donovan & Weldon, Williamson & Lawton) have adapted this metric to quantify the shape complexity of habitat patches. Landscape ecologists and conservation biologists wish to determine if there is a relationship between habitat shape complexity and species diversity based on the hypothesis that habitat heterogeneity supports greater species diversity. If the fractal dimension correlates with spatial heterogeneity, it might be a useful tool that could be used with remote images as well as ground-based data.

Students used GIS receivers to collect coordinate points and ArcView GIS to map habitat patches on the college campus. The fractal dimension of various-sized habitats was determined and compared with similar metrics. A simpler method was discovered using the "count" command in ArcView to count the vertices along the habitat perimeter to develop a metric that correlates more consistently with habitat perimeter heterogeneity. This metric, the "vertex segment index," could be used to quantify habitat complexity. What needs to be done next is to determine if this metric correlates with species diversity. If so, this could be used to manage habitat shape for species conservation. (Oral presentation.)

## GREEN CHEMISTRY IN THE FIRST YEAR LAB: USING BIODIESEL TO TEACH GENERAL CHEMISTRY PRINCIPLES.

Richard W. Hartmann, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

The synthesis of fatty acid methyl esters ( FAMES) also known as biodiesel presents a unique opportunity for first year chemistry students to study a variety of chemical principles while gaining experience in experimental design. Beginning with the extraction of oils from a variety of foodstuffs students get a "hands on feel" for the importance of intermolecular forces and are able to make connections between what they are learning in lecture and its affects in the real world. During the FAME synthesis students are able see how changes in structure, such as the cleavage of fatty acids from a glycerine backbone, result in two very different materials which separate into two layers as a result of these differences. Measurement of a variety of physical properties (determined by the students ) also reveals the effect of structure on intermolecular forces. (Oral presentation.)

## MEASURING CORAL REEF STRESS AROUND THE VOLCANIC CARIBBEAN ISLAND OF MONTSERRAT.

N. Hause, J. Hallilley and J. Hewlett, Department of Science and Technology, Finger Lakes Community College, 4355 Lakeshore Drive, Canandaigua, NY 14424-8395.

Coral bleaching involves the breakdown in the symbiotic relationship between the coral and its algal symbiont. Repeated bleaching events are known to be damaging to coral, and widespread coral bleaching is considered a very serious environmental issue. Many scientists suggest that if bleaching is observed in coral, the stress that produced that event may have occurred much earlier. In many cases, several stressors may have been integrated over weeks to months to produce the event. Recently, a small number of genetic markers have been identified that relate to the integrity of the symbiotic relationship that occurs in coral. Changes in the expression of these genes have been shown to be an early indicator of environmental stress, and the initiation of the symbiotic breakdown that results in bleaching. In this long-term study, a complete picture of stress, from an ecosystem to molecular level, will be utilized to better understand the impact that the Soufrière Hills Volcano is having on the reefs around the island of Montserrat. (Oral presentation.)

## ROLE OF CLU1P IN MITOCHONDRIAL GENOME STABILITY AND MORPHOLOGY IN BUDDING YEAST.

Christine Hochmuth, Crystal Allen, and Rey A. Sia, Department of Biological Sciences, SUNY at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Mitochondrial genome maintenance is essential for the normal function of the cell. Mutations in mitochondrial DNA (mtDNA) lead to the loss of mitochondrial function and have been associated with a variety of human neuromuscular and age-related diseases. *S. cerevisiae* is a facultative anaerobe that can grow in the absence of respiration under specific growth conditions, although mitochondria are still required for viability. The lab used a yeast two-hybrid assay with the known mitochondrial protein, Ilv5p, to isolate genes involved in the organization, repair, and recombination of mtDNA. The lab has identified the Clu1p in this screen. Clu1p function was previously found to be required for proper mitochondrial morphology and distribution (1).

Our data shows that a *clu1*Δ strain displays a 9.5 fold increased rate of respiration loss as evidenced by increased petite formation. This increase in petite formation may arise due to DNA polymerase slippage events at microsatellite tracts or an increase in mtDNA point mutations. Using *clu1Δ::URA3* reporter strains, the lab has found a 1.6 fold increase in the rate of alterations in microsatellite tracts and a 2.1 fold increase in the rate at which mtDNA point mutations form. Using a recently developed direct-repeat-mediated deletion reporter strain, loss of Clu1p results in a 5.3 fold decrease in the rate of deletion formation relative to that of wild-type. Microscopy has supported previous reports indicating that a *clu1*Δ strain displays a "clustering" phenotype (1). This deletion strain exhibits a branched mitochondrial network that is localized to one side within the yeast cell. These data provide evidence that Clu1p plays a central role in mitochondrial genome stability and morphology.

Reference: 1. Fields SD, Conrad MN, Clarke M. *J Cell Sci.* 1998 Jun;111 (Pt 12):1717-27. (Poster presentation.)

## POSITIONAL CLONING OF THE TRANSPARENT TESTA 9 LOCUS OF *ARABIDOPSIS THALIANA.*

M. Indriati Hood and Matthew K. Pelletier, Department of Biology, Houghton College, 1 Willard Avenue, Houghton, NY 14744.

*Transparent testa 9* is a recessive mutation in *Arabidopsis thaliana* which results in plants that produce small, pale-brown seeds that tend to germinate less efficiently than wild-type seeds. The pale seed-color phenotype is the result of reduced levels of proanthocyanidins in the testa. In order to determine the specific gene affected in *tt9*, its location was mapped using a positional cloning approach which involved analyzing a mapping population resulting from a cross between *tt9* plants in the Landsberg *erecta* (L*er)* ecotype background with wild-type Columbia (Col) plants. Genetic analysis of nearly 2500 $F_2$ plants has enabled the narrowing of the region containing *tt9* to a 70,000 base pair interval on the third chromosome.

Given that *tt9* plants are affected at the level of seed coat pigmentation and have been observed to germinate less efficiently than wild-type plants, it was proposed that the gene in question would be expressed in siliques or seeds and may also be expressed following specific environment cues, or at particular developmental stages, e.g. following stratification, imbibition and/or during germination. Review of publicly available RNA expression data for the 15 genes contained within the 70kb interval as well as independent data obtained in this lab for several of the candidates revealed that six of these genes were expressed in the tissues and developmental stages predicted. This, together with the mapping data, provides strong evidence that one of these six genes may be defective in *tt9* plants. Wild-type genomic clones of each of the six candidates are being generated for complementation via *in planta* transformation of mutant plants. If one of these genes is successful in restoring the wild-type phenotype in transformed plants, it will be confirmed that the gene in question was that which was defective in the *tt9* mutant. (Oral presentation.)

## STOPOVER RATES AND DURATIONS OF MIGRANT NORTHERN SAW-WHET OWLS IN SOUTHERN PENNSYLVANIA.

Michael S. Hurban[1], Emily A. Caruana[1], Sarah M. Musilli[1], Scott Weidensaul[2], H. David Sheets[1] and Sara R. Morris[1], [1]Departments of Biology and Physics, Canisius College, 2001 Main St., Buffalo, NY 14208; and [2]Ned Smith Center for Nature and Art, P.O. Box 33, Millersburg, PA 17061Although Northern Saw-whet Owls are common migrants, little is known about the stopover ecology of this species. Using banding data collected on 2,374 Northern Saw-whet Owls from southern Pennsylvania, we investigated factors potentially affecting stopover rate and minimum stopover length. The likelihood of recapture was affected by date of capture, mass, and condition index in a logistic regression, although fat and keel scores were not significant factors in the model. Owls captured early in the season and owls with higher mass and condition index were more likely to be recaptured than later migrants and migrants with lower mass and condition index. Additionally, we found a significant difference in recapture rates among the six locations in this study. In contrast, we did not find any significant effects of date of capture, mass, condition index, fat score, or keel score on the length of minimum stopover, either treated independently or as part of a general linear model. The effect of mass and condition index on recapture rate contrasts with previous studies on migrant passerines that generally exhibit the opposite pattern. Sexual dimorphism and differential response to audio lures may be factors contributing to the effects of date and condition. (Poster presentation.)

## ANTIBIOTIC RESISTANT BACTERIA FROM SPOTTED TURTLES (*CLEMMYS GUTTATA*).

Caitlin Kempski, Michael Gingras; Asamoah Mfoafo, Christina Pfandl and Julio Rivera. Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Antibiotic resistant bacteria have been reported in wild birds and mammals, even from remote regions such as the Amazon River Basin. The spread of acquired resistance is believed to be the result of widespread release of antibiotics from agriculture and human and veterinary medicine. We compared antibiotic resistance in enteric bacteria isolated from spotted turtles that are part of a reintroduction program. The turtles were bred at the Seneca Park Zoo. Twelve of the turtles have been in captivity since they were hatched, and three have been released and radio-tracked at the reintroduction site in Monroe County, NY. Bacteria resistant to antibiotics commonly used in agriculture and medicine (notably Erythromycin, Streptomycin, and Polymyxin B) were isolated from both groups of turtles. Wild populations of spotted turtles occur in New York, and we plan to sample turtles from these populations to evaluate the incidence of antibiotic resistance in turtles that have never had direct contact with humans. (Poster presentation.)

## CHARACTERIZATION OF PCR-AMPLIFIED MITOCHONDRIAL COII GENES.

B. Kissel, J. Kulis, and M. Jahnke, Division of Natural Sciences, Mathematics and Physical Education, Keuka College, Keuka Park 14478.

A variety of studies have used mitochondrial and nuclear genes to explore the phylogenetic relationships of different species of rodents, of primates, and of hominids (gorillas, chimpanzees, and humans), to name a few. This is a report of the use of PCR to amplify a mitochondrial gene, cytochrome c oxidase subunit II (COII) in studies of human and other mammalian genes. The studies have revealed both classes of RFLPs in amplified human genes (loss and gain of restriction sites, and have proved to be a rich source of student investigation of research topics.

Human cheek cell DNA was purified by a modification of the Marmur method; the same method was used to purify DNA from commercial ground beef, and from a variety of tissues from squirrels and chipmunks. The squirrels included several gray and one black squirrel, a representative of a local race of black squirrels. The primers and PCR conditions reported by Ruvolo et al. (1991) were used to amplify the DNA sequences. For amplification of the animal sequences, the annealing temperature had to be lowered approximately 5°C. The resulting COII amplicons were assessed by agarose gels, then cut with either of two restriction enzymes, *Hae*III or *Alu*I. The sizes of the resulting restriction fragments were assessed by agarose gel electrophoresis; anomalous results were repeated several times, and one student DNA sample was sequenced at Indiana University.

Among the animal sequences assessed, all *Hae*III and *Alu*I restriction patterns observed conformed exactly to the patterns predicted by published COII sequences from cow, squirrel and chipmunk sources; in particular, all squirrel COII sequences showed identical restriction fragment patterns.

By contrast, a larger number of individual human COII were surveyed with *Hae*III and *Alu*I. All AluI restriction fragment patterns were identical; however, two individuals (St1 and St2) showed anomalous restriction fragment patterns. St1 consistently showed a new, larger band on agarose gel electrophoresis; examination of the published human COII sequence predicted that the loss of the second *Hae*III restriction sequence (GGCC) would result in precisely the pattern consistently observed on agarose gels. Subsequent DNA sequencing from Indiana University confirmed the conversion of the GGCC to GTCC. A second student COII sequence (St2) showed the second type of restriction fragment polymorphism, appearance of two smaller fragments and loss of a larger fragment, presumably from the creation of a GGCC sequence by mutation.

The St1 mutation proved to be a silent mutation (both versions code for a glycine residue); the St2 mutation (which has yet to be sequenced) is likely also a silent mutation. A BLAST search of the St1 mutation demonstrated that this mutation had been reported for several human samples, including a 2000-year-old mummy; both versions of the sequence were also reported in several hominoids, including chimpanzees, gorillas, and orangutans. The most likely St2 mutation has also been reported in humans and other species.

In summary, PCR amplification of the COII gene is rapid and reliable. The system provides a wealth of opportunities for students to design and carry out experiments on their own genes, as well as other animal species.

Reference: Ruvolo, M., Disotell, T. R., Allard, M.W., Brown, W.M., and Honeycutt, R.L. (1991). *Proc. Natl.Acad.Sci. USA* 88: 1570-1574. (Oral presentation.)

## NMR SPECTROSCOPY OF DIPROPYLENE GLYCOL (CHEM 25).

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The Aldrich Library depicts the structure of CHEM 25, CAS # 25265-71-8, to be Dipropylene glycol. Using Proton and Carbon-13 NMR, other Aldrich Library reference spectra, and COSY experiments we have concluded that the structure of CHEM 25 is actually a mixture of branched isopropyl isomers and is at least a tripropylene glycol. After analyzing the Proton and Carbon-13 NMR data we noticed a discrepancy in comparing these spectra to the spectrum of the CAS # of CHEM 25, found in Aldrich's Library of Reference Spectrum. This led us to look further into Aldrich's Library to find a spectrum that more closely matched our observed spectrum for CHEM 25. Once we found a closer match in Aldrich we began to propose other possible structures for CHEM 25. Using a COSY experiment we were able to choose which structure matched CHEM 25 as well as being able to prove The Aldrich Library has the wrong structure for CAS# 25265-71-8. (Oral presentation.)

## IDENTIFICATION OF INTERSTITIAL CELLS OF CAJAL IN THE ZEBRAFISH GASTROINTESTIAL TRACT.

Scott Leddon, Kyle Leonard, and Adam Rich, SUNY Brockport, 350 New Campus Dr, Brockport, NY 14420.

Motility, or the coordinated contraction of the gastrointestinal (GI) tract, is achieved by a network of interstitial cells of Cajal (ICC), enteric neurons, and smooth muscles in higher vertebrates, including humans. Disruption of any single component results in poorly organized contractions, dysmotility disorders, such as gastroparesis, irritable bowel syndrome, and Hirschprungs disease. The cellular and molecular details controlling GI motility are unclear, and therefore new model systems are needed. The aim of this work is to identify the pacemaker cell (ICC) in zebrafish. It has been shown that ICC determine the frequency and strength of contraction in the GI tract in humans, and GI motility disorders are associated with lesions of this cell type. Identification of ICC in the zebrafish GI tract will be necessary to establish the zebrafish as a relevant and appropriate motility model for human disease. Zebrafish larvae are optically transparent, allowing the assessment of GI tract function in-vivo. Novel genes may be identified using a forward-genetic approach, by first identifying mutant larvae with aberrations in GI motility followed by identification of the underlying genetic elements. This work focuses on the anatomical organization of ICC, enteric neurons, and smooth muscle cells in larvae and in adult zebrafish using immunohistochemistry, histology, and digital imaging techniques. (Poster presentation.)

## SOLAR VOLUME VARIABILITY AND PLANETARY ORBITS, ORBITAL PERIODS, AND GLOBAL SURFACE TEMPERATURES.

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The hot plastic plasma volume of the Sun is determined by a dynamic state between solar radioactive mass to energy conversion of and solar gravity. Thus, the solar volume and radius may vary with the dynamic state. Changing solar radius affects the solar gravity and solar-planetary interactions. Modeling shows that very small (<0.1%) variations of solar radius have significant, super-linear effects on planetary orbits. The magnitude of the planetary orbit changes is predicted to have measurable effects on their orbital periods, and their surface temperature.

Increases of solar radius cause increasing planetary orbits and orbital periods. and lowering of surface temperature. At a critical solar radius, planets will separate from the solar system. The model predicts that Pluto, Earth, and Mercury will separate from the solar system if the solar radius increases by 0.012, 0.47 percent, and 1.2 percent, respectively.

Decrease of the solar radius results in decreasing planetary orbits and orbital periods, and increases of surface temperatures. A decrease of the solar radius by ten percent will contract the Earth radius to within a few percent of the solar surface. Changes in planetary orbits affect global temperatures. Thus, the Earth global temperature is predicted to change at a rate of 0.29C per 0.001% solar radius change, and of 0.90C per 1.0E06 km (0.67%) orbital change. These temperature changes are in addition and above much studied greenhouse effects. The solar radius effect may be a cause of recorded global hot and ice ages. The orbital period of the Earth year is predicted to change by 1.14 days per 0.001% solar radius change. The predicted effects are amenable to experimental verification.

The volume / gravity model is universal and is anticipated to extend to other planetary systems, and to galactic and intergalactic interactions. (Oral presentation.)

## ISOLATION AND CHARACTERIZATION OF HYDROCARBON DEGRADING BACTERIA FROM ENVIRONMENTAL HABITATS IN WESTERN NEW YORK STATE.

Katarina Malatova, Yun Xin Lim, Matthew Reader and Jeff Lodge, Rochester Institute of Technology, Rochester, NY 14623 .

Screening of hydrocarbon degrading microorganisms isolated from three habitats in Western New York State by selective enrichment technique, resulted in the collection of 20 distinct species. All strains were cultivated in liquid media with crude oil as a sole carbon and energy source. Bacterial strains capable of degrading hydrocarbons belong to the genera *Pseudomonas sp., Acinetobacter baumannii* and *Serratia marcescens.* Carbon dioxide evolution experiments were used as the major indicator of microbial degradation of oil in biometric flasks. The measurements of $CO_2$ evolution rates have shown to effectively evaluate the biodegradation rates by providing significant data within a short period. The chemical composition of the residual oil was determined by gas-chromatographic techniques. The results indicate that the highest accumulation of carbon dioxide and the highest degradation efficiency of medium chain alkanes were observed on Leeper-shank crude oil, whereas degradation of Mexican crude oil with a composition of higher saturated and substituted hydrocarbons was prolonged. Additionally, biodegradation of Smakover oil was significantly reduced due to a high content of aromatic hydrocarbons. Noticeable formation of solubilizing agents was observed by GR1 (not yet identified clone) and *Serratia marcescens.* The results also suggest that the application of bacterial consortiums containing combinations of two isolated strains enhanced the degradation of Mexican crude oil and also lead to a successful utilization of complex organic waste obtained from local CIMS facility. The bacterial mixture of GR1 clone and *Acinetobacter baumannii* demonstrated the highest growth and $CO_2$ evolution on both substrates among all tested bacterial blends. (Oral presentation.)

## THE ROLE OF *YOL057W* IN MITOCHONDRIAL DNA REPAIR, RECOMBINATION, AND ORGANIZATION.

Jonathan Malecki, Crystal Allen, and Rey A. Sia, Department of Biological Sciences, SUNY at Brockport, Brockport, NY 14420.

Mitochondrial genome maintenance is required for normal cellular respiration and the generation of most cellular ATP. *Saccharomyces cerevisiae* (budding yeast) is a facultative anaerobe that can grow in the absence of respiration when supplied with a fermentable carbon source, a valuable system in which to study mitochondrial genes and their products. Mutations in mitochondrial DNA (mtDNA) can lead to the loss of mitochondrial function. Understanding repair, recombination and organization of the mitochondrial genome is important for gaining further knowledge of mitochondrial malfunction, which is implicated in aging as well as heart, lung and neurodegenerative diseases. In previous experiments the lab has used a yeast two hybrid assay with the known mitochondrial protein, Ilv5p, to isolate proteins involved in the organization, repair and recombination of mtDNA.

The Yol057w protein was identified in this screen. This protein is highly homologous to a human expopeptidase, dipeptidyl peptidase III (DPPIII)[1]. A deletion of the *YOL057w* gene was found to increase the frequency at which yeast cells spontaneously lose the ability to respire. A *yol057wΔ::URA3* strain loses respiration 10.9-fold higher than wild type. In order to determine the mechanism of this increase respiration loss, a direct-repeat mediated deletion assay was conducted. I this assay we found a 6-fold increase compared to that of wild type. Microscopy was used to show altered mitochondrial morphology in *yol057wΔ::URA3* strains indicating an additional source for increased respiration loss.

Reference: (1.) www.ncbi.nlm.nih.gov/BLAST/Blast.cgi. (Poster presentation.)

## LOCATION, LOCATION, LOCATION: COMPARISON OF STOPOVER AT TWO SITES.

Kathryn E. Mattern, 2001 Main St., Canisius College, Buffalo, NY 14208; Rebecca W. Suomala, Natural Resources Department, University of New Hampshire, Durham, NH 03824; and Melissa S. Mustillo, Peggy E. Buckley, Sara R. Morris and H. David Sheets, 2001 Main Street, Canisius College, Buffalo, NY 14208.

Migratory passerines utilize stopover sites to refuel fat stores, rest, and avoid predation. During fall migration, birds traveling from breeding to wintering grounds may stop at the Isles of Shoals in the Gulf of Maine. Because of differences in vegetation, migrants may be using individual islands differently. The goal of this project was to compare recapture rates and stopover lengths of migratory passerines on two islands, Appledore Island and Star Island, in the Isles of Shoals during fall migration during 1999 and 2000. Five species had adequate banding records for comparison. Magnolia Warblers (*Dendroica magnolia*) had a greater recapture rate on Star Island during 2000, and Red-eyed Vireos (*Vireo olivaceus*) had a greater rate on Appledore Island during both 1999 and 2000. Stopover length was significantly longer on Appledore for both Northern Waterthrushes (*Seiurus noveboracensis*) during 1999 and Red-eyed Vireos during 2000. Only Red-eyed Vireos during 2000 could be compared using CMR models, they tended to stay on Appledore longer than Star Island. These results indicate that migrants are using these two sites differently, despite the proximity of the sites. Further study is needed to establish the factors affecting stopover decisions of migrants and how best to determine the importance of individual sites. (Poster presentation.)

## SEARCHING FOR THE GENES INVOLVED IN THE MESODERM DEVELOPMENT OF *EUCIDARIS TRIBULOIDES.*

Danielle Meadows, Sebastian Ricoult, Naqi Haider and Hyla Sweet, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester NY 14623.

Mesoderm development in echinoderms is controlled by the interactions of several different genes. Some of the genes involved are GATAc, Glial Cells Missing (GCM), Brachyury (Bra), and T-Brain (TBr). The objective of our project is to determine the expression patterns of these specific genes in *Eucidaris tribuloides*, a primitive sea urchin. The long-term goal of our research is to study the evolution of mesoderm development in echinoderms.

Using NCBI, homologues of the genes of interest were found from different organisms. The sequences were then aligned to show highly conserved regions. Degenerate PCR primers were designed to recognize and bind to these regions. These primers were used with PCR and cDNA template to amplify the gene sequences of interest. The PCR products were separated by size using gel electrophoresis. Bands of the predicted size were cut from the gel

and purified. These PCR fragments will be cloned and sequenced. Eventually, in situ hybridization and real time PCR will be carried out to determine the spatial and temporal expression patterns of these genes. We will compare these expression patterns in *Eucidaris tribuloides* to the known expression patterns in other echinoderms. (Poster presentation.)

## SEX-RELATED DIFFERENCES IN THE MIGRATION OF NORTHERN SAW-WHET OWLS.

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Northern Saw-whet Owls (*Aegolius acadicus*) are small, nocturnal, migratory owls that show reverse sexual size dimorphism, in which the females are larger than the males. Although little is known about their migratory patterns, they are believed to show differential migration, in which one sex migrates before the other. The analysis of 2,374 Northern Saw-whet Owls, banded in Pennsylvania during the fall migration seasons of 1998–2003, documented several sex-related differences in migration. Our results supported that females were significantly larger than males, with higher masses and longer wing-chords. Females were in better body condition, having significantly higher condition indices (mass*100/wing chord) and keel scores. Although there were no differences found between the sexes in the date of arrival or the diel time of capture, males were captured at rates significantly lower than females, accounting for only 10% of the captures. Furthermore, males were recaptured significantly less frequently than females. The lack of male recaptures precluded additional comparisons of males and females with respect to stopover ecology. Additional study, particularly from other locations, is needed to determine whether the high capture rates of females is due to differential migration, differential capture probability, or both. (Poster presentation.)

## TIMING IS EVERYTHING: SEASONAL COMPARISON OF MIGRATORY STOPOVER.

Melissa S. Mustillo, Elizabeth H. Lewis, Kathryn E. Mattern, Sara R. Morris and H. David Sheets, Departments of Biology and Physics, Canisius College, Buffalo, NY 14208.

Although migration is relatively widespread in birds, few studies have compared the two migratory seasons. Knowing that seasonal priorities of migrants may differ, the migration and stopover ecology of birds are also likely to differ between spring and fall. The goals of our project were to compare stopover ecology between spring and fall migration and to investigate possible annual variations. Using data from five species banded on Appledore Island, Maine, we compared recapture rates and stopover lengths (both minimum and SODA) between the seasons. The recapture rate for most species analyzed was significantly higher during fall. The minimum stopover was also longer during fall. When each year's record of Red-eyed Vireo (*Vireo olivaceus*) data was analyzed, there was a general pattern showing minimum stopover and SODA stopover to be longer during fall. Annual recapture rates for this species were also significantly higher during fall. It appears that there are seasonal differences in the stopover ecology of migrating birds. Birds have longer stopovers and higher rates of recapture during fall compared to spring. Our results are consistent with the hypothesis that avian behavior during spring migration is influenced by the need to arrive early on breeding grounds, while fall migrants are not time limited at this northern stopover site. (Poster presentation.)

## ISOLATING ENDO16 FROM A PRIMITIVE SEA URCHIN.

Geetanjali Nayak and Hyla Sweet, Department of Biological Sciences and Department of Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The long-term goal of our research is to study the evolution of endomesoderm induction and the role of Delta/Notch signaling in echinoderm development. One of our projects specifically focuses on the Endo16 gene of a primitive sea urchin *Eucidaris tribuloides*. The pattern of Endo16 gene expression is in part controlled by Delta/Notch signaling. DNA analysis and studies of the developmental expression of the Endo16 mRNA and protein have shown that it is initially expressed in the endomesoderm and later expressed only in endoderm.

Currently the primary goal of our project is to isolate the *Eucidaris* homologue of the Endo16 gene. A few short-term goals have been accomplished including amplification of this gene using gradient PCR and nested PCR, agarose gel purification of PCR fragments and insertion of fragments into a plasmid.

The next step of this project is to sequence EtEndo16, isolate a full-length clone and determine both spatial and temporal expression patterns using in situ hybridization, Northern blot analysis and/or real-time PCR. By comparing EtEndo16 expression patterns to Endo16 expression in other echinoderms, we will understand better the evolution of endomesoderm development. (Poster presentation.)

## MOUNTAIN LIONS IN NEW YORK? A SURVEY OF THE EVIDENCE.

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If mountain lions (*Puma concolor*) are present in any numbers in New York, what evidence would be expected? Numerous sightings are reported annually, but little physical evidence has been shown to support those accounts. We surveyed the documented evidence of mountain lions in New York and found it lacking to support the claim that these cats are in fact roaming the state. In addition, we found numerous inconsistencies in the evidence that is reported such as documented misidentifications, e-mail hoaxes, reports of unlikely or impossible behaviors by eyewitnesses and many sightings of black mountain lions. Although we can't disprove the existence of mountain lions in New York, we remain unconvinced of their presence as a free roaming wild population. (Oral presentation.)

## RV2985 DIADENOSINE POLYPHOSPHATASE FROM *M. TUBERCULOSIS*, AN "INVASION" ENZYME HOMOLOG AND POTENTIAL NOVEL ANTIBIOTIC TARGET.

Julian Ramos, Daniel Sheibley, Sarah Glick and Suzanne F. O'Handley, Department of Chemistry, Rochester Institute of Technology, Rochester, NY 14623.

The Nudix hydrolases are a family of enzymes that cleave substrates containing a nucleoside diphosphate linked to some moiety, x, and are identified by the common signature sequence: $GX_5E_7REUXEEXGU$, where U= I, L, or V. We have been systematically discovering and characterizing Nudix hydrolases from *M. tuberculosis* to identify potential novel antibiotic targets. One such enzyme, Rv2985 diadenosine polyphosphatase, is a homolog to enzymes shown to be responsible for the invasiveness of pathogenic bacteria. We are purifying and characterizing Rv2985 as a possible candidate for the *M. tuberculosis* "invasion" enzyme. Blocking the ability of a pathogen such as *M. tuberculosis* to be able to invade its human host may be an excellent target for the development of new antibiotics. (Poster presentation.)

## NOTES ON THE TERRESTRIAL ISOPODS OF WESTERN NY.

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In the past five years, I have collected 11 species of terrestrial isopods (Oniscoidea) in the deciduous woodlands of western New York. All of the species collected are European species which may have arrived during the Quaternary period of continental drift or were introduced by man. Terrestrial isopods are crepuscular and require moisture. They are seldom active in daylight and must be located under stones and logs, or in soils. Methods of collecting are discussed. *Onicus asellus* and *Trachelipis rathkei* are the dominant species. (Oral presentation.)

## DEPRESSION STORAGE IN NATURAL AND MODIFIED LAND USES.

Paul L. Richards, Ryan Grimm and David Cannon, Dept. of Earth Science, SUNY College at Brockport, 14420.

Topographic depressions occur in many different spatial scales and have a significant effect on watershed connectivity. They also impact the timing and volume of surface runoff. Although depression storage is an important concept in hydrologic modeling, few studies have measured it in the field. Most work to date has involved theoretical investigations on the relationship between depression storage and physical variables like roughness, tortuosity and slope. In this study, we evaluated depression storage in natural and anthropogenic land uses common to the Finger Lakes region to determine its variability in the landscape. We also wanted to explore how terrestrial biologic processes, such as vegetation and bioturbation impact depression storage and depression storage – slope relationships, and to consider the implications on runoff prediction.

Depression storage was evaluated by digitizing the land surface using a roughness clinometer. The device measures the depth to surface at 5 cm intervals relative to a plane parallel to the general slope of the surface. Specialized software was developed to compute the actual depression storage from measurements by adjusting the

ideal depression storage to account for the free surface of water behind local topographic highs. The surface of the ground was cleared of debris (with the exception of active roots) prior to using the instrument. Sites were mapped using GPS. To date six different land uses have been evaluated (Table 1).

Data collected so far suggests that natural land uses such as wetland, forest and herbaceous had considerably more depression storage than urban land cover at all slopes (Table 1). These land uses can store 5 or more times rainfall than pervious land cover in urban settings. Effective/ideal depression storage ratio is a strong function of slope, however with commercial and residential land use a sharp drop was noted at slopes 3% or more. The effect of depression storage on runoff prediction and the origin of this microrelief are discussed. (Oral presentation.)

*Table 1*

| Land use | # obs | Mean effective storage (mm) | Std. dev. effective storage (mm) |
|---|---|---|---|
| Wetland | 24 | 10.8 | 7.0 |
| Mature deciduous forest .<br>*includes tree fall depressions | 30 | 7.0 (9.9*) | 7.0 (13.0*) |
| Unused crop field | 32 | 9.4 | 5.0 |
| Urban residential grassland | 20 | 0.5 | 0.4 |
| Urban open (commercial) | 15 | 2.0 | 2.4 |

## PLANKTON BIODIVERSITY IN BORO BEEL, PABNA, BANGLADESH.

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The floodplain lakes or *beel* ecosystem of Bangladesh is an extraordinary complex inhabited by diversified flora and fauna. Most of the *beels* are reeling under high to very high level of eutrophication as evidenced from the existence of dense macrophytic stands. The plankton population in particular has suffered the most both in terms of quality and quantity. Additionally, irrigation is the major threat to the plankton of *beel* ecosystems during dry season. Thus, the present study was conducted to determine the status of plankton population of Boro *beel* in relation to the environmental parameters of *beels* from July 2003 to June 2004. Boro *beel* is a complex system containing a cluster of 15 water bodies. These include 13 *beels*, one river and one canal. There are 27 other *beels* connected with this *beel* through Chiknai river and various canals. During the rainy season, all 13 *beels* became a single water body. During the dry season almost all the *beels* dry up except two water bodies within the system. The water area during the rainy season is 3,000 ha and during the dry season it is 300 ha.

A total of 23 genera of phytoplankton and 10 genera of zooplankton were recorded in the Boro *beel*. The qualitative texture of phytoplankton community indicated the dominance of Chlorophyceae (11 genera) followed by Bacillariophyceae and Cyanophyceae each contained 4 genera, Euglenophyceae (3 genera) and Dinophyceae having single species. Zooplankton consisted of Rotifera and Crustacea, each containing 5 genera. Phytoplankton contributed 76% of the total plankton in terms of abundance.

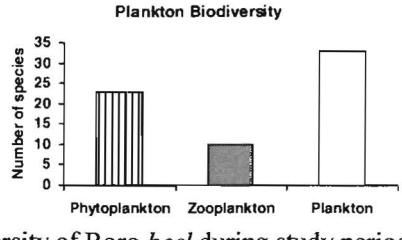


Fig. 1. Plankton biodiversity of Boro *beel* during study period from July 2003 to June 2004.

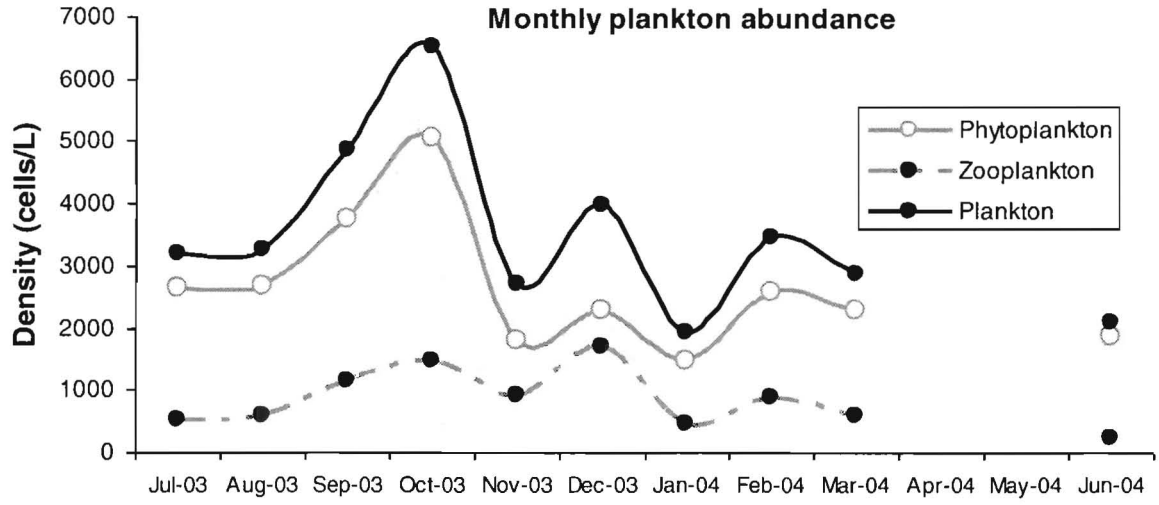


Fig. 2. Monthly variation in abundance (cells/L) of plankton of Boro *beels* over the study period. Data was not collected in Boro *beel* during April-May/2004 due to drying of *beel*.

The phytoplankton plays the dominant role in determining the quantitative distribution of total plankton. The plankton population was found to range between 1933 u/l (January) to 6500 u/l (October). Chlorophyceae (53%), Cyanophyeae (17%), Bacillariophyceae (13%), Euglenophyceae (10%) and Dinophyceae (7%) contributed the abundance of phytoplankton. Crustacea (66%) and Rotifera (34%) formed the zooplankton abundance. Plankton had direct strong ($P<0.01$) correlation with rainfall ($r = 0.588$), transparency ($r = 0.734$) and water level ($r = 0.633$) of the *beel*. (Oral presentation.)

## LONG-CHAIN N-ACYL-HOMOSERINE LACTONE SIGNAL DEGRADATION IN TUMORIGENIC AND NON-TUMORIGENIC STRAINS OF *AGROBACTERIUM VITIS*.

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*Agrobacterium vitis*, the causal agent of crown gall disease on grape, employs a cell-to-cell signaling mechanism called bacterial quorum sensing (QS) to regulate necrosis on grape and a hypersensitive response in tobacco. *N*-acyl homoserine lactones (HSL) are the small diffusible signaling molecules produced by QS bacteria. HSLs may be classified as short-chain or long-chain, referring to the number of carbons comprising their acyl side-chains.

Cell density and QS signal accumulation were determined during growth in two tumorigenic (81, 957) and two non-tumorigenic (516, 569) strains. *A. vitis* strains were cultured in potato dextrose broth (PDB). pH was monitored during growth of the non-tumorigenic strains. All strains produce at least one short-chain and one long-chain HSL. Three strains (81, 957 & 569) degrade their long-chain HSL starting in early death phase while concomitantly accumulating short-chain HSL. However, strain 516 does not degrade its long-chain signal. The culture pH of strains 516 and 569 increases over time but does not exceed 7.2. To further evaluate whether signal degradation is influenced by an increase in pH, strain 81 was cultured in PDB with a MOPS buffer. pH remained between 6.7 and 6.9, and long-chain signal was degraded during stationary and death phases. Together, these results suggest that the long-chain HSL is enzymatically targeted and degraded during death phase in strains 81, 957 & 569. Strain 516 may be mutant for this phenotype, or may accumulate the long-chain signal to levels that mask observable degradation. Continuation of this research may provide insights to the role of long-chain signal in saprophytic and pathogenic behaviors of *A. vitis*. (Poster presentation.)

## CATEGORIZING BIOLOGICAL OR PALEONTOLOGICAL SPECIMENS USING OUTLINE-BASED MEASUREMENTS OF SHAPE: COMPARING THE PERFORMANCE OF SEVERAL METHODS.

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The morphology of organisms often varies with species, age, and/or sex. Quantification and classification of outlines or contours on biological organisms or geological samples have been approached using a number of different methods. We present here a case study using three geometric morphometric methods (semi-landmarks, elliptical fourier analysis and extended eigenshape analysis) to categorize feathers as coming from hatch-year (young) or after-hatch-year (adult) Ovenbirds (*Seiurus aurocapilla*). All of these methods pose challenges to discriminant function analysis because there are typically more measurements than specimens, resulting in the need to reduce dimensionality prior to the discriminant function analysis. We present here an approach to dimensionality reduction which optimizes the estimated rate of correct classifications, as determined by cross-validation. Since the different processing methods have different approaches to removing information about scale and rotation differences between specimens, this might be expected to have an impact on the ability of the methods to classify specimens. We show that the performance of the three shape measurement methods yield very similar rates of classification when using an optimized dimensionality reduction scheme. This approach should have applications in a way range of fields where the need to classify specimens based on shape exists. (Oral presentation.)

## SCEC/USEIT: BRIDGING THE GAP: PROGRAMMERS AND USERS, USERS AND DATA SITES.

Lori Sheperd, Canisius College, 2001 Main Street, Buffalo, NY 14208 and University of Southern California (SCEC), Los Angeles, CA.

Visualization in a 3D environment is a vital aid in understanding and conveying informational data concerning geosciences, especially earthquakes. This summer's Grand Challenge was to create software that would benefit scientists, public services and the media, as well as the general public, by utilizing 3D visualization to monitor earthquake sequences and create animated movies about them. Although proprietary and less comprehensive visualization tools are available, the SCEC UseIT intern group focused this summer's project on continued development of a more powerful and user friendly visualization tool, SCEC_ Virtual Display of Objects (SCEC_VDO).

SCEC_VDO has been enhanced by improving the versatility of the plug-in that enables users to import, query, and display earthquake catalogs. For the first time, users of SCEC_VDO can now import parametric data in two common catalog formats, the SCEDC and Hypo71 formats. The Southern California Earthquake Data Center (SCEDC) contains data from the Southern California Seismic Network, the longest running network. Although coding to improve and build upon existing Java code is beneficial, another important aspect of this summer's project was serving as a liaison between intern coders and users involved in the movie making process. Movie scripts were created to experiment with new functionalities added by other interns, to investigate the program for errors, and to generate new ideas and functionality that would be advantageous for the user. This area of the project bridges the gap between the program coders' ideas and the users' needs. This connection between program coders and program users is vital in the advancement of SCEC_VDO; giving the programmer a sense of necessities users require, as well as how user friendly the current version is. (Poster presentation.)

## THE SYNTHESIS OF AMINO-SUBSTITUTED ALKYLARYLTELLURIDE PHOSPHONIUM SALTS.

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The goal of our research is the synthesis of alkyltriphenylphosphonium salt analogs of electron rich alkylaryltellurides and evaluation of their use as probes of oxidative damage and repair in yeast mitochondria. This is of interest because damage caused by oxidation in the mitochondria contributes significantly to many human

disorders, including neuromuscular degenerative diseases, aging, and cancer. Alkylaryltellurides were chosen because they are known to act as antioxidants by readily losing an electron under oxidizing conditions and by oxidizing in the presence of two-electron oxidants. More specifically, tellurides having amino-substituted aryl rings are most easily oxidized, thus making them better antioxidants. Placing a triphenylphosphonium group at the terminus of the alkyl group of the alkylaryltellurides should result in improved transport into yeast mitochondria, as has been shown for lipophilic cationic derivatives of the antioxidant vitamin E. This presentation describes the successful synthesis and characterization of four amino-substituted alkylaryltelluride phosphonium salts. (Poster presentation.)

## ASSESSING DIETARY DIFFERENCES OF RIVER OTTERS LIVING IN MARINE VERSUS FRESHWATER HABITATS-WHICH ENVIRONMENT PROVIDES OPTIMAL FORAGING OPPORTUNITIES?

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River otters (*Lontra canadensis*) are unique mammals in that they are able to adapt to living in both marine and freshwater habitats. Researchers in the field debate the optimality of each environment in terms of foraging success and profitability. This study attempts to ascertain an answer to this issue for conservation purposes, with applications being geared toward re-introduction programs. The diets of each an inland and coastal population were analyzed by scat (droppings) to determine composition. The inland location in Rochester, NY consisted of creeks and tributaries of similar latitude as the Pacific coastal rocky islands and inlets in Rivers Inlet, British Columbia. Two separate sites at each location were scouted for latrine sites on foot and by canoe, and scat samples were collected and stored frozen until analysis. Scat was thawed and passed through a set of stacked sieves (2.4 mm, .2 mm) and indigestible hard part remains were retained and washed for identification under a dissecting microscope. Bulk analysis of scats by volume displayed a range of 48%-100% centrarchids, 18.5%-51.6% cyprinids and 2.5% Osmeridae in NY; with the entire diet relying on teleosts. In the marine habitat 1.7-100% of the scat volume was teleost, 10-99% crustaceans and 3.7-20% mollusks. A frequency analysis demonstrated the presence bony fish in 100% of scats collected inland, while 25% of the marine samples contained mollusks, 50% contained crustaceans and 100% contained bony fish. The marine habitat diet appeared to display more variation, as a minimum of six different prey species were identified, as compared to three species of prey inland. The main components of inland scat were fish ribs, vertebrae and scales, scales ranged in size from 1 mm to 2 cm. The constituents of the marine scats were fish gill rakers, fin and vertebrae fragments, crustacean carapace parts and mollusk shell parts. Scales ranged from 0.5-7 mm, mollusk parts from 7 mm-1 cm, and crustacean parts ranged between 1.5 mm and 6 mm in length. From this data it appears that marine prey may be less profitable in terms of size and energy content than inland prey. Further work should include the application of the optimal foraging theory to more accurately compare dietary differences. (Poster presentation.)

## HISTORIC AND PREHISTORIC ARCHAEOLOGY IN MT. MORRIS.

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The Mills Mansion site in Mt. Morris, NY offers a unique opportunity for students of archaeology. The site contains both historic and prehistoric components. This paper will review evidence of both time components of the site and discuss the heuristic value of students working at multi-component sites.

Located in the Genesee River Valley, the Mills Mansion was the home of the founder of Mt. Morris, Major General William Augustus Mills. Currently, the Mt. Morris historical society is funding the excavation and restoration of the Mills Mansion and the surrounding area. A field school for secondary school and college students is offered each season, which provides the students an opportunity to learn excavation methods and to learn first hand about the history of Mt. Morris from 1837 to the present.

The site also contains prehistoric artifacts from Native Americans that occupied the Genesee River Valley dating from 2,000 B.C. This unique duality of sites in a single location is excellent for introducing new students to a wide range of archaeological experience. Students are able to excavate and identify historic artifacts such as glass, building materials, and ceramics; and features such as walkways, a driveway, and the well. The students are also able to excavate prehistoric artifacts and features, such as projectile points and post moulds. In addition to fieldwork,

the Mills Mansion has an on-site lab which completes the archaeological experience for students. (Poster presentation.)

## DNA SEQUENCE ANALYSIS OF A CHS GENE FAMILY IN GESNERIADS.

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Chalcone synthase is the first enzyme in the flavonoid biosynthetic pathway in green plants and is encoded by a small gene family. Analysis of 22 exon 2 CHS sequences from *Saintpaulia ionantha* suggests that there are five *CHS* genes (*CHSA-E*). Primers specific for the *CHS* gene in other genera were designed using DNA sequences obtained from PCR amplification using redundant primers for each genera. The specific primers and a high fidelity polymerase were used for PCR to generate amplified fragments which were sequenced. These sequences provide data for an evolutionary comparison of the genera within the Gesneriaceae family. (Poster presentation.)

## 2,2-DIMETHO-OXYPROPANE AS POTENTIAL DRYING AGENT FOR GREEN SOLVENTS.

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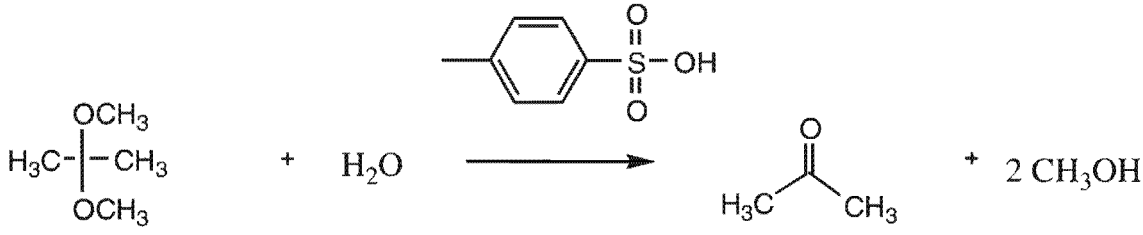
The presence of water in organic solvents can interfere with water-incompatible reagents in chemical synthesis. Ionic liquids are often very hygroscopic and removal of water impurities can be difficult. The use of 2,2-Dimethoxypropane (DMP) as a drying agent for green solvents, specifically surfactants and ionic liquids, containing a broad range of 0.02-2 % $H_2O$ by mass, was investigated.




Scheme 1.

As shown in Scheme 1, DMP reacts with water, in the presence of toluenesulfonic acid as catalyst, cleaving the ketal and forming acetone and methanol as products. The volatile products and remaining DMP reactant were then effectively removed by stripping with nitrogen gas. Stripping with nitrogen gas alone does not effectively remove the water. With DMP, water level can be reduced to a range of 0.04–0.06% water by mass. (Oral presentation.)

## TRACKING DOWN CYANOBACTERIAL TOXIN IMPOSTERS.

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Cyanobacterial blooms commonly occur in freshwater lakes and may be associated with the release of toxic peptides known as microcystins. These potent liver toxins have been associated with the deaths of several dogs and waterfowl in the upstate NY region. Microcystins consist of a number of different congeners and one common method for quantifying microcystins is by HPLC equipped with a photodiode array detector. Total microcystins can also be measured using an activity-based protein phosphatase inhibition assay or PPIA. In general, these two methods give excellent agreement. In this study water samples collected from Lake Agawam NY, Oneida Lake, NY and from San Francisco Bay were analyzed for their microcystin content using the two different methods (HPLC-PDA and PPIA) and the resulting toxicity values were compared. It was found that there was no correlation between values provided by the two methods. These results suggest that natural compounds present in these samples can inhibit one or the other assay and that HPLC alone is an insufficient means for determining the total toxicity of a sample. (Poster presentation.)

## GI MOTILITY IN THE ZEBRAFISH: DEVELOPMENT OF A FUNCTIONA ASSAY.

Tiffany Telarico, Stacy Hess, and Adam Rich, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

Efficient nutrient absorption and waste elimination by the gastrointestinal (GI) tract requires mixing and propulsion of GI contents in an ordered manner. Contraction of GI smooth muscles is rhythmic and highly coordinated such that waves of contraction propel GI content in an aboral direction (oral-to-anal) . Poorly regulated contraction of GI smooth muscles may underlie motility disorders such as delayed gastric emptying, bloating, nausea, constipation etc. The zebrafish is a rapidly emerging model organism for human disease. The zebrafish GI tract is anatomically similar to human, and at 96 hours post-fertilization the GI tract is completely functional. Larvae are transparent, allowing direct observed of function *in vivo*. The aim of this work is to develop functional assays to quantify GI function in intact zebrafish larvae. Contraction frequency may be directly observed, videotaped, and quantified. However, this assay does not discriminate coordinated versus uncoordinated contractions. Contraction frequency will be compared in wildtype (WT) larvae and *sparse*, a mutant zebrafish that may lack interstitial cells of Cajal. Data will also be presented on the development of a 'time-to-pass' assay that will quantify GI transit time. (Poster presentation.)

## ANALYSIS OF THE COMPLETENESS OF EURYPTERID REMAINS.

O. Erik Tetlie, Department of Geology and Geophysics, Yale University, P.O. Box 208109, New Haven, CT 06520-8109; and Samuel J. Ciurca, Jr., 54 Appleton Street, Rochester, NY 14611.

Taphonomy is the study of conditions and processes that happen to an organism during fossilization. One taphonomic process, with a potential of influencing the completeness of fossils of the extinct eurypterids, is transportation. Most eurypterid remains at most localities are found disarticulated. More rarely, 'complete' individuals are found and these are often the specimens (selectively) preserved in museum collections. As arthropods, eurypterids molted their exoskeleton during growth, and provided several exoskeletons that had the possibility of preservation as a fossil eurypterid, perhaps more than 10 molts in a eurypterid's lifespan. For example, there are about 200 parts that could be preserved from just one molt of the most common eurypterid in New York, *Eurypterus*, giving at least 2000 potential fossils from one individual. Since most of these are tiny spines on the legs, they are rarely seen, and even a 'complete' individual would rarely exhibit more than a tiny fraction of all possible parts. The number of leg spines also varies from taxon to taxon, and to be able to empirically compare the completeness of eurypterids from different localities, horizons and taxa, we propose to calculate a 'eurypterid completeness index' (ECI). The ECI provides a weight of 1 to each of the following elements when they are articulated: carapace, 12 tergites (dorsally), 6 tergites, 4 pairs of sternites, metastoma and genital operculum (ventrally), 10 appendages (II-VI) and telson to circumvent preservational and morphological differences. Incomplete elements that can be identified are given the weight of 0.5 and those that are not identifiable 0.1. This gives a eurypterid fossil a potential maximum score of 24 and a minimum score of 0.1. The ECI is calculated by summarizing the scores of all individual fossils and dividing on the number of specimens, thus giving an average value for the specimen completeness.

We are currently retrieving data from tens of thousands of partial and nearly entire individuals, from more than a hundred localities, now in the collections of the Yale Peabody Museum. Are all eurypterid remains the result of molting followed by transportation and disarticulation of molted parts? Are the 'complete' specimens nicely preserved molts or carcasses? Is preservation due to exceptional conditions, e.g., hypersalinity or storms? Where did eurypterids actually live? Can we understand biological and sedimentary facies changes from the stratigraphic record preserved?

Preliminary ECI values have so far been computed for three localities with number of specimens indicated: Kokomo limestone, Wabash Formation, Kokomo, Indiana ECI 6.69 (27.8% completeness, N = 13), Split Rock Quarry, near Syracuse, New York (Olney Limestone) ECI 1.69 (7.0%, N = 187), and Phelps Member, New York State Thruway, Phelps, New York ECI 1.52 (6.3%, N = 96). (Poster presentation.)

## THE EFFECTS OF AN URBAN HEAT ISLAND ON TWO SMALL CITIES IN NEW YORK STATE.

Christopher Thuman, SUNY Oswego, Meteorology, Oswego, NY.

The effects of the urban heat island have been carefully studied and documented from the early 20th century to the present. However, to this date there have been few projects performed to determine the extent of urban heat islands in the northeastern region of the United States. Even less research has been conducted examining heat islands in small cities having a population less than 15,000 people. This study examines the extent of an urban heat island in Syracuse, New York (43°03'N, 76°06'W), a city containing 143,101 people in 2004 where a heat island is expected and in Fulton, New York (43°19'N, 76°24'W), a much smaller city (11,643 people in 2004) by both population and surface area. After examining Syracuse and Fulton for an urban heat island during the summer months of June and July, the results did show a heat island present for the majority of occasions. A heat island having a magnitude greater than 3°C was found in Fulton during 5 out of 13 experimental trials, while Syracuse displayed a heat island greater than 2.8°C in 6 out of 11 trials. Further, results were found indicating that the heat island in Syracuse had a peak magnitude of 6.5°C on 24 June 2005 and 4 July 2005 while Fulton was capable of producing a heat island peak magnitude of 5.2°C on 28 June 2005. These results are somewhat surprising and not expected for cities the size of Syracuse and Fulton. By examining observations from the KSYR and KFZY ASOS reporting stations located near Syracuse and Fulton respectively, it was able to be determined on a preliminary basis that surface observations of temperature at Syracuse Hancock International Airport and the Oswego County Airport near Fulton are representative of rural temperatures and do not appear to display the effects of the urban phenomenon. (Oral presentation.)

## FOLDING OF REDUCED CYTOCHROME *C* FROM THE MOLTEN GLOBULE INTERMEDIATE.

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Conditions for the formation of the molten globule intermediate of horse heart cytochrome *c* (cyt *c*) upon exposure to sodium dodecyl sulfate (SDS) are examined for both the oxidized and reduced protein species via an SDS titration that is monitored using UV and CD spectroscopies. At low SDS concentrations (0.1-1 mM) there were significant differences in the folding curves of the oxidized and reduced cyt c species, where the oxidized species existed as a molten globule intermediate and the reduced species existed as the native state protein. A time resolved absorption study was performed to probe the kinetics of photoreduction-triggered folding of 10 μM oxidized cyt *c* in 0.5 mM SDS and 50 mM NaP at pH 7. Rapid reduction induced the folding of the protein species from the initial oxidized cyt *c* molten globule state to the near native reduced cyt *c* species. The progression of this folding process was monitored by OD changes in the Soret absorbance region. (Poster presentation.)

## INVESTIGATION OF NF-κB NUCLEAR LOCALIZATION IN VESICULAR STOMATITIS VIRUS-INFECTED L929 CELLS.

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Interferon (IFN) is a key component of a virally-infected cells innate immune defense. IFN causes surrounding cells to enter an anti-viral state and prevent the viral infection from spreading. The overall focus of our work is to further understand IFN gene regulation by Vesicular Stomatitis Virus (VSV). Wild type VSV suppressed the IFN antiviral response while the T1026R1 mutant induces large amounts of IFN in infected cells. Our lab is interested in determining how the virus regulates this antiviral response and which virus components are responsible. A former student in the lab discovered that VSV regulates NF-κB, a transcription factor that is essential for IFN gene regulation. He used immunofluorescence to determine if NF-κB was activated in VSV infected cells. The goal of my work was to confirm the findings using a more sensitive Elisa based Trans AM assay. Currently, the difference between NF-κB activation in wild type and T1026R1 infected cells has been confirmed. Recombinant viruses have been tested, but repeats are necessary to achieve a more detailed understanding of the mechanism used by the virus to regulate NF-κB. Various NF-κB inhibitors, such as BAY, will also be tested to confirm the predicted NF-κB

activation pathway. This data, along with data generated by other students in the lab will lead to valuable insights into the way VSV combats the production of IFN. (Oral presentation.)

## SEDIMENT CONCENTRATION IN HEADWATER STREAMS OF VARYING WATER QUALITY AT DIFERENT FLOWS.

Tom Veeder and Ted Georgian, Dept. of Biology, St. Bonaventure University, St. Bonaventure, NY 14778.

We compared total suspended solids (TSS) concentrations of two headwater streams: Coon Branch and a reference stream, Ninemile Creek. The Coon Branch drainage basin consists primarily of active or abandoned farmland, with a riparian zone that is poorly developed or absent. By contrast, Ninemile Creek has a highly developed riparian zone consisting of mostly hardwood forest. Riparian zones protect water quality by acting as a buffer against pollutants as well as minimizing bank erosion. Absence of a riparian zone can cause high suspended sediment concentrations and damage to benthic habitats. We hypothesized that Coon Branch would carry a heavier sediment load and less organic material than the reference stream.

We sampled TSS at 2 locations in Coon Branch, 1740 m apart, and at 1 location in Ninemile. Sampling took place from October 2004 through May 2005 at discharges ranging from baseflow (~6 L/s) to high flows of nearly 1000 L/s. Water samples were filtered through pre-ashed, 47-mm glass-fiber filters, dried, weighed, ashed at 510° C, and reweighed.

Preliminary regression analysis indicated that at low flows (~25 L/s) TSS at the downstream location in Coon Branch was ~10 mg/L > Ninemile Creek; Coon Branch upstream had even higher concentrations. Similar trends were seen at high flows of ~300 L/s, with a difference of ~13 mg/L between Coon Branch upstream and the reference stream. The organic content of Coon Branch TSS was much lower than Ninemile. Organic content was higher in autumn in Ninemile Creek, as expected, while the organic content of Coon Branch sediment showed little seasonal variation. However, differences between seasons and sites were not statistically significant (by t-tests).

Although these data supported our hypothesis, leaf pack studies done at the same time showed that the types of invertebrates are indicative of good to excellent stream quality, as measured by a Biotic Index. The conflicting results suggest that high sediment concentrations may be damaging portions of the stream ecosystem not measured by the leaf pack study. (Poster presentation.)

## AVIAN FLU: REVIEW OF CURRENT RESEARCH.

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During the 20th century, the influenza virus has claimed the lives of over 40 million people (1). There is a concern that the avian influenza virus may have the potential to cause a new pandemic. The justification is based upon two aspects. They are: the ability of the virus to readily mutate and its ability to evade host immune defenses (2).

The avian flu, is an influenza virus that is indigenous to migratory water fowl worldwide (1, 2). It is characterized as being an RNA enveloped virus. The highly pathogenic strain receiving the spotlight refers to influenza type A strain H5N1 (1, 4, 5). The *H* and *N* refer to viral glycoproteins termed hemagglutinin and neuraminidase (2, 7) They are found on the surface of the virus and are involved in receptor-binding and membrane fusion (2, 7). The exact mechanism of virulence is unknown at this time. However, the influenza virus does appear to be resistant to interferon and tumor necrosis factor –a (3).

The influenza virus has been found to infect, not only wild fowl, but also domesticated animals such as ducks, chickens, pigs, and horses (1). Furthermore, in 1997, 6 humans died in Hong Kong from the strain H5N1 (5, 6). In response, over 1.5 million domesticated birds were destroyed in an effort to remove the source of infection (5, 6). However, other sources of the virus found in the domesticated animal population; indicated that the virus was still present. As mentioned above, some domesticated animals, such as the pig, are known to become infected with H5N1 (7, 8). Research suggests that domesticated animals, such as the pig, serve as an intermediate host, for what is known as antigenic shift, where changes occur in the genome of the virus that result in a new subtype (2). Thus the H5N1 was able to acquire the ability to infect humans due to alterations made in their genome (2). Fortunately, the virus does not appear to spread easily from human to human (2).

In October 2005, Europe reported several bird cases of the avian flu virus subtype H5N1 in Romania, Turkey, and parts of Russia (2). The United States is working with both the European and Asian governments to improve our

understanding of the influenza virus (1, 2, 4). They are also working to develop a vaccine and implement effective prevention/action strategies (1, 2, 4). Finally, great effort is being made to educate the agricultural industry and general public regarding bio-security measures to aid the prevention of a pandemic from the avian influenza virus (1, 2, 4).

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(Oral presentation.)

## TOTAL SYNTHESIS OF A CROSS-MEMBRANE FLUOROMETRIC PROBE.

Ryan Walvoord, Greg Wright, Christina Collison and Andreas Langner, Rochester Institute of Technology, 85 Lomb Memorial Drive Rochester, NY 14623.

Previous research conducted by Dr. Langner has employed a piperadine-derivatized dansyl fluorometric probe to monitor the aggregation dynamics in the decane/AOT/water/butyl alcohol microemulsion. The emission spectrum of the dansyl probe exhibited a significant spectrochromic shift in nonpolar to moderately polar solvents. Application of the probe to the quaternary microemulsion revealed that the hydrocarbon continuum is essentially pure decane (i.e. the alcohol partitions to the particles). However, it is difficult to determine the location of bound probe and its partitioning between the surfactant membrane and the aqueous core. To affect this analysis, a collaboration has been established with Dr. Christina Collison to synthesize a tethered cross-membrane probe that will show both nonpolar and polar spectrochromic sensitivity. The tethered fluorescence probe is comprised of 9-aminoacridine and dansylamide, separated by an octyne spacer. The spectrochromic sensitivity of secondary dansylamides in nonpolar environments is matched by the sensitivity of 9-aminoacridine in polar and aqueous systems. By tethering these two probes with a hydrocarbon spacer, the resulting probe system can be anchored across a surfactant-based membrane. Subtle physiochemical changes on either side of the membrane can thus be monitored simultaneously by ratioing the dansyl and acridine signals. The proposed tether is designed to span the AOT-based membrane. To extend the work to other surfactant systems, including biological membranes will require that the tether can be extended to variable lengths. (Poster presentation.)

## AQUATIC INVERTEBRATES IN LEAF PACKS: A COMPARISON OF TWO HEADWATER STREAMS.

Renée Willey, Tom Veeder and Patty Parsley, Dept. of Biology, St. Bonaventure University, St. Bonaventure, NY 14778.

Headwater streams receive much of their energy inputs from the surrounding terrestrial ecosystem. Leafy and woody litter from riparian vegetation forms leaf packs in the stream bed; these leaf packs sustain complex food webs. We compared invertebrate taxa in naturally occurring leaf packs in two headwater streams: Coon Branch, which drains a basin of active and abandoned farmland, with a poorly developed riparian zone, and Ninemile Creek, a reference stream whose basin is covered with mixed hardwood forest. We hypothesized that differences in the riparian zone would result in differences in the numbers and kinds of invertebrates in leaf packs in the two streams.

Ten natural leaf packs were samples at each stream on 17 Nov 2005. Invertebrates were rinsed from the leaves and the leaves were dried and weighed. Invertebrates were identified to order and to family for the more common taxa. To assess water quality, we calculated a Biotic Index, based on pollution tolerance values published by the Leaf Pack Network (Stroud Water Research Center).

Mayflies, stoneflies and midges were the most prevalent taxa found in leaf packs from both streams. The Biotic index averaged 3.10 for Coon Branch and 3.75 for Ninemile Creek (difference not significant; t-test, $p>0.10$). Values for individual leaf packs suggested good to excellent water quality for both streams. The leaf packs varied from 3.24 to 32.72 g dry weight for Coon Branch and 3.31 to 30.72 g dry weight for Nine Mile Creek. Differences in the number of invertebrates/g dried leaf pack were not significant (t-test, $p>0.10$).

Despite the lack of a true riparian zone at Coon Branch, its Biotic Index indicated very good water quality, comparable to the reference stream, which was contrary to our hypothesis. Studies by Veeder and Georgian that compared sedimentation between the streams suggest differences in water quality. Our sampling was limited to leaf packs in one season and we did not sample invertebrates in the stream bed where impacts of sedimentation may be greater. (Poster presentation.)

## LONGITUDINAL WATER ECOLOGY STUDY OF THE WEST BRANCH OF RED CREEK, ROCHESTER, NY.

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An eight-week study was conducted to compare stream ecosystems from three sites on the west branch of Red Creek, a mixed hardwood watershed in western New York. The east and west branches of Red Creek converge near Genesee Valley Park and flow into the Erie Canal in Rochester, NY. Sites 1 and 2 are headward of the confluence of the east and west branches. Site 3 is located directly at the confluence of Red Creek and the Erie Canal. Conductivity and pH data indicate a strong correlation in the water chemistry of sites 1 and 2, but values diverge at site 3. Benthic macroinvertebrate data indicate good to excellent water quality at all sites with some deterioration at site 2. Field data suggests this may be due to localized urbanization and construction. While these results indicate that the east branch, which flows through a more commercialized district, greatly influences the water chemistry at site 3, water quality does not deteriorate. (Poster presentation.)

## DETERMINATION OF INF MRNA PRODUCTION AS A FUNCTION OF NF-KAPPA B ACTIVATION IN VSV INFECTED MOUSE CELLS.

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Wild type (wt) vesicular Stomatitis virus (VSV) has been well documented as a strong inhibitor of Interferon-beta (IFNβ) production in mouse L929 cells. IFN is a Cytokine produced by normal cells in response to viral infection, inhibiting the reproduction of VSV. Prior work in our lab has implicated that VSV may utilize both global host transcription inhibition and a specific mechanism to down regulate IFN production. We have found that wt VSV specifically blocks activation of the transcription factor NF-kappaB in its suppression of IFN gene expression. Conversely, VSV mutant T1026R1 (R1) has been found to be a poor inhibitor of NF-kappaB activation in L929 cells. In this study, we wanted to establish a functional link between regulation of NF-kappaB and IFN gene expression in VSV infected cells. Establishing this link would strengthen our hypothesis that VSV does utilize a specific mechanism to suppress NF-kappaB activation. Through the use of relative quantification real-time RT-PCR, I was able to effectively compare how much IFN mRNA was produced in wt and R1 infected cells compared to mock infected cells over a five hour time course. I found a dramatic increase in the amount of IFN mRNA production in R1 infected cells over a 5 hour time course, while very little IFN mRNA was produced in wt-infected cells. We next used pharmacological inhibitors to create a functional link. Addition of the NF-kappaB inhibitor Bay 11-7082 to R1 infected cells blocked the viruses ability to induce IFN mRNA production, further connecting the specific regulation of NF-kappaB to VSV's ability to suppress IFN gene expression. (Oral presentation.)

## HISTONE DEACETYLASE 1 KNOCKDOWN RESULTS IN INCREASED TGFβRII EXPRESSION IN THE FET COLON CARCINOMA CELL LINE.

Jessica Wright, 3629 Horan Road, Medina, NY 14103 and Dr. Gillian Howell.

The role of Histone Deacetylase 1 (HDAC 1) in the relatively non-progressed tumor cell line, FET, was studied using siRNA HDAC1 knockdown clones. Of particular interest was the change in sensitivity of the tumor suppressor, TGFβRII.

Previous studies have shown that HDAC inhibitors induce apoptosis, terminal differentiation, or cell cycle arrest of tumor cells. Such inhibitors have recently entered clinical trials, regardless of the fact that they do not target specific HDACs and result in an overall increase in acetylation. The role of specific HDACs might allow the design of more effective drugs with fewer side effects.

It has been previously demonstrated that TGFβRI and TGFβRII have tumor suppressing abilities. Both are involved in TGFβ signaling and the loss of either receptor can result in the loss of TGFβ responsiveness. In this study, HDAC1 knockdown clones of the FET cell line were observed to determine the role of HDAC1 in TGFβRII signaling.

HDAC1 knockdown clones were previously created by stable transfection of an HDAC1 siRNA expression vector. To demonstrate the specificity of the siRNA vector for HDAC1, Western Blot analysis of HDAC2 expression confirmed the knockdown. TGFβ responsiveness of the knockdown clones were assessed by mitogenesis, and at different concentrations of TGFβ the clones showed greater sensitivity to TGFβ as compared to the parental FET. TGFβ sensitivity was further studied by Luciferase assay using the TGFβ responsive promoter, 3TP- LUX, which was transfected into the clones and the parental line. Luciferase activity was greatest in the knockdown clones, which corresponds to increased TGFβ responsiveness. Protein levels of the clones were compared to the parental FET by Western Blot analysis, which determined that TGFβRII expression is increased at confluence and quiescence in the clones as compared to FET. CAT analysis of the HDAC1-7 clone and the FET parental line was performed and indicated higher TGFβRII promoter activity in the clone as compared to FET. This result may be due to increased acetylation at the TGFβRII promoter.

The study of this specific knockdown clone demonstrates that HDAC1 is specifically involved in regulating TGFβRII expression, and also that the level of TGFβRII is being regulated both transcriptionally and post-transcriptionally. (Poster presentation.)

## THE FATE OF THE INHIBITORY PROTEIN IκB IN VESICULAR STOMATITIS VIRUS-INFECTED CELLS.

A. Yee, M. Quinn, W. Hammond and M.C. Ferran, Rochester Institute of Technology, Department of Biological Science, 85 Lomb Memorial Drive, Rochester, NY 14263.

The induction of interferon (IFN) is one of the primary host defense responses that is triggered within virally-infected cells. The IFN response causes infected and surrounding cells to enter into an antiviral state, thereby inhibiting viral replication. In response, various viruses have evolved mechanisms that block the IFN response. The overall goal of our laboratory is to understand the mechanisms used by vesicular stomatitis virus (VSV) to regulate IFN gene expression. One event that is necessary for IFN gene expression is the activation of a host transcription factor called NF-κB. When inactive, NK-κB is found within the cytoplasm bound to its inhibitory protein IκB. Upon activation, IκB is phosphorylated and degraded, allowing for the nuclear translocation of NK-κB. Once in the nucleus NF-κB, in concert with several other host transcription factors, induces the IFN gene. The goal of this project is to better understand the mechanisms used by VSV to regulate NF-κB activation. We have compared the fate of IκB-β and IκB-α in L929 cells infected with wildtype VSV, a IFN suppressor, and recombinant VSV, which is defective in IFN suppression. We find that IκB-β and IκB-α are not degraded in VSV-infected cells. Our results therefore demonstrate that VSV is not regulating NF-κB activation at the level of IκB-β and IκB-α degradation. Experiments are currently being conducted to determine if VSV is altering another step in the pathway that leads to NF-κB activation. (Oral presentation.)

# THIRTY-THIRD ANNUAL SCIENTIFIC PAPER SESSION

## ST. JOHN FISHER COLLEGE
## ROCHESTER, N.Y.
## November 4, 2006

## LARRY J. KING MEMORIAL LECTURE

### The Hidden History of the Telescope: Little-Known Facts, Unusual Designs, and Interesting Personalities Leading Up to the Invention of the Telescope

**William Gilman**
**Senior Vice President for Technology at Quality Vision International, Inc.**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### COMPARISON OF COLLECTION METHODS FOR TERRESTRIAL ISOPODS.

Angeline Oh Abai[1], Janice K. N. Smith[1], John Waud[1], William F. Rapp[2], and F. Harvey Pough[1]; [1]Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623; and [2]87 South Main Street, Pittsford, NY 14534.

Differences in the abundance and species diversity of oniscidean isopods have been used to characterize the quality of terrestrial habitats. Studies to date have employed several different collecting methods, but the effectiveness and selectivity of the different methods has never been evaluated. We compared three commonly used methods of sampling terrestrial isopods.

—Extracting animals from leaf litter and soil by hand.

—Attracting animals with potatoes placed on the soil surface beneath the leaf litter.

—Attracting animals with moist corrugated cardboard placed on the soil surface beneath the leaf litter.

Potatoes and cardboard attracted similar numbers of isopods, and species were present in the same proportions with both methods. Sorting leaf litter produced fewer animals than the other two methods. No species were represented only in the litter sample, but this sample size is inadequate for robust comparison with the other methods. (Poster presentation.)

### BACTERIAL COMMUNICATION SIGNALS OF GRAPEVINE TUMOR ISOLATES.

T. Anderson, D. Carter, M. Savka, Rochester Institute of Technology, Department of Biological Sciences, 85 Lomb Memorial Drive, Rochester, NY 14563.

The soil bacterium *Agrobacterium vitis* is the causal agent of crown gall disease on grapevine. The tumors form along the base of the plant, frequently at sites that have experienced damage due to freezing or other injury. Crown gall disease, and its necessary treatment, can incur significant loss of productivity for vineyards by weakening vines and requiring crops to be replanted. The causal agent, a plasmid called tumor-inducing (pTi), is transferred to saprophytic *A. vitis* by conjugal transfer. This conjugal transfer process is regulated by a mechanism called quorum sensing (QS). QS is a gene regulatory mechanism that allows participating bacteria to detect cell-density along with physical confinement by producing and detecting low molecular weight signals called *N*-acyl homoserine lactones (AHLs). In order to develop more effective disease management practices, it is important to understand the significance of bacterial communication signals, AHLs, within the microbial community of the grape tumor. We employed AHL detection assays using a TraR sensor-reporter with and without thin-layer chromatography to test 135 unknown bacterial isolates taken from field grape tumors. Forty-seven isolates produced detectable levels of AHL signal; nine of the signals were identified as *Agrobacterium tumefaciens* conjugal AHL

signal, 3-oxo-C8-HSL. This study suggests that *N*-acyl homoserine lactones may play an ecological role within the microbial community of grape crown gall tumors, thereby favoring conjugal transfer of pTi in *A. vitis*. (Poster presentation.)

## PRODUCTION AND CHARACTERIZATION OF HUMAN ALPHA-A, ALPHA-B AND GAMMA-C CRYSTALLINS.

C.E. Armbruster, D. Carter, and G.M. Thurston, Departments of Biological Sciences and Physics, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The leading cause of blindness worldwide is cataract disease, which is the end result of increased scattering of light within the ocular lens. This increased scattering is due to a change in the interactions between different lens crystallins, which is reflected in the liquid-liquid phase diagrams of their concentrated mixtures. Phase diagrams of human lens crystallins have not been studied as extensively as those of the calf lens. We have produced human lens crystallins for this purpose. E. coli BLR (DE3) was transformed with plasmids containing genes for human alpha A, alpha B and gamma C crystallins. The cells were grown to log phase, then induced to produce crystalline with isopropylB-Dthiogalactopyranoside (IPTG). Cells were harvested by centrifugation, lysed and the supernatants were subjected to size exclusion chromatography to separate the crystalline from cellular proteins. The crystallins were run on an SDS PAGE gel to assay their purity. Titrations were also performed on the human crystallins in parallel with calf crystallins to help determine the surface charge on the protein. Once the individual crystallins have been fully characterized, concentrated mixtures similar to those within the lens can be produced for studies of the phase diagram and its molecular basis via light, neutron and x-ray scattering experiments. (Poster presentation.)

## DETERMINATION OF TRANS-RESVERATROL IN BLUEBERRY, CRANBERRY, AND RASPBERRY WINES.

Angela Balliano, Dr. William Lammela, Nazareth College of Rochester, 4245 East Avenue, P.O. Box 18900, Rochester, NY 14618.

Resveratrol, an antioxidant known for its health benefits, has been found in a variety of sources such as grapes, peanuts, chocolate, blueberries, cranberries, and fruit juices. Using HPLC (high-performance liquid chromatography) analysis, wines made from blueberries, raspberries, and cranberries were analyzed for the presence of trans-resveratrol. It was determined only the Tomasello Winery Blueberry Wine contained resveratrol. Wines made from both blueberries, cranberries, or raspberries and red or white grape wine were shown to contain no resveratrol. Presence of resveratrol in fruit wines may depend on the variety of berry being used. Further analysis should be performed on a greater variety of wines made from 100% fruit. (Poster presentation.)

## THE EFFECTS OF PHOSPHORYLATION VIA CGMP DEPENDENT PROTEIN KINASE ON THE MAXIK CHANNEL IN WILD TYPE AND BETA-1 KNOCK OUT ARTERIAL SMOOTH MUSCLE.

Jonathan Bates, Dr. Guillermo J. Pérez. Masonic Medical Research Laboratory, Utica, NY.

The β1 subunit of MaxiK channels is hypothesized to serve as the opening mechanism for the pore forming α-subunit. Wild type (WT) and β1 knock out (KO) arterial smooth myocytes were subjected to experimental solutions known to induce phosphorylation and consequently increase MaxiK channel activity. Analysis of electrophysiological traces from patch-clamp recordings yielded slight trends in the activation of WT and KO channels. Further studies are in progress to fully conclude the effects of phosphorylation on MaxiK channels. (Poster presentation.)

## ANATOMICAL SURVEY OF THE PRESENCE OF GLUCOCORTICOID RECEPTOR IN MONKEY BRAINS AND IN DYSBINDIN MUTANT, HETEROZYGOTE, AND WILD TYPE MICE BRAINS.

Kelly Bolton, Division of Natural Sciences, Mathematics, and Physical Education, Keuka College, Keuka Park NY, 14478.

Glucocorticoid Receptor (GR) is a steroid receptor and can be found in the cytoplasm of a cell. In the absence of cortisol this receptor is bound by chaperone proteins. As cortisol moves through the plasma membrane of the cell it will bind to the receptor and the chaperone proteins will fall off yielding a cortisol-receptor subunit. A homodimer will form and translocate to the nucleus of the cell. It will then bind to specific DNA responsive elements which will activate gene transcription. This leads to a biological response specific to that cell. Dysbidin is a gene that has been identified as a susceptibility gene for schizophrenia. Schizophrenics have an increased amount of anxiety and therefore theoretically will have higher amounts of cortisol. I have done two preliminary experiments to study the distribution of GR in the mammalian brain. First I tested whether in varying anatomical positions in the brain of monkeys there would be varying amounts of GR. Second I tested whether there was a different amount of GR in dysbindin knockout mice in comparison to the heterozygote and wild type mouse. Both experiments followed the same procedure and both used fresh frozen brain sections. For the first experiment I acquired 10 slides of various anatomical levels of monkey brains. My second experiment consisted of two wild type mice, two heterozygotes, two mutants, and one control. I blocked endogenous peroxidases with 3:1 Methanol/3% $H_2O_2$ following this 10% goat serum was added to the slides. Primary antibody was added which was made in rabbit. Then after incubating overnight a biotinylated anti-goat, secondary antibody was added. Avidin biotin complex was added to amplify the bonding of the secondary antibody and then 3,3 diaminobenzadine was added to create a peroxide reaction thus staining the positive areas of the slide brown. In both cases my results were not what I expected. My first experiment showed darker staining in the white matter however when looking under a microscope these areas appeared to be non-cytoplasmic staining and therefore a negative response. The grey matter of some slides showed cytoplasmic staining which indicates the presence of GR. I do not know why some slides showed grey matter staining and some did not. The contrast in the staining between the white matter and the grey matter was similar in all anatomical levels of the brain. Because both white matter and grey matter stained this may suggest that both neurons and glia may be directly responsive to stress hormone. With the second experiment results yielded that each genotype showed equal amounts of GR in the cell cytoplasm. The most concentrated areas were the dentate gyrus. A colleague found there were varying amount of GR In both of these cases I plan to replicate this experiment to ensure my results are correct. (Poster presentation.)

## WHY USE RED LIGHT AT NIGHT.

Frank Bov, 16 Gladbrook Rd., Pittsford, NY.

The human visual system responds to an extraordinarily wide range of light intensity. In this literature review, key aspects of the eye's light and dark adaptation characteristics are discussed. Drivers of human visual sensitivity result from the eye's physiology as much as its chemistry, and an integrated model explains why red light is universally used by those, such as amateur astronomers, who must read in the dark. (Oral presentation.)

## GLEEVEC® INHIBITS ICC DEVELOPMENT IN THE ZEBRAFISH.

Chris R. Brown, Gianrico Farrugia*, and Adam Rich; * Mayo Foundation, Rochester MN; and Department of Biological Sciences, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

Gastrointestinal motility is an essential part of vertebrate physiology. GI motility is the rhythmic and coordinated contractions of smooth muscle, resulting in the aboral propulsion of chyme through the digestive system. Motility is controlled by complex interactions between smooth muscle, enteric neurons and interstitial cells of Cajal (ICC). Treatment for GI motility disorders is lacking and therefore new model systems are desirable to better understand the regulatory control mechanisms. The zebrafish is an important *in-vivo* model system for the study of human disease, but the mechanisms controlling zebrafish GI motility have not been characterized. The primary advantage of zebrafish for GI physiology is that motility can be observed directly in the intact organism. Previous work in this lab has identified ICC in the adult zebrafish GI tract. It is known that ICC development is required for the development of functional, coordinated GI motility that contribute to propulsion. We tested the

hypothesis that ICC development is required for coordinated GI motility in the zebrafish. A pharmacological approach was utilized to block ICC development. Time lapse imaging of live larvae at various days post fertilization (dpf) was used to quantify GI motility. Specifically, the average velocity and the average length of a single contraction was measured, as well as the number of full propagated contractions per 300 second interval. The KIT receptor tyrosine kinase is required for ICC development. Gleevec® (imatinib mesylat), a specific KIT inhibitor, was used to block KIT function, and thereby prevent ICC development. GI motility in Gleevec® treated larvae was used to determine the role of ICC on the development of coordinated contractions. Contractions in 7 dpf larvae were variable and few of fully propagated contractions were observed. Contractions in 14 dpf were consistent and all were fully propagated. Gleevec® treated 14dpf larvae had few contractions which were variable and did not fully propagate. Quantification of GI motility variables is given in Table 1.

| Table 1 | 7dpf | | 14dpf | | 14dpf (Gleevec®) | |
|---|---|---|---|---|---|---|
| | Total | Average | Total | Average | Total | Average |
| Total # contractions | 17 | 5.67 ± 0.58 | 17 | 5.67 ± 0.58 | 7 | 2.3 ± 0.58 |
| Fully Propagated | 11 | 3.67 ± 0.58 | 17 | 5.67 ± 0.58 | 2 | 0.66 ± 0.58 |
| Velocity (μm / sec) | 14.3 ± 0.6 | | 20.3 ± 2.3 | | 10.2 ± 3.1 | |
| Distance (μm) | 512.6 ± 54.8 | | 663.0 ± 24.9 | | 399.8 ± 67.2 | |

These results show that coordinated GI motility develops between 7 and 14 dpf in zebrafish larvae, and Gleevec® inhibits this process. These data are consistent with the hypothesis that ICC are required for coordinated propagating GI contractions in the zebrafish. (Poster presentation.)

## DEVELOPMENT OF A NEW GASTROINTESTINAL MOTILITY ASSAY USING ZEBRAFISH.

P. Burke, M. P. Heitz, and A. Rich, Department of Biological Sciences, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

Gastrointestinal (GI) motility disorders such as constipation and dyspepsia are common, but current treatment options are largely ineffective. New model systems are needed to facilitate the understanding of the regulatory processes involved in GI motility. Zebrafish larvae are optically transparent, and GI contraction frequency has been used to quantify motility. GI motility functions to mix and propel luminal contents. However, counting contraction frequency does not distinguish between mixing and propulsive motility. Therefore, the specific aim of this work is to develop a propulsive motility assay.

Zebrafish larvae were fed fluorescent microspheres and the total fluorescence emission was measured at specific time points. We hypothesized that total fluorescence emission will decrease with time resulting from propulsive motility. Specific objectives for this project were to determine background fluorescence of zebrafish larvae, select an appropriate fluorophore, determine the extent of variability GI propulsive motility between larvae, to determine if propulsive motility develops with age.

The peak emission wavelength of the background fluorescence in larvae was found to be 320–330 nm. Rhodamine B was selected as a fluorophore based on peak emission wavelength (585 nm) and high quantum yield. Larvae were loaded with rhodamine B-labeled micro-spheres, washed, and the total fluorescence emission was measured. Total emission intensity decreased by 50% between 7 and 8 dpf larvae, indicating elimination of half of the luminal contents, compared to a decrease n 15% between 11 dpf and 12 dpf larvae. These data show a reduction in fluorescence emission that is consistent with propulsive motility. However, it was unexpected that older larvae would show less propulsive motility. Experiments on single larvae showed high variability (~25%) suggesting differences in microsphere loading, or propulsive motility between individual larvae. More experiments are necessary to determine if total fluorescence intensity of ingested fluorescent microspheres can be used to accurately quantify GI propulsive motility. (Poster presentation.)

## PHYLOGENETIC ANALYSIS OF THE FAMILY GESNERIACEAE USING A DUPLICATED NUCLEAR GENE.

Sarah E. Caro, Michael J. Greene, and Michael A. Kotarski, Academic Center for Integrated Sciences, Department of Biology, Niagara University, NY 14109.

The DNA sequence of low copy number nuclear genes can be used to construct phylogenetic relationships of species that are otherwise difficult to place. Chalcone synthase (CHS) is the first enzyme in the flavonoid biosynthetic pathway in green plants and is encoded by a small gene family in nearly all species studied. Two copies are present in the Gesneriaceae *(CHSI* and *CHSII)* presumably caused by a gene duplication and subsequent divergence. There are several genera within Gesneriaceae for which assigning a tribal or subfamily relationship is difficult using morphological data or high copy number gene sequence data. Primers specific for a 757 base pair sequence of *CHS* exon 2 were designed and a high fidelity polymerase was used to generate amplified fragments that were sequenced. Sequence data were used to produce a tree that clarifies the placement of rogue species into either the old world or the new world subfamily. (Oral presentation.)

## PALLADIUM-CATALYZED REACTIONS OF ARYL CHLORIDES: THE NATURE OF THE CATALYST AND EXTENSION TO "GREEN SOLVENTS".

Cory J. Charbonneau and Margaret E. Logan, Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420

Palladium-catalyzed reactions of aryl chlorides include carbon-carbon, carbon-nitrogen, and carbon-oxygen bond forming reactions, as well as hydrodehalogenation. The work that will be described explores several aspects of the amination and hydrodehalogenation reactions of aryl chlorides using palladium catalysts with biphenyl ligands (developed by the Buchwald group). In hydrodehalogenation reactions, the chlorine substituent is replaced with a hydrogen, while in the amination reaction, the chlorine is replaced with an amine. First, studies of both reactions were done to determine whether the active catalyst is homogeneous, or instead exists as nanoparticles. An understanding of the mechanism could be used for applications of the chemistry to, for example, PCB remediation. A second area of study is the use of ionic liquids as the solvent for these reactions, replacing organic solvents that produce waste that is harmful to the environment. Our results in both of these areas will be described. (Oral presentation.)

## IDENTIFICATION OF PLASMIDS IN ANTIBIOTIC RESISTANT BACTERIA FROM WILD SPOTTED TURTLES, *CLEMMYS GUTTATA*.

Shu Shien Chin, Ching Wooen Sze, Tze Feng Yong, Harvey Pough, and Michael Savka, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Bacterial isolates from wild spotted turtles (*Clemmys guttata*) were collected, purified and putatively identified by undergraduates during the summer of 2005. Further analysis have identified isolates that exhibit antibiotic resistance to well known antibiotics (such as Ampicillin, Tetracycline, Cefaclor, and Sulfamethoxazole).

We seek to determine 1) if genetic mobile elements such as plasmids carry antibiotic resistance traits in our wild turtle bacteria, and 2) if antibiotic resistant genes in wild turtle bacteria are similar (homologous in DNA sequence) to known antibiotic resistance genes in bacteria from humans. (Poster presentation.)

## PHOSPHOLIPASE A2 INHIBITORS ALTER THE LOCALIZATION OF NPC1, BUT DO NOT DISRUPT CHOLESTEROL TRAFFIC IN THE LATE ENDOSOMAL PATHWAY.

Stephanie Cianchetti and Edward B. Cluett, 157 Center for Natural Sciences, Ithaca College, 953 Danby Road, Ithaca, NY 14850.

Niemann Pick C (NPC) disease is a neurological disorder in which cholesterol accumulates in late endosomal/lysosomal compartments. Most cases result from mutations in NPC1, an ABC transporter that contains a sterol-sensing domain. However, the molecular basis of the disease is not fully known. In normal cells, NPC1 has been found in membrane tubules, but in affected cells, the protein is found in the late endosomes and lysosomes. We found that phospholipase A2 inhibitors (PLAIs), which prevent the formation of membrane tubules in the Golgi complex and endosomes, disrupt the trafficking of free cholesterol in mammalian cells and alter the localization of

several proteins involved in endocytic transport. Although, these drugs disrupt the tubular localization of NPC1, PLAIs affect the early, but not the late endosomal pathway. We are currently investigating the relationship between these two pathways, and present results suggesting that NPC disease may involve a more general defect in membrane trafficking. (Poster presentation.)

## THE PITTSFORD MEMBER OF THE LOWER VERNON FORMATION REVISITED: THE TASTINGS SITE (NEW) PITTSFORD, NY.

Samuel J. Ciurca, Jr., Curatorial Affiliate, Peabody Museum of Natural History, 2457 Culver Road, Rochester, NY 14609.

During July 2006,Wegmans began excavation near their Tastings Restaurant for expansion of their parking lot and encountered, again, parts of the lower Vernon Formation (Salina Group) including the eurypterid-bearing Pittsford Member (black shale, mudstone and dolostone). This is a continuation of studies reported previously in the Rochester Academy of Science Abstracts and elsewhere.

Most of the lithologies recognized at the Spring House Commons Site were observed in the material examined from the Tastings Site. These include the red shale/mudstone and waterlimes that overlie the Pittsford member and the Blue Stone that underlies the unit. Within the Pittsford Member, all units were recognized including the very resistant intercalated waterlimes, the Chunky Bed and particularly the Slate Bed.

Abundant fossil remains were retrieved from most of the units previously observed at the SHCS. Several species were recovered and continue to emphasize the importance of this unit as a unique repository, locally, of the remains of prehistoric arthropods that dominated the region over 400 million years ago. A large research collection of fossils from previous excavations is now part of the eurypterid collections of the Yale Peabody Museum of Natural History in New Haven, Connecticut.

The Tastings Site provides the first example of a nearly complete pterygotid—a type of eurypterid known to reach upwards of 10 feet in length. The two 'common' eurypterids within the lower Vernon Formation (*Hughmilleria socialis* and *Eurypterus pittsfordensis*) are represented by numerous isolated specimens of carapaces, tergites, coxae, telsons and other parts. Many examples of nearly entire individuals of *H. socialis* were retrieved.

The bizarre *Mixopeterus* is rare in the fauna and only a partial carapace, a curved telson and spiny leg were observed. This genus is best known from the rocks of Norway.

Even though most of the Pittsford Member consists of fine-grained sediments, there is much evidence of a high-energy regime. Scouring is much in evidence, lenticular waterlimes are present, and the thin units indicate swift changes in sedimentation during what must have been a relatively short period of time. The Pittsford Member starts with a thin waterlime (Clam Bed) that may be a channel into lower deposits and is succeeded by a hypersaline black shale (Slate Bed) with eurypterids.

Samples of various structures and lithologies were recovered and will be examined at a later date along with other fossil remains encountered: clams, ostracods, *Lingula* sp., and small horseshoe crabs. (Poster presentation.)

## HORTENSE POWDERMAKER; OBSERVER OF CONTEMPORARY CULTURE.

Martha Cleveland, Julia Gutowski, and Sarah Nachtrieb, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

This poster will include a brief biography of the anthropologist Hortense Powdermaker's life and work. It will include background information as well as a description of her fieldwork, books she authored, awards she received and achievements she had. (Poster presentation.)

## THE IONIC LIQUID TRIHEXYL (TETRADECYL) PHOSPHONIUM CHLORIDE INHIBITS LABORATORY-GROWN FRESHWATER BIOFILMS.

Sandra J. Climenhaga[1], Markus Hoffmann[2], and Tracey C. Householder[1]; [1]Department of Biological Sciences, and [2]Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Ionic liquids are alternative solvents that are considered green chemicals, but their toxicity in the environment has not been fully determined. We evaluated the toxicity of trihexyl (tetradecyl) phosphonium chloride on the most basic community of microorganisms, the biofilm, as a function of ionic liquid concentration. Batch biofilm reactors

were filled with locally-acquired freshwater, and the biofilms were grown on suspended glass slides. (Poster presentation.)

## SERUM RESPONSE FACTOR EXPRESSION IN THE ZEBRAFISH.

Jody Davis, Xiaochun Long*, Mary Georger*, Adam Rich, and Joseph Miano*; SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420; and *The Cardiovascular Institute of Research, University of Rochester School of Medicine, Rochester, NY 14624.

Serum response factor (SRF) is a transcription factor that influences the growth and differentiation of skeletal, cardiac, and smooth muscle cells. Transcription factors regulate gene expression. SRF has been defined in *Danio rerio* (zebrafish) and expression was reported to be restricted to skeletal muscle. However, it is possible that the known SRF ortholog is also expressed in cardiac and smooth muscle similar to the mouse. The zebrafish genome often contains duplicated mammalian genes, and therefore it is also possible that a second zebrafish SRF ortholog is expressed in cardiac and smooth muscle. Experiments were performed to specifically test for SRF expression in zebrafish cardiac muscle and smooth muscle using immunohistochemical techniques. Using bioinformatic techniques a second SRF gene (SRF2) was identified. Polymerase chain reaction was used to amplify the predicted sequence for the SRF2 gene from cDNA prepared from zebrafish tissues. SRF1 expression at the protein level was observed in adult zebrafish cardiac, gastrointestinal, and vascular tissues. These results are consistent with the hypothesis that SRF influences growth and differentiation in cardiac and smooth muscles, and identifies a second SRF gene that could act to compensate for any loss in SRF1. In-situ hybridization experiments are necessary to determine tissue expression patterns for each SRF gene as a step towards understanding their function in this teleost. (Poster presentation.)

## RIVER OTTER, *LONTRA CANADENSIS*, DISTRIBUTION PATTERNS WITHIN MONROE COUNTY, NEW YORK.

Darren Doherty and Dr. Lei Lani Stelle, 37 Hartwood Drive, Rochester, NY.

River Otters, *Lontra Canadensis,* were reintroduced in Western New York after being extirpated in the early 1900's. The focus of my thesis will be to determine whether human disturbance and land use is impacting otter habitat selection. The goal of this project is to understand what environmental variables influence habitat selection of River Otters, within Monroe County, NY. The research area includes three tributaries of the Genesee River: Black, Honeoye, and Oatka Creeks. We survey for latrine sites and use a handheld Geographical Positioning System(GPS) unit to record the location of these sites. Based on identified toilet sites, I have collected samples of water chemistry at 30 sites and macroinvertebrates at 9 sites as an index of water quality throughout the three creeks. I will use Geographical Information Systems (GIS) to incorporate land use and determine if there are any relationships between water quality and habitat preference. This will provide a better understanding of river otter habitat preference and the impacts of human disturbance on habitat selection. (Poster presentation.)

## CONFOCAL IMAGING OF THE REGRESSION OF THE RAT HYALOID VASCULATURE.

Margret Donahue, Beth-ann Ollivierre and Irene Evans, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Regression of the hyaloid/fetal vessel system of the eye occurs before birth in humans and after birth in rats. Some possible mechanisms for blood vessel regression have been studied and linked to changes in growth factors and changes in blood flow. Blood vessel regression was studied in the newborn rat using confocal microscopy. The hyaloid vasculature, composed of the hyaloid artery (HA), *vasa hyaloidia propia (VHP)*, *tunica vasculosa lentis* (TVL), and pupillary membrane (PM) nourishes the immature lens and is present at birth along with the choroid and iris vasculatures. The retinal vasculature forms after birth even as the hyaloid vasculature is regressing and competition for blood flow between these two vascular systems may be one of the triggers for hyaloid regression. Lack of hyaloid regression can lead to hyaloid persistence which can cause partial blindness. In order to investigate developmental vascular regression, the hyaloid, retinal, iris, and choroidal vessels were imaged and their remodeling documented. The regression of the eye hyaloid vasculature and the development of the retinal vasculature were observed in the newborn rat from postpartum days 1-36 by intracardiac injection of FITC-dextran followed by scanning laser confocal microscopy and image reconstruction. The order of hyaloid vessel regression was loss of the

pupillary membrane (beginning on day 8 and completed on day 14) followed by loss of the *tunica vasculosa lentis* (day 18-26) followed later by the *vasa hyaloidia propria* (day 28-36), and hyaloid artery (36-40). Retinal vasculature could be visualized in the first week after birth and its formation correlated with the disappearance of the hyaloid system. As the retinal vessels form, the intricate structures of the hyaloid system begin to dismantle, beginning with the pupillary membrane. The scanning laser confocal microscopy imaging technique provides a view of the complexities of the hyaloid vasculature and the temporal and spatial relationships of its various parts as well as the relationships between the hyaloid, retinal, choroidal, and iris vascular systems. Depletion of blood flow to the hyaloid vessel system due to increasing diversion of flow to the developing retinal vasculature as well as the iris and choroid may induce apoptosis in the endothelial and pericyte cells. This may eventually block blood flow and hasten regression of the hyaloid fetal vasculature. (Poster presentation.)

## A HUMAN MAXILLA TROPHY FROM OAXACA, MEXICO.

William N. Duncan[1], Christina Elson[2], Charles Spencer[2], and Elsa Redmond[2]; [1]Department of Anthropology, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618; and [2]Division of Anthropology, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024.

A left human maxilla was found in a surface collection adjacent to a looted tomb from the Preformative (2500 B.C.–A.D. 200) Los Mogotes site in Oaxaca, Mexico. The maxillas as cut anterior-posteriorly approximately at the plane of the inferior border of the nasal aperture. This treatment is identical to the human maxillae found in necklaces worn by sacrificed victims at the site of Teotihuacan in central Mexico, but it is the first such trophy made from human remains from Oaxaca. In this paper we describe the maxilla and its manufacture, and discuss the meaning of taking human maxillae and mandibles as trophies in Mesoamerica. Specifically we argue that such trophy taking was a way of appropriating the animating essences (soul-stuff) of enemies. (Oral presentation.)

## PICK ME! A STUDY OF BEGGING BEHAVIOR AND SIBLING RIVALRY IN THE HOUSE WREN (*TROGLODYTES AEDON*).

K. Fedors, S. Kassmann, A. Kuntz and K. Hannam, Department of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

Begging in nestlings is a form of competition between siblings over food allocated by the parents. House Wren nestlings (*Troglodytes aedon*) compete with one another by using vocal and non-vocal signals. We are interested in non-vocal aspects of begging, such as nest position and posture that may influence who is fed. These actions may be used by the parent in order to determine who is hungriest and should be fed. Obtaining a greater portion of food resources from the parent would cause the nestling to have greater fitness. During the summers of 2005 and 2006, audio and video recordings were taken of the nestlings at various stages of development: early, middle and late. Video recordings were each one hour long and were captured on the nest as a whole. Nestling data was gathered from 3 locations around Geneseo, NY and one location in Avon, NY. The data collected will help to interpret which signals most strongly influence the outcome of competition among nestlings in a brood. We'll present the results from 37 video recordings from 2005 and from 25 of the recordings from 2006. Preliminary results from 2005 showed that the nestlings position relative to the parent, intensity of begging, and whether or not they were first to beg all significantly influenced the probability of being fed. (Poster presentation.)

## THE EFFECTS OF INVASIVE BLACK LOCUST ON NORTHERN HARDWOOD FOREST DYNAMICS.

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Black locust (*Robinia psuedoacacia* L.) is not native to New England, but has been introduced into the region for ornamental and soil enrichment purposes. An adult black locust tree has been noted in a permanent long-term study plot at Bartlett Experimental Forest (Bartlett, NH). The species is considered an invasive species in the northeastern United States. National Park Service Alien Plant Working Group considers black locust a "significant ecological threat" due to its ability to invade native ecosystems (including upland forests) and out-compete native

flora. The species is typically found in full sun in disturbed areas on sandy/loamy soils rather than in mature forests, so the noted successful establishment is particularly unexpected and worrisome. Additionally, symbiotic bacteria living in root nodules fix nitrogen in this species, potentially leading to impacts on the biogeochemical cycling of the forest stand. Our goals in this study were: 1) to assess the current population dynamics of black locust; 2) to assess the rate of spread of the invasion by black locust in a northern hardwood stand; 3) to compare forest floor nutrient concentrations (*e.g.* N, Ca, Mg) between areas with and without black locust; and 4) to investigate the effect of the addition of black locust leaf litter on decomposition rates. Preliminary findings indicate that the adult individual is reproducing (>50 seedlings and saplings) both vegetatively and by seed, and that the sprouts extend more than 30m beyond the adult. (Poster presentation.)

## MUTATIONS IN DYSBINDIN-1 (DTNBP1) MAY INITIATE DECREASED LEVELS OF GLIAL FIBRILLARY ACIDIC PROTEIN (GFAP) IN THE HIPPOCAMPUS OF SDY MUTANT MICE.

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Schizophrenia is a severe neurological disorder characterized by a combination of specific anatomical and molecular abnormalities occurring predominately within the prefrontal cortex and hippocampus of affected individuals. Recent studies have demonstrated attenuations in mRNA and protein expression for both susceptibility gene dysbindin-1 (DNTBP1) and glial fibrillary acidic protein (GFAP) in the brain regions implicated in cases of schizophrenia. In this study, the effects of mutations in dysbindin-1 on GFAP expression levels in the hippocampus were tested in SDY mice, which possess a mutation in the dysbindin-1 gene. Frozen coronal sections of six juvenile females (two normal, two heterozygous, and two knock-out) were fixed, blocked in 3:1 methanol/3% hydrogen peroxide, 10% goat serum, and subsequently treated with 1° rabbit anti-GFAP and biotinylated 2° goat anti-rabbit antibodies. Addition of avidin-biotin peroxidase and diaminobenzidine tetrahydrochloride provided successful immunolabelling of GFAP. Blind to SDY mice genotypes, hippocampi were evaluated under a light microscope and scored on a scale of 1 to 3 for GFAP stain intensity (a score of 3 denoting the strongest immunolabel). A Mann-Whitney U test of mean scores showed significantly lower GFAP stain intensities in hippocampi of knock-out mice ($z = 1.62$, $p = 0.05$) in comparison to their normal and heterozygous counterparts. The difference in GFAP stain intensity suggests an abnormality in the GFAP-containing glia exists when the dysbindin-1 gene is disrupted. This research demonstrates that mutations in dysbindin-1 may initiate the down-regulation of GFAP levels in the glial cells that comprise the hippocampus and provides insight to the role of dysbindin-1 in the neuropathology of the disorder. (Poster presentation.)

## POLYMERIZATION OF POLAR MONOMERS AND OF POLYETHYLENE IN WATER USING SINGLE-SITE CATALYSTS.

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Polymerizations with single-site catalysts are of great importance because of high polymerization activities, excellent control of polymer synthesis and the resulting polymer properties. A drawback of typical metallocene catalysts, which are currently applied industrially for the synthesis of the major commodity polyolefins, is that they are unstable in the presence of polar compounds. Therefore, there is a great interest in finding single-site catalysts that would be able to polymerize polar monomers to such polymers as poly(vinylchloride) or (polymethyl methacrylate). Furthermore, these new types of single-site catalysts have potential to let the polymerization occur in water as solvent, which would be environmentally friendly in comparison to the currently used organic solvents. We will present results we have obtained so far on the polymerization activities and comonomer incorporation of ethylene with methyl acrylate using 2,6-diacetylpyridine (2,4,6-trimethylanil) iron (II) chloride with methylaluminoxane. Additionally, we will report on comparisons with two further polymerization catalysts. The second catalyst represents a modified metallocene catalyst with tris(pentafluorenyl) borane as cocatalyst. The third catalyst we applied is based on a chelated nickel enolate complex not requiring a cocatalyst. Only the nickel based catalyst can be utilized in water, and when performing aqueous emulsion polymerizations, we were able to successfully produce polyethylene of relatively low molecular weight. Results of the characterizations of the polymers using Fourier Transform Infrared Spectroscopy (FTIR), Proton Nuclear Magnetic Resonance Spectroscopy (H-NMR), Differential Scanning Calorimetry (DSC), and Thermal Gravimetric Analysis (TGA) will

be also presented. In the coming year, we are planning to prepare further late transition metal catalysts, which can polymerize other polar monomers than those used for the production of existing commodity polymers. We also would like to use catalyst systems that enable us to obtain more desirable polymer properties, such as higher molecular weights in the range of 50,000 to 100,000 g/mol. (Oral presentation.)

## REGIOSPECIFIC SYNTHESIS OF 1-METHYL-4-VINYLIMIDAZOLE.

Brett Granger, Dr. Christina Collison, and Dr. Thomas W. Smith, Chemistry Department, Rochester Institute of Technology, Rochester, NY 14623.

1-methyl-4-vinylimidazole is a 5-membered aromatic compound which is being synthesized as a precursor to 1,3-dialkyl-4- and -5-vinylimidazolium salts. These salts are room temperature ionic liquids, or RTILs, which can be polymerized. Polymerizable RTILs are of interest because of their possible use as transducers (i.e. artificial muscles), and in membranes in electrochemical devices and fuel cells. An efficient synthesis of the monomer is essential in order to carry out the rest of the project. In 2002, Lovely and coworkers published a procedure for the regiospecific synthesis of 1-methyl-4-vinylimidazole. In this research Lovely's general procedure has been repeated and is being adapted to optimize reaction conditions, isolation, and purification procedures. The final results of this synthesis will be presented and described. (Poster presentation.)

## AN IMPLICATION OF CONFORMATIONAL CHANGE IN AMYLOID BETA/OVALBUMIN PROTEINS CONJUGATED ON THE SURFACE OF GOLD COLLOIDAL NANOPARTICLES.

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The kinetic properties of proteins, amyloid beta 1-40 and ovalbumin, adhered to the surface of gold colloidal nanoparticles (size 20 nm) was investigated. We utilized the absorption spectroscopy to monitor the surface plasmon resonance (SPR) of the gold colloidal nanoparticles at different pHs. In both protein solutions, the color of the solution exhibits either a red or blue color at pH 4 and 10, respectively. While the gold colloidal nanoparticles with adhered albumin exhibited a color change at slightly higher pH values than those observed in amyloid beta, a color change of protein conjugated gold colloid nanoparticles took place approximately one pH unit higher than that of bare gold colloid nanoparticles. The color change at the lower pH (blue color) was considered due to the aggregation of the gold colloidal particles through unfolded proteins on the surface of the metal colloid. (Poster presentation.)

## A COMPARATIVE ANALYSIS OF INTERFERON INDUCING AND SUPPRESSING STRAINS OF VSV: SEARCHING FOR THE VIRAL COMPONENT(S) RESPONSIBLE FOR INTERFERON SUPPRESSION.

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Vesicular Stomatitis Virus (VSV) is a member of the family Rhabdoviridae that primarily targets cattle, although it can infect a very wide array of hosts. VSV contains a negative sense RNA genome that encodes five major proteins: the nucleocapsid protein (N), the phosphoprotein (P), the matrix protein (M), the glycoprotein (G), and the large protein (L), which acts as a viral polymerase. The relatively simple composition of the virus makes VSV an ideal model system for the study of viral-host interactions. With these five proteins, VSV must perform all of its necessary functions, such as replication and the inhibition of host transcription, translation and cellular defenses. The method via which VSV evades one of the primary cellular viral defenses, the Interferon (IFN) response is being investigated. Interferons are a family of proteins, many of which have antiviral properties or act as transcription factors for viral-inhibiting genes. IFN is also secreted from cells, eliciting a similar response in surrounding cells. We are trying to identify the specific viral proteins(s) responsible for the suppression of IFN in infected mouse L929 cells. In order to accomplish this goal, the genomes of two closely related strains of VSV, an IFN suppressor and an IFN inducer are being sequenced and compared. It is likely that the viral components necessary for inhibiting host IFN's is mutated in some way in the IFN inducing strain of VSV. The entire genomes have not been sequenced yet, but preliminary data appears promising. A mutation has been identified in amino acid 52 of the M protein, a protein which had previously been tied to interferon suppression. This mutation is located in a region that is suspected to contain at least one nuclear localization signal and mutations have been identified in this

general region in other viruses that fail to suppress interferon, including the strain T1026R1 which is also studied in our lab. In order to confirm experimentally which viral components are necessary for IFN suppression, the individual genes of various strains of VSV are being cloned into a GFP containing expression vector so that they can be transfected into L929 cells. IFN mRNA production and activation of several transcription factors that are essential for IFN gene induction will be measured in cells expressing various combinations of the VSV genes. (Oral presentation.)

## NAGD UMPASE FROM *ESCHERICHIA COLI* AND VIRULENCE FACTOR "NAGD" PHOSPHOGLYCOLATE PHOSPHATASE FROM *STAPHYLOCOCCUS AUREUS*, TWO DISTINCT MEMBERS OF THE NITROPHENYL PHOSPHATASE FAMILY OF THE HAD SUPERFAMILY.

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NAGD from *E. coli* is a novel UMPase of the Haloacid Dehalogenase (HAD) superfamily. The HAD superfamily is a ubiquitous superfamily with a wide variety of hydrolases especially phosphatases. NAGD is the first UMPase of the HAD superfamily, and may be involved in cell surface lipopolysaccharide (LPS) and cell wall biosynthesis through hydrolysis of UMP, which is an intermediate of both pathways. There are homologs of NAGD in a number of pathogens including *Salmonella* and *Yersinia pestis*, thus making NAGD a potentially useful antibiotic target.

*Staphylococcus aureus* is a major cause of hospital acquired infection. One of the main problems of *S. aureus* infection is that of multi-drug resistance, thus finding new drug targets is vital. A new virulence factor from *S. aureus* was recently described as a homolog of NAGD UMPase from *E. coli*. We wanted to determine if this virulence factor was in fact an ortholog of NAGD or rather a new member of the nitrophenyl phosphatase family of the haloacid dehalogenase superfamily. We cloned the gene, expressed and purified the protein, and determined its activity. This virulence factor is not an ortholog of NAGD, but rather a phosphoglycolate phosphatase. Recently, a phosphoglycolate phosphatase from *E. coli* has been implicated with a role in DNA repair. If the *S. aureus* phosphoglycolate phosphatase is involved in both DNA repair and virulence, this would be a novel type of virulence factor, and a potential novel antibiotic target.

This research is currently supported by an NIH AREA grant. (Poster presentation.)

## TUBULINS IN *C. ELEGANS* SENSORY CILIA.

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Undergraduate research is increasingly recognized as an important and effective means to prepare students for careers in biomedicine. With the goal of immersing students into the process of biomedical investigation, I have developed an inquiry-based series of laboratories for an upper level cell biology course that exploit the tractability of *Caenorhabditis elegans*. Two major strengths of the nematode *C. elegans* as a model system are its anatomic/genetic simplicity and technical amenability. As an example, RNA-mediated gene interference (RNAi), which can be accomplished through common molecular cloning and microbiological culturing methods, allows undergraduates to reduce protein expression in an intact organism and observe abnormal phenotypes. During the first half of the semester, each student defines a set of genes of cell biological interest and uses RNAi to inhibit expression in larval and adult nematodes. Data from these experiments are collected into a database. During the second half of the semester, each selects one gene that they found particularly interesting and designs a strategy for molecular subcloning. Background information, preliminary RNAi results, a rationale for choosing a particular gene, and future experiments are presented in the first major assessment, a written grant proposal. Finally, students expand upon their initial research using bioinformatic tools and present a PowerPoint about the biological function of their worm gene (or published data about an orthologue of their gene). These two major assessments are augmented by worksheets focused on common cell biological protocols, laboratory notebooks and a concept map. Examples of novel phenotypes and work produced by students will be presented along with evaluation criteria. I am currently

investigating the effectiveness of this approach for teaching concepts in cell biology and for inspiring students to pursue careers in research. (Oral presentation.)

## TERRESTRIAL ISOPOD HABITAT RELATIONSHIPS IN AN URBAN FOREST AND COMPARISON OF SAMPLING METHODS.

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Terrestrial isopod crustaceans (Oniscoidea), have been used as bioindicator species because of their responses to general aspects of habitat quality and to specific pollutants such as heavy metals and organic compounds. Studies of this sort, and comparisons of different studies, have made little or no distinction among the various methods that have been used to sample the isopods.

We evaluated four commonly used isopod sampling methods and determined the most important environmental gradients associated with local isopod communities. During 7-day periods between 11 and 22 September 2006, we sampled isopods on 11 plots in a hardwood forest on the Rochester Institute of Technology campus. Each circular 3-m radius plot had four sub-plots equidistant along its perimeter in the cardinal directions and randomly assigned to one of four sample methods: leaf litter collection, corrugated cardboard cover boards, drop cans, and potato baits. We recorded a total of 28 habitat variables at each plot and captured a total of 372 individuals of 14 species of isopods.

We compared the species composition, species richness, and species diversity of isopods for each of the four sampling methods and found that the potato bait method yielded the greatest number of individuals captured, the highest species richness, and greatest species diversity. The leaf litter samples had the lowest species richness, and the lowest species diversity.

Canonical correspondence analysis determined that average plot canopy cover, percent moss groundcover, percent oak leaf litter, and shrub stem count best explained the occurrence of isopod species on the RIT campus. We believe this analysis shows an environmental gradient from slightly more elevated and drier sites that are dominated by American beech to low-lying damp, more open sites and a secondary gradient from oak and maple dominated forest to shrub-dominated sites with a greater percent bare ground. (Poster presentation.)

## IMMUNOLOGICAL HEALTH AND BODY CONDITION IN MIGRANT BIRDS.

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Because of their long distance travels, and the multiple habitats they encounter along the way, migratory birds are exposed to a broad range of parasites, pathogens, and disease. The immune system is the primary means of defense against pathogenic microorganisms and the energetic stress of migration may affect a bird's ability to defend against pathogens. Migratory birds may exhibit signs of immunosupression and/or immune system stress due to the stress of migration as well as poor body condition. In 2002, we took blood samples from about 60 birds at the Braddock Bay Bird Observatory during fall migration. Additional blood samples take from the same bird species (Grey Catbirds, Hermit Thrushes, Grey Cheeked Thrushes, Swainson's Thrush and Wood Thrush) were collected during fall migration in 2006. We will report our analyses of the relationship between measures of energetic condition and immunological condition. Immunological health was measure through differential white blood cell counts and the heterophil: lymphocyte ration from blood samples. Energetic condition was determined through the use a 0-5 fat score (less fat indicated by 0 score, more fat by 5), and a size-corrected body condition index. Low fat scores were prevalent, low levels of white blood cells were evident in the blood samples, and high heterophil: lymphocyte rations were also present. Our results suggest that migratory birds may be in poor immunological health and body condition. (Poster presentation.)

## THE REQUIREMENT OF PAR-1 FOR MALE TAIL DEVELOPMENT.

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The *C. elegans* male tail consists of nine pairs of sensory structures called rays that originate from blast cells of the lateral hypodermis. Ray development happens near the end of the L4 larval stage when these blast cells proliferate and give rise to three cell types: neurons, neuronal structural cells and hypodermal cells. Coordinated with the development of the ray neuronal lineages, the fan of the male tail is formed as a result of the anterior retraction of hypodermal cells present more posterior in the tail. Studies show that multiple developmental and cell biological processes take place during tail development including cell fate specification and regulation of cell to cell contact and signaling. The *C. elegans* gene *par-1* encodes a serine-threonine kinase that is associated with a variety of essential roles in metazoan development. Such roles include the establishment of cell polarity, cytoskeleton function and regulation of signaling. Given that PAR-1 is expressed in hypodermal cells, we asked whether it may play a role in the development of the male tail. To address this question, RNA-mediated gene interference was used to eliminate the PAR-1 protein. We specifically used bacterial-feeding RNAi during post-embryonic development and observed tails in both wild-type and *par-1*(RNAi) L4 to adult males. Defects in both the hermaphrodite vulva (a tissue known to require PAR-1) and the male tail were observed in the *par-1*(RNAi) worms. These defects included both missing and fused rays, most severely affecting rays 4, 5 and 6. These data show that PAR-1 is required for normal development of the male tail and suggest future experiments that might reveal its specific role. (Poster presentation.)

## THE IMPACT OF IMPERVIOUS SURFACES IN THREE WATERSHED CATCHMENTS.

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The primary goal of this project is to perform a comparative measure of the effectiveness of greenspaces on the stream ecology they are designed to protect. The town of Pittsford has identified a number of greenspace preserves designed to buffer the impact of housing developments and reduce the expense of providing municipal services to the homes. Several of these greenspaces provide riparian habitat along headwaters of the east branch of Allen Creek. For this project, we compared streams in Pittsford greenspaces, Irondequoit Creek at Main Street, Fishers, representing minimal impact and Allen Creek in Henrietta, representing minimal preservation of riparian habitat. Measurements included impervious surface area and water quality: water chemistry, vegetation and macroinvertebrate diversity indices. The results demonstrate that greenspaces are effective in reducing the impact of housing on stream water quality. (Oral presentation.)

## CONSTRUCTION OF A BIOLUMINESCENT PLASMID REPORTER BASED ON *PANTOEA STEWARTII* QUORUM SENSING RECEPTOR PROTEIN, ESAR.

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The bacterial pathogen, *Pantoea stewartii* subsp. stewartii (*Pnss*), causes Stewart's wilt and leaf blight diseases on sweet corn and maize, respectively. *Pnss* grows in the plant xylem and produces an exopolysaccharide slime layer called Stewartan that interferes with vascular transport of water. Production of Stewartan is cell density dependent and governed by the EsaI/EsaR quorum sensing (QS) system. QS systems enable bacteria to sense the environmental porosity and its population density. The EsaI protein is an *N*-acyl homoserine lactone (AHL) signal synthase and EsaR is the cognate AHL-responsive transcription factor. AHLs are diffusible signals that control gene expression in QS. Previous work has shown that the EsaR directly interacts with promoter regions upstream of the *rcsA* gene to promote Stewartan synthesis. This work shows our strategy and progress on the construction of a cell-based reporter system to investigate the role of sweet corn- and maize- produced host factors on Stewartan synthesis. The EsaR responsive element and the lux box sequence of the *rcsA* promoter region, was positioned upstream of the luminescence operon, *luxCDABE*, from *Photorhabdus luminescens*. This plasmid-based vector should allow EsaR-responsiveness in a *Pnss* strain that contains a functional EsaR protein but lacks the EsaI synthase. This biosensor strain will allow us to follow EsaI-produced AHL signals in plants bioengineered to produced the EsaR-cognate AHL signal, 3-oxo-C6-HSL, and to characterize AHL signal mimics potential produced by genotypes of sweet corn and maize that differentially response to *Pnss* infections. (Poster presentation.)

## THE SYNTHESIS OF CATIONIC ANTIOXIDANTS AND THE EVALUATION OF THEIR USE AS PROBES OF OXIDATIVE DAMAGE IN YEAST MITOCHONDRIA.

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Antioxidants are of importance in regulating mutagenic reactions that occur intracellularly, as they inhibit damage caused by reactive oxygen species (ROS), which are a result of cellular respiration in the mitochondria. This is of interest because many human diseases are associated with an imbalance in cellular redox systems, a biochemical condition known as Oxidative Stress (OS). In the work that will be described, cationic alkylaryltelluride antioxidants were synthesized and their use as probes of oxidative damage and cellular repair in yeast mitochondria was explored. Alkylaryltellurides were chosen because they have the ability to act as both one- and two-electron antioxidants. The assay used was a respiration loss assay in which the cellular respiration ability of yeast mitochondria is impaired by hydrogen peroxide, a common ROS. The synthesized antioxidants are being evaluated in conjunction with or sequentially with hydrogen peroxide to determine if the antioxidants can be used in preventing or repairing oxidative damage. (Oral presentation.)

## RAMAN SPECTROSCOPY AND GROUP THEORY IN THE PHYSICAL CHEMISTRY LABORATORY.

Kristina Lantzky-Eaton, St. John Fisher College, Rochester, NY.

The coverage of group theory in physical chemistry has declined recently often being deferred to inorganic chemistry. The implementation of a Raman spectroscopy experiment in the physical chemistry laboratory, which implements group theory to determine vibrational modes of small organic compounds, offers an inorganic overlap experience for upper level students. Students model the given organic molecule with Gaussian03 and then obtain Raman spectra. Mode assignments are made by comparing Gaussian calculations to the vibrational components from the reduced representation. (Oral presentation.)

## USING GLYCOLIC POLYESTERIFICATION REACTIONS TO TEST LIQUID SURFACTANTS AS POSSIBLE SOLVENTS.

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Surfactants are widely used in detergents, soaps, and cleaning. However, they have not been yet considered as potential solvents for chemical reactions. We successfully carried out glycolic acid polyesterification reactions in isoalkylpolyethoxy/propyloxy-alcohol, a poly-disperse nonionic liquid surfactant, demonstrating that surfactants can serve as a solvent medium for chemistry. The product glycolic acid polyester is also of wider interest as a potential material as skin replacement for burn victims to diminish scaring. Other researchers attempted previously the glycolic polyesterification reaction using water as solvent but yields very rather low due to the fact that the presence of large amounts of water, a by-product of the reaction, shifts the chemical equilibrium towards the reactant side. While yields in our study were >80% in using surfactants the degree of polymerization, n, could not be determined precisely, but appears to be small ($n < 10$). The glycolic polyester products were analyzed by their melting points, and their IR, NMR and GC/MS spectral data, and these results will be presented. (Poster presentation.)

## STABILITY OF PLANETARY ORBITS.

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Planetary orbits are not stable but increase with time. At the beginning of the solar system, all planets were closer to the Sun than presently, and they will be more distant in the future. The cause is the relative instability of the planetary orbits and the solar mass and gravity loss by radiation and solar wind.

The potential energy of planetary orbits, relative to the solar escape energy (escape velocity), determines the stability of planetary orbits. Applying fundamental physical concepts, the planetary potential energy relative to the solar surface was obtained by calculating the launch energy (~launch velocity) that is necessary to move an object from the solar surface to the planetary orbit ('planetary launch velocity'). The launch energy is equal to the planetary

potential energy relative to the solar surface. They range from 613.830 km/s for Mercury to 617.526 km/s for Pluto. The difference between the solar escape velocity of 617.547 km/s and planetary launch speeds ranges from 3.7 km/s (0.6%, Mercury) to 0.037 km/s (0.006%, Pluto). The launch velocity of the furthest planet (UB313) is calculated to 617.526 km with a solar attachment of 0.0034%.

The gravitational interaction between Sun and planets decreases with time since the Sun continuously loses mass and gravity by solar radiative and solar wind mass loss. This reduces the solar–planetary orbital potential energy. Changes of planetary orbits with time were calculated based on the total solar mass-loss rate constant. At the beginning of the solar system (-4.5byrs), all planetary orbits were closer to the Sun, and orbital periods are increasing. The data correctly predict that Mars changed from liquid to frozen water about 3.6 billion years ago. The model is the only one to predict the observed movement of the Earth away from the Sun.

The planets will escape the solar system when the solar escape velocity decreases below the planetary potential energy (launch velocity). The planetary escape time is calculated for the current solar mass loss rate to 1.3 and 0.76 billion years for Pluto and UB313, respectively. Present orbital separation rates and orbital period increases are predicted, which are within the range of experimental observation. (Oral presentation.)

## SEARCHING FOR THE GENES INVOLVED IN MESODERM DEVELOPMENT OF *EUCIDARIS TRIBULOIDES.*

Amanda LoGuidice, Hyla Sweet, Ph.D., Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Mesoderm development in derived sea urchins has been shown to be controlled by a variety of transcription factors. The objective of this project is to determine the expression patterns of four of these genes, Hnf6, FoxA, GataE and Otx, in *Eucidaris tribuloides*, a primitive sea urchin, which has significant differences in mesoderm development compared to derived sea urchins. NCBI was used to find homologs of these genes from different organisms. The sequences were aligned to show highly conserved regions and degenerate PCR primers were designed based on these sequences. The primers were used with PCR and cDNA from mixed embryo stages of *E. tribuloides* or *Lytechinus variegatus* (positive control) to amplify the gene sequence of interest. The PCR fragments were separated by size using gel electrophoresis. The next step will be to cut out bands, purify, clone and sequence the DNA. Eventually quantitative RT-PCR and in-situ hybridization will be carried out to determine when and where these genes are expressed in the embryos of *E. tribuloides*. We will then compare the expression patterns in this primitive sea urchin to those of derived sea urchins. (Poster presentation.)

## MULTIPLE ANTIBIOTIC RESISTANCE FOUND IN BACTERIA FROM WILD LEOPARD FROGS.

Jillian Lund, Kevin Posman, Han Ming Gan, G. Thomas Frederick, and F. Harvey Pough, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Widespread use of antibiotics has caused an increase in the incidence of antibiotic resistant bacteria in the environment. We chose the Northern leopard frog, *Rana pipiens*, as an indicator organism to study the spread of resistance. Enteric bacteria were sampled from the cloacae of *Rana pipiens* from the RIT campus. We selected 6 different Gram-negative bacteria to study. Standard minimum inhibitory concentration plating of antibiotics: ampicillin, erythromycin, streptomycin, and tetracycline indicated multiple intermediate levels of resistance in several of these bacteria. (Oral presentation.)

## EXTRACTION AND ANALYSIS OF PICEID FROM POLYGONUM CUSPIDATUM ROOT.

Kayleigh MacMaster and Dr. William Lammela, Department of Chemistry, Nazareth College of Rochester, Rochester, NY 14618.

Piceid is the 3-O-ß-D glucoside of resveratrol. Piceid has been used for years in ancient Chinese and Japanese folk medicine and is believed to have medicinal benefits. The roots of two plant varieties of *Polygonum cuspidatum*, Hu Zhang and Japanese Knotweed, were analyzed for piceid. The roots were made into powder followed by a series of extractions with organic solvents. Beta-glucosidase was used to convert piceid to resveratrol for comparison purposes. Analysis of piceid content was performed using liquid chromotagraphy (LC). In a methanol and formic acid mobile phase piceid elutes between 6.8 and 7.1 minutes. (Poster presentation.)

## INVOLVEMENT OF THREE TRANSCRIPTION FACTORS IN THE LOSS OF E-CADHERIN THROUGH DEXAMETHASONE TREATMENT OF A VULVAR CARCINOMA CELL LINE.

M. Marinescu and J. Lewis, Department of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

Certain epithelial cancers, which lose their ability to express specific cell-cell junction proteins, often develop into more aggressive carcinomas. The cause of junction protein loss is varied and not fully understood. The vulvar cancer cell line A413 experiences loss of the cell-cell junction protein Epithelial (E)-cadherin when treated with dexamethasone (dex). Dex is a glucocorticoid, which is mainly used in anti-inflammatory medications. Recent research indicates that the transcription factors Snail, Sip1, and Slug can modulate E-cadherin expression. My project involves analysis of these transcription factors in the regulation of E-cadherin by dexamethasone in A431 cells. I am using reverse transcription factors. Using total RNA extracted from the A431 cell line grown in the presence or absence of dex, my work has thus far shown a definitive decrease in E-cadherin expression post dex treatment using the RT PCR method. These results validate the technique and are now being used to determine which transcription factors are involved in downregulating E-cadherin in response to dex. (Poster presentation.)

## THE EFFECT OF THE HISTONE DEACETYLASE (HDAC) INHIBITOR PXD101 ON THE COLON CARCINOMA CELL LINE FET.

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Genetic changes which contribute to the cancer phenotype have been well documented but recent studies have focused on epigenetic changes which play a role in cancer development. One of the most notable epigenetic changes is acetylation. Histone acetyltransferases (HAT's) add an acetyl group to the n-terminal lysine tails of chromatin, resulting in a more open conformation, which is readily accessed by transcription factors. Histone deacetylases (HDAC's) antagonize HAT's by removing the acetyl group, thus condensing the chromatin and impeding transcription. Deacetylation of histones aids cell proliferation by modifying gene expression of cell-cycle regulators and apoptosis related molecules. As a result, HDAC inhibitors have recently been introduced into clinical trials. HDAC inhibitors induce growth arrest, apoptosis and differentiation of a variety of tumor cells, making them useful as anti-cancer drugs. However, HDAC inhibitors currently in trial are non-specific. Recent studies focus on the mechanisms involved in the effects of HDAC inhibitors

We studied the effects of the HDAC inhibitor, PXD101, on the colon carcinoma cell line, FET. It was found that PXD101 led to the increased expression of the tumor suppressor gene transforming growth factor beta receptor II (TGFβRII) and decreased expression of survivin, a member of the inhibitor of apoptosis protein (IAP) family. The TGFβRII pathway participates in the regulation of cell proliferation and differentiation, as well as acting as a tumor suppressor in a variety of human cell types. In order to determine whether the increased expression of TGFβRII played a role in the down-regulation of survivin, we analyzed the effects that PXD101 had on FET cells expressing a dominant negative TGFβRII (DNRII) construct. In these cells, survivin expression was more resistant to down-regulation by PXD101. The increased TGFβRII expression and decreased survivin was associated with decreased phospho-AKT activation and increased PARP cleavage in the FET cell line compared to the DNRII expressing cells. PXD101 increased activated smad2 in the FET cell lines, a transcription factors that may be involved in regulating expression of survivin. Future studies will focus on the contribution of survivin down-regulation to the action of PXD101 and the exact mechanism by which PXD101 regulates survivin. (Poster presentation.)

## PHYLOGENETIC ANALYSIS OF IGUANID LIZARDS USING 12s and 16s RIBOSOMAL LOCI.

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This investigation will to construct an updated phylogenetic tree for eight genera of iguanid lizards and one out-group. The genes of interest are the 12s and 16s ribosomal loci, two relatively conserved sequences in the iguanid mitochondrial genome. Changes that occur within the sequences track evolutionary divergence which gives information about relative divergence time between taxa. The current alternative hypotheses disagree on the placement of the genus *Cyclura, Sauromalus,* and *Ctenosaura defensor*. Protein coding mtDNA loci (ND4 and

Cytochrome b) support an *Iguana-Sauromalus* sister relationship while morphological data and 12s/16s data (so far) support an *Iguana-Cyclura* sister relationship. Also, the iguana *Ctenosaura defensor* has been incorrectly identified as nested within the genus *Ctenosaura* based on morphological data, when mtDNA data place it outside the genus *Ctenosaura* and explain its spiny-tailed characteristics by means of convergent evolution. Some trees have *C. defensor* rooting the genus or as the root of all iguanini, but with weak statistical support. More sequences from more genera and species are being added constantly which increase the resolution of the trees. With enough 12s/16s data, the conflict between the mtDNA data sets and morphology will finally be resolved. (Poster presentation.)

## ISOLATING AND CHARCTERIZING THE ROLE OF BRACHYURY IN THE ENDOMESODERM DEVELOPMENT OF *EUCIDARIS TRIBULOIDES.*

Danielle Meadows and Hyla Sweet, PhD, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The long-term goal of our lab is to study the evolution of mesoderm development in echinoderms. The objective of this project is to isolate and determine the expression patterns of one of these genes, Brachyury, in *Eucidaris tribuloides*, a primitive sea urchin. Using NCBI, homologues of Brachyury were found from different organisms. The sequences were then aligned to show highly conserved regions. Degenerate PCR primers were designed to recognize and bind to these regions. These primers were used with PCR and cDNA template from *Eucidaris* embryos to amplify EtBrachyury. The PCR products were separated by size using gel electrophoresis. Bands of the predicted size were cut from the gel and purified. These PCR fragments were cloned, sequenced and confirmed to be EtBrachyury. Using the sequence of this fragment, gene-specific primers were designed for 5' and 3' Rapid Amplification of cDNA Ends (RACE). The 5' end of EtBrachyury has been isolated. Work continues to isolate the 3' end of the gene sequence. Once the full-length cDNA has been isolated, in situ hybridization and quantitative reverse transcription PCR will be carried out to determine the spatial and temporal expression patterns of EtBrachyury. We will compare these expression patterns in *Eucidaris tribuloides* to the known expression patterns of Brachyury in other animals. (Poster presentation.)

## IMPACTS OF AUDIOLURES ON THE CAPTURE OF NORTHERN SAW-WHET OWLS.

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Since the mid-1980s, the capture of Northern Saw-whet Owls (*Aegolius acadicus*) has been enhanced by the use of an audiolure placed at the center of a mist-net array. We were interested in examining the effects of the audiolure on the capture of migrating owls using banding data from central Pennsylvania from 1998 to 2005. Most of the owls captured were females (80% of all owls handled and over 90% of those assigned a specific sex). Despite the predominance of females, males and females were captured in equal proportions at different distances from the audiolure. Additionally, young and adult birds were captured in equal proportions at different distances from the audiolure. Our results contradict earlier studies suggesting that males and females respond differently to audiolures, although the high proportion of females does not appear to be a result of audiolure use, since stations netting without an audiolure report equally high percentages of females. Furthermore, recaptured owls appear to be trap happy. The overall recapture rate was low (4.5%), but the subsequent recapture rate of recaptured birds was almost three times higher (12.9%). (Poster presentation.)

## MELANIN CONCENTRATING HORMONE-INDUCED DESENSITIZATION OF MAPK SIGNALING IN A CELL CULTURE MODEL.

Makoto Nagahama and Laurie B. Cook, Department of Biological Sciences, SUNY College at Brockport, 350 Campus Drive, Brockport, NY 14420.

Recent studies show that Melanin Concentrating Hormone (MCH) and its receptor are linked to the regulation of appetite and energy expenditure. However little is known about how cells regulate this receptor's activity or signaling. Abnormal signaling could ultimately lead to obesity, anorexia, or similar conditions. Therefore, an understanding of MCH receptor physiology is necessary to design new treatments. The first aim of this study was to develop a model system to study MCH receptors in cell culture. We generated MCH receptors tagged with various

epitopes and expressed them in cells. Expression of receptors was verified using ELISA. MCH receptors are known to activate the mitogen-activated kinase (MAPK) pathway. The second aim of this study was to 1) investigate whether the MAPK signaling pathway was activated in our cell lines and 2) investigate whether it desensitized to MCH treatment. We performed single and double hormone-treatment assays followed by Western blot with antibodies to MAPK or phosphorylated (activated) MAPK. In our cells, MAPK activation peaks within 5 to 10 minutes and returns to baseline within 30 minutes. This agrees with studies by others using alternative model systems. Interestingly, our results also indicate that MAPK signaling induced by MCH partially desensitizes, meaning that if cells are given a second dose of MCH, MAPK will not activate to the same extent. Since MCH receptor internalization is known to be incomplete, with up to 60% remaining at the plasma membrane available for signaling, it seems unlikely that internalization of MCH receptors is the sole contributor to this phenomenon, especially after a 30 minute recovery time. We hypothesize that desensitization to MAPK occurs at the level of the receptor prior to internalization. Future experiments are aimed at deciphering this mechanism of action. (Poster presentation.)

## A NEW MULTICHROME STAIN TO DISTINGUISH CARTILAGE, MATURE BONE, AND IMMATURE BONE IN HISTOLOGIC BONE SAMPLES.

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Hematoxylin and eosin is the gold standard in histologic staining, however many connective tissues, including bone, stain similar shades of pink due to the extensive amounts of extracellular matrix. Traditional techniques to distinguish bone and cartilage are unable to resolve bone tissue according to its state of maturity. Trichrome and pentachrome stains have been developed but many of these are designed for plastic resin-embedded tissues that are not decalcified. This proves difficult for the basic histology laboratory. Hence, the objective of this work was to identify a staining technique that would clearly distinguish mature bone, immature bone, and cartilage in the same formalin-fixed, paraffin-embedded sections. Here we demonstrate that alcian blue hematoxylin counterstained with orange G eosin satisfies these requirements. ABH/OGE was used to stain 5 μm sections of murine tibia growth plates following 24 hours of formalin fixation, 14 days of 10% EDTA decalcification and standard histologic processing. Cartilage is clearly indicated by the bright blue staining. Mature bone appears orange and the immature woven bone is mauve. Another benefit of this stain is the improved stability and simplified preparation. One application of this technique is the ability to estimate age based on the relative amount of cartilage present within the growth plate/epiphysis. (Oral presentation.)

## PARAPHYLETIC RELATIONSHIPS WITHIN *CTENOSAURA PECTINATA*.

Ms. Katelyn Page, Dr. Larry Buckley, Dr. Oscar Flores, Mr. Edmundo Perez-Ramos, Mr. David Ramos, Mr. David Spina, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

*Ctenosaura pectinata* inhabits the semi-arid thorn forest and interior dry forests of western and southwestern coasts of Mexico. It shares a well-established sister relationship with Ctenosaura acanthura which inhabits similar areas on the eastern coast, including some interior river valleys. Color pattern and scale polymorphisms among populations of *C. pectinata* have been noted by many researchers for some time. Additionally, comparisons of cytochrome b mitochondrial DNA and cranial osteological characters from populations throughout its range indicate that as currently recognized, *C. pectinata* is paraphyletic. Populations on the western coast, south of the transvolcanics (S. Jalisco through Qaxaca) are more closely related to *C. acanthura* than to populations of the northern west coast (Sinaloa and Nayarit). This requires either synonomy of *C. acanthura* with the older name *C. pectinata*, or recognition of a new species on the western coast. Specific recognition of the northern populations as *Ctenosaura brachylopha* (Bailey, 1928), rather than synonymy of all populations on both coasts, is a preferred solution given the pattern of morphological and molecular divergence discovered. (Poster presentation.)

## BAYTRON P MICROSENSOR FOR METHANE AND ITS DERIVATIVES.

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BATRON P {3,4-Polyethylenedioxythiophene/polystyrenesulfonate} chip was made by depositing it onto a gap of two L shaped gold plates on a silicon wafer separated by 150 μm such that the gold plates contacted the polymer only in the gap region. The chip surface was examined by optical polarizing microscopy for determining the extent of deposition. The resistance of the polymer was examined at ambient room temperature before and after the exposure of the chip to different concentrations of methane and its derivatives such as chloroform, carbon tetrachloride and methylene chloride. The chip response to methane gas opens up the prospects of its usage in room temperature for the industrial and environmental detections. Among the derivatives of methane, carbon tetrachloride showed the highest response for detection. (Poster presentation.)

## N-CADHERIN AND VIMENTIN: A DUAL ROLE IN MOTILITY OR JUST A COINCIDENTAL COEXPRESSION IN CARCINOGENESIS.

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This project involves correlating the expression of N-cadherin and vimentin with increased cell motility in carcinoma cells. N-cadherin is a glycoprotein that forms adhesions between cells. Vimentin is an intermediate filament that plays an important structural role as a part of the cell's cytoskeleton. Both these molecules are not typically expressed by epithelial cells but by fibroblast and muscle cell types. During carcinogenesis of epithelial cells, the appearance or "misexpression" of vimentin and N-cadherin is associated with metastasis and poor prognosis. Recently, it has been observed that under certain conditions N-cadherin and vimentin can interact. My experiments examine the hypothesis that N-cadherin and vimentin expressed togethter in epithelial cells increases cell motility more than either molecule expressed alone. Two parenthal cell lines are being used (one expressing vimentin and one lacking) to see if vimentin increases the rate of motility of the cells when N-cadherin is transfected into the carcinoma cells. I am using immunoflouresence to observe the cadherin and vimentin expression for the cell lines and western blotting to verify protein size and amount. Motility assays are being used to measure the cells rate of movement. (Poster presentation.)

## EXPRESSION OF HUMAN LYSOZYME IN BUDDING YEAST AND PURIFICATION USING REVERSE MICELLES FORMED BY HEXADECYLTRIMETHYL-AMMONIUM BROMIDE.

William Pierson[1], Mark P. Heitz[2], and Rey A. Sia[1]; [1]Department of Biological Sciences and [2]Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

The effect of protein conformation on surface interactions is an important phenomenon that is not completely understood. It has been shown that the amount of conformational change a protein, such as lysozyme, undergoes is proportional to the strength of its surface binding-interactions. Conformational analysis of a protein using fluorescence spectroscopy may also permit analysis of the surface binding-interactions of the protein. The purpose of this research is to generate a human lysozyme protein that can be successfully analyzed using fluorescence spectroscopy techniques. Native lysozyme has multiple tryptophan residues that have natural fluorescence and can be utilized for analysis. However, each of the multiple tryptophan residues generates background noise during analysis because each residue is contained within a unique microenvironment. The goal of the research is to construct a functional lysozyme molecule that has all but one of the tryptophans changed to non-fluorescing similar amino acids in the hopes of limiting background fluorescence. Using a copper inducible promoter, we can express the human lysozyme gene in *Saccharomyces cerevisiae*. A reverse micelle purification technique that takes advantage of the high isoelectric point of lysozyme will be used to purify the lysozyme from the yeast. This modified lysozyme can then be analyzed using fluorescence spectrometry with limited background fluorescence. Analyzing the noise-free lysozyme will help our understanding of how conformational changes affect surface interactions of proteins. (Poster presentation.)

## UTILIZING TRANSPOSON MUTAGENESIS IN THE STUDY OF *ENTEROBACTER SAKAZAKII* TO IDENTIFY GENES INVOLVED IN OSMOTOLERANCE AND BIOFILM FORMATION.

Patrick J. Polito and Tracey C. Householder, Department of Biological Sciences, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Since its separation from *Enterobacter cloacae* in the early 1980s, *Enterobacter sakazakii* has been implicated in numerous cases of neonatal meningitis and enterocolitis. In many of the cases, the source of the infection was traced to dried infant formula. We are investigating *E. sakazakii's* ability to form biofilms as well as its resistance to highly osmotic environments, both of which allow it to be transmitted by desiccated infant formula. Transposon mutagenesis is being employed as a method of identifying mutants incapable of surviving in highly osmotic environments as well as those that have biofilm characteristics varying greatly from the wild type strain. Mutants were created by transforming *E. sakazakii* with an Epicentre EZ::Tn5™ transposon and selecting for antibiotic resistance. The resulting strains were used to create a library which was subsequently screened for the desired phenotypes. Preliminary results indicate that this form of mutagenesis does indeed yield mutants deficient in osmotolerance as well as mutants exhibiting decreased or increased ability to form biofilms. Mutants are currently being characterized and the genes affected during mutagenesis determined. (Poster presentation.)

## PHYLOGENIC ANALYSIS OF THE IGUANAS BASED ON SEQUENCES OF THE RHODOPSIN GENE.

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The evolutionary relationship of the genera *Ctenosaura* within the Iguanid family is uncertain. Morphological phylogenies show the genus *Ctenosaura* is monophyletic, but mitochondrial molecular phylogenies indicate that the genus *Ctenosaura* is a paraphyletic taxon. This research plans to solve the problem by sequencing the third intron of the rhodopsin nuclear loci from samples of all eight genera and most of the species in the genus *Ctenosaura*. Only by analyzing a large data set can this study test the morphological and molecular hypotheses. Currently there are several incomplete data sets in which to test the previous phylogenies against. The goal of this investigation is to complete the current data sets with continued sequencing and the expansion of this laboratory's current sample set to include all *Ctenosaura* species. The data produced thus far suggests a strong correlation to the molecular hypothesis. Yet, current interpretations of this data have proven inconclusive due to the lack of statistical support. (Poster presentation.)

## THE STEAMROLLER BLUES: REDISCOVERING AN HISTORIC CEMETERY.

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Skeletons dating to the contact period (mid-1700's) in western New York are rare, due to taphonomic factors that inhibit good bone preservation. Colonial skeletons, when preserved, are often encountered incidentally as unmarked burials in the name of modern progress (i.e., road or civic improvements).

Such a find is presented here. Human remains discovered in July 2005 were initially thought to be a forensic case by the county sheriff's department as a road was being dismantled for utility upgrades. The sandy substrate, geologically deposited by a glacial delta of the Genesee River, allowed for excellent preservation of the skeleton. The remains were interred in a pinned shroud within a wooden coffin, which had since degraded. Anthropological analysis revealed a craniodental anomaly, intense physical labor, and nutritional deficiency as a child. Cranial measurements and gross morphological observations reveal an "atypical" skull for a European male. Femora also lacked anterior bowing. Portable XRF was performed to determine trace element concentrations.

This individual represents one of multiple burials that were discovered in this general area. An incomplete adult calvarium and pelvic bone of a juvenile were also recovered in the days after the initial excavation. Historical documents revealed that two other burials were discovered in 1920 and 1820, however no anthropological report was found. It is likely that these burials represent the earliest settlers of the region dating to the contact period in New York State. (Oral presentation.)

## RV2985 DIADENOSINE POLYPHOSPHATASE FROM M. TUBERCULOSIS, AN "INVASION" ENZYME HOMOLOG AND POTENTIAL NOVEL ANTIBIOTIC TARGET.

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The Nudix hydrolases are a family of enzymes that cleave substrates containing a nucleoside diphosphate linked to some moiety, x, and are identified by the common signature sequence: GX5E7REUXEEXGU (U= I, L, or V). We are systematically discovering and characterizing Nudix hydrolases from *M. tuberculosis*. One such enzyme, Rv2985 diadenosine polyphosphatase, is a homolog to enzymes shown to be responsible for the invasiveness of pathogenic bacteria. We are purifying and characterizing Rv2985 as a possible candidate for the *M. tuberculosis* "invasion" enzyme. Recently we have subcloned and purified a His-tagged protein, and showed that it retains full expression, solubility, and activity, as compared to wild type, yet purifies by affinity chromatography as one pure protein. Blocking the ability of a pathogen such as *M. tuberculosis* to be able to invade its human host may be an excellent target for the development of new antibiotics. This research is currently supported by an NIH AREA grant. (Poster presentation.)

## SPEECH ADAPTATION AND SITUATIONAL OPTIMALITY.

John Rhoades, St. John Fisher College, Rochester, NY 14618 and Zhiming Zhao, SUNY Geneseo, Geneseo, NY 14454.

Language serves as a primary means of human adaptation. This paper critically examines attempts to identify certain phonological aspects of language systems as particularly adaptive. These postulate that the CV (consonant plus vowel) syllable is an optimum in speech adaptation to warm climates that encourage "distal communication". These attempts are shown to be overly simplistic, motivated by a model that stresses transmission but disregards speech differentiation. An alternative analysis is proposed that recognizes that speech adaptation must negotiate between transmission and differentiation factors. (Oral presentation.)

## EXAMINING THE TEMPORAL AND SPATIAL EXPRESSION OF THE DELTA HOMOLOG IN *EUCIDARIS TRIBULOIDES.*

Sébastien Ricoult and Hyla Sweet, PhD, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester NY 14623.

Mesoderm development in echinoderms is controlled by the interactions of several different genes. One fundamental gene required for the development of the mesoderm is Delta. The objective of this project is to determine when and where Delta mRNA is expressed in *Eucidaris tribuloides*, a primitive sea urchin. New sense and antisense digoxigenin-labeled RNA probes were created using a previously generated full-length cDNA clone of the *Eucidaris tribuloides* homolog of Delta. These probes were used for in situ hybridization with a mix of *Eucidaris tribuloides* embryos of different developmental stages. Preliminary results suggest that this gene is not expressed as anticipated. To confirm this we will use reverse transcription PCR (RT-PCR) to try to amplify EtDelta from several stages of *Eucidaris tribuloides* embryos. If this technique shows that EtDelta is not expressed, then this would suggest that the molecular mechanisms of mesoderm development in *Eucidaris tribuloides* are very different than in derived sea urchins. This would be an extremely interesting result. If RT-PCR shows that EtDelta is expressed (contradicting our preliminary in situ hybridization results), then we will use quantitative RT-PCR and trouble shoot the in situ hybridization to examine when and where EtDelta mRNA is expressed with more precision. (Poster presentation.)

## EFFECTS OF TRICHLORFON AND PERMETHRIN ON MEIOSIS IN ZEBRAFISH (*Danio rerio*) OOCYTES.

Brian Riesenberger and Edward A. Freeman, Ph.D., St. John Fisher College, Rochester, NY 14618.

Meiosis is the cell division process that produces germ cells (eggs and sperm). The human oocyte is susceptible to errors in meiosis that result in an inappropriate distribution of chromosomes during cell division. The resultant cells have an abnormal number of chromosomes, a condition called aneuploidy, and are typically incapable

of proper development if fertilized. However, several aneuploid conditions can result in a live birth; for example, Down Syndrome (Trisomy 21) and Turner Syndrome (Monosomy for the X chromosome).

Research on human eggs strongly suggests that advanced maternal age is associated with a meiotic defect termed congression failure. Congression failure occurs when chromosomes fail to properly align prior to cell division. If cell division occurs in the absence of properly aligned chromosomes, errors in chromosome number often occur in the resultant cells. It has been postulated that changes in the ovarian environment may lead to the production of unhealthy eggs. However, the specific mechanisms that underlie congression failure are not known.

Genetically engineered mutant mouse models present meiotic defects very similar to humans. However, studies using mutant mice are very expensive and time consuming. Alternatively, endocrine disruptors may be used to study meiosis. Endocrine disruptors, chemicals that imitate endogenous hormonal activities in the body, are found throughout the environment. Studies on mouse eggs which have been exposed to specific endocrine disruptors exhibit a range of defects including altered cell cycle progression, altered *in-vitro* fertilization capacity, congression failure and aneuploidy. It is possible that endocrine disruptors may induce meiotic abnormalities through mechanisms similar to that which act in eggs from humans of advanced maternal age.

Zebrafish (*Danio rerio)* are an excellent animal model for biological experimentation and research. Specifically, zebrafish embryos are transparent and develop externally from the mother, they are simple to breed, easy to maintain, and cost effective. Finally, zebrafish are prolific breeders providing numerous offspring on a daily basis. These attributes make zebrafish a highly desirable model to study the effect of endocrine disruptors on meiosis.

This study will investigate effects of pesticides (Trichlorfon and Permethrin) on zebrafish oocytes. Pesticides, one class of endocrine disruptors, have been shown to have detrimental effects on reproduction at various levels. Trichlorfon has been shown to induce meiotic abnormalities in both humans and mice. However, trichlorfon has not been studied using lower vertebrate models, such as the zebrafish, where the mechanism of action may be easier to determine. Permethrin exposure has not been evaluated for effects on meiosis. In fact, permethrin has not been intensively studied in any animal model. Therefore, the studies proposed below will address the meiotic impact of exposure of zebrafish eggs to Trichlorfon and Permethrin. (Poster presentation.)

## ANALYSIS OF FLAVONOIDS AND RESVERATROL IN COCOAS.

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Flavonoids are the compounds present in cocoas that are responsible for the antioxidant properties in chocolate. The concentration of flavonoids can be measured using a spectrophotometer or a Liquid Chromatogram (LC). Four types of baking cocoa were analyzed, including Hershey's Special Dark cocoa, Baker's Unsweetened Baking Chocolate Squares, Ghirardelli Chocolate Unsweetened Cocoa, and Scharffen Berger Unsweetened 99% Cacao. The standard used for flavonoid content was epicatechin. Epicatechin was found in all cocoas that were tested, but the two methods used produced different results. An LC method was used to determine the resveratrol content in the cocoas. Resveratrol is found in red wine and is beneficial to the heart, but there was no evidence found in the cocoas when using the LC method. (Poster presentation.)

## EXPLORATION OF THE STRUCTURAL DIFFERENCES IN DUPLICATED *SAINTPAULIA* CHS PROTEINS USING MOLECULAR MODELING.

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The CHS genes are present in all green plants as a small gene family. The study of these enzymes has combined genetic, molecular, biochemical and evolutionary approaches and their function is the most well understood of any plant enzyme. The structure of the alfalfa CHS protein from the RCSB protein data base was used as a model for the comparison of the secondary structures and isopotential contours of the two *Saintpaulia* proteins, CHS A and CHS D. The alfalfa CHS protein is ~82% homologous to the *Saintpaulia* proteins and the structures are surprisingly similar. There is little difference in the secondary structures between the observed models of the two *Saintpaulia* proteins. Isopotential maps highlight the small differences and indicates that the CHS D protein is more highly charged. The high degree of similarity of the proteins suggest that the genes duplicated relatively recently and have had little time to diverge. (Poster presentation.)

## AMATEUR OBSERVATION OF GULLIES ON MARS.

James J. Secosky, Finger Lakes Community College, Canandaigua, NY 14414.

Introduction: In recent years, images from various spacecraft have displayed features on Mars that are attributed to possible recent water erosion. In August 2003 NASA began accepting suggestions from the public for possible targets for the Mars Orbiter Camera (MOC) narrow angle camera system on the Mars Global Surveyor (MGS). Up to that time over 120,000 images—representing about 3% of the surface –had been taken. I began receiving images from MOC in October 2004. My presentation will include images providing evidence of water-formed gullies in the southern hemisphere of Mars. Many more images are on my website: paws.flcc.edu/~secoskjj/ Instructions for use of the public target program are at www.msss.com.

Image description: The MOC narrow angle images have resolutions of 1.4, 3.0, or 4.5 meters/pixel. Images are either 1.5 or 3.0-3.1 Km across (about 1 or 2 miles across). They are all taken with a local time of 2 p.m. when the spacecraft crosses the equator. In other words, the angle of the sun is consistent.

Gullies: Malin and Edgett (2000) described gully features on the walls of impact craters, valleys, pits, and graben. Gullies usually have alcove. channel, and depositional-apron regions. These gullies created great excitement in the scientific community as they appeared quite young. They have very few craters. cover dunes (which are believed to be young), and often display dark tones. Right, fine dust generally quickly covers nearly all Martian surfaces so darker features may be younger. Malin and Edgett, 2000 and Mellon and Phillips, 2001 suggested that liquid water coming from shallow aquifers could have carved the gullies. However, since then many other models have been proposed. See Heldmann and Mellon, 2004 for a review of many of the popular models. As past and present life forms would most likely be found near water, these gullies may be prime places to search for Martian life. By examining areas where gullies have been found, I have discovered a few new ones.

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## KEUKA LAKE SEASONAL PLANKTON DYNAMICS: INTEGRATING MULTIPLE EXISTING FIELD RESEARCH WORK WITH MICROCOSM EXPERIMENTS.

Tim Sellers, Center for Aquatic Research, Keuka College. Keuka Park, NY 14478.

In order to maintain good water quality and ecological functioning, the mechanisms that drive phytoplankton dynamics (and the resulting food web effects) must be better understood. The recently created Center for Aquatic Research (CAR) at Keuka College has advanced water quality and phytoplankton ecology research on Keuka Lake by College students and faculty. However, multiple research groups have been collecting water quality data on the lake for many years. Given this, CAR lake studies have been designed to complement rather than duplicate this existing body of work. By combining experimental and modeling work with the numerous water quality-related surveys, CAR research attempts to gain a more complete understanding of the mechanisms, not just the observations, regulating primary production in Keuka Lake.

In both 2005 and 2006, Keuka Lake Association (KLA) -measured surface chlorophyll levels were relatively low throughout the summer, but then spiked (~ 4x) in late summer and early fall. Penn Yan water treatment raw turbidity samples mirrored the changes in the KLA chlorophyll concentrations throughout the year, and showed this event as well. This late-season surface algal bloom was not a result nutrient return from lake turnover, as evidenced by temperature data from the Penn Yan treatment plant and temperature-depth profiles from Hobart and William Smith Colleges data. Nutrient ratios (dissolved N:P from KLA data) and bioassay growth rate results (from CAR experiments) suggest phytoplankton growth was primarily limited by dissolved phosphorus availability until late summer when nitrogen then became the limiting nutrient. The autumn surface blooms were concurrent with declining surface dissolved nitrate levels. HWS light transmission data suggested that there was a persistent algal plate positioned at the base of the epilimnion throughout both summers, while KLA data showed low surface chlorophyll concentrations. Algal plates (or deep chlorophyll layers) are not uncommon for oligo- to meso-trophic

lakes (like Keuka), although the exact mechanisms for its formation and maintenance are not fully understood. However, concurrent with the observed late summer surface algal bloom, HWS light transmission data showed the loss of the deep chlorophyll layer, but a new near-surface layer. Thus, the observed late summer surface bloom may simply be a result of existing phytoplankton populations migrating to the surface. Causes for these migrations are not known but hypotheses include grazing pressure differences, algal community changes, or changes in light availability. Physical mixing does not seem to be a likely candidate, as both the Penn Yan water treatment plant temperature data and HWS depth profiles show a well-stratified epilimnion. While this type of event is not unheard of in lakes similar to Keuka, this event highlights that deciphering the cause between internal, ecological factors and external watershed-driven events can be difficult. Integrating existing work can yield better understanding of internal lake dynamics and external watershed inputs. Watershed and lake managers and researchers must better communicate and incorporate more than survey methodologies. (Oral presentation.)

## AN INITIAL APPROACH TO THE ESTIMATION OF UNCERTAINTY IN BIODIVERSITY ESTIMATES OBTAINED FROM COMPOSITE SECTIONS, WITH AN EXAMPLE FROM THE HIRNANTIAN MASS EXTINCTION.

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Comparisons of patterns of biodiversity change require an understanding of the uncertainty in estimates of standing diversity, and in the rates extinction and origination. Diversity data depend heavily on the preservation potential of the species under study, the completeness of the rock record itself, and the sampling effort expended. The effects of binning and stratigraphic range determination are all key issues in developing an understanding of the nature and sources of the uncertainty appearing in diversity patterns. We present here the initial results of a long term project to develop a framework for assessing variation in diversity patterns. An analytic framework has been developed to form a composite listing of the presence and absence of taxa based on occurrence data from individual sections, using the constrained optimization approach to stratigraphic section matching. This composite pattern of observations of taxa over time is then analyzed using maximum likelihood methods to estimate the rates of recovery, extinction, origination and diversity. Jackknifing methods may then be applied to the original section data to estimate the variability of both composite section formation and subsequent rate estimations. We here apply these methods to patterns of graptolite diversity during the Hirnantian Mass Extinction based on collections from the Yangtze Platform region of SE China. Initial results are similar to our prior bootstrap estimates of this history and its standard errors, but suggest a substantially lower (and geologically more reasonable) recovery rate than previous analyses. We present a discussion of how the current analytic procedure will be expanded to accommodate additional geological data and/or statistical approaches to variance estimation. (Poster presentation.)

## ABUNDANCE AND PRODUCTION OF *LEPTODORA KINDTII* BEFORE AND AFTER THE INVASION OF THE PREDACIOUS CLADOCERAN, *BYTHOTREPHES CEDERSTROEMI.*

Karen E. Simpson, William J. Edwards and Doug D. Kane, Department of Biology, Academic Center for Integrated Sciences, Niagara University, NY 14109.

Many populations of aquatic plants and animals that reside in the Great Lakes have been negatively affected by the invasion of exotic species. One such invasive species introduced via ballast water is the predatory cladoceran, *Bythotrephes cederstroemi* (common name: the "spiny waterflea"). This predator is larger than most cladocerans and has a long caudal appendage with barbs that acts to deter predators. The abundance and productivity of the native predatory cladoceran *Leptodora kindtii* has decreased in correlation with the invasion of *Bythotrephes cederstroemi* in the western basin of Lake Erie. To determine if the cause of the *L. kindtii* decreases were indeed due to the exotic invader, quantitative zooplankton samples were collected after sunset on a weekly basis near S. Bass Island, OH. Post-invasion production and abundance of *L. kindtii* and *B. cederstroemi* were determined in each sample, calculated using length-weight regressions and productivity models, and were compared against pre-invasion productivity of *L. kindtii*. Prey abundances were also calculated to determine competition interactions to explain the

decrease in *L. kindtii* abundance and productivity. The impact of this invader is important in determining the effects on both the upper and lower parts of the aquatic food web. (Poster presentation.)

## CLARK WISSLER: A PIONEER IN AMERICAN ANTHROPOLOGY.

James L. Smith, Daniel Poirier, and Nicholas Koehler, St. John Fisher College, 3690 East Avenue, P.O. Box 1375, Rochester, NY 14618.

Dr. Clark Wissler had a profound impact on the development of American anthropology. This paper will explore Wissler's life and his career as an anthropologist. Through primarily educated in the field of Psychology, in which he earned his Ph.D. in 1901, Wissler changed his research interests to focus on the material and living culture of the Plains Indians of North America. Through his work at the American Museum of Natural History, Wissler influenced other prominent anthropologists such as, Margaret Mead. His work with the plains Indians helped produce his concept of culture areas, which attempts to describe and define the relationship between culture and environment. Among his many published works is *The American Indian*, a very important introductory text which is still used today. Throughout his long and illustrious career, Wissler contributed much to the field of anthropology and influenced many future anthropologists. (Poster presentation.)

## STUDIES TOWARD THE TOTAL SYNTHESIS OF A NOVEL γ-LACTONE.

Jessica Smith, William Spencer, Olukorede Agusto, and Dr. Christina Collison, Chemistry Department, Rochester Institute of Technology, Rochester, NY 14623.

The novel γ-lactone was recently isolated from the Red Sea soft coral *S. trocheliophorum* that has been shown to inhibit the growth of certain bacteria. Our efforts are focused on using palladium coupling methods to facilitate a convergent construction of the lactone with the unsaturated side chain. The nonpolar side chain will be constructed through the use of a Stille mono-coupling using the highly sensitive 1,1-vinylidene dibromide. (Poster presentation.)

## *STAPHYLOCOCCUS AUREUS* IS A PREVALENT BACTERIAL SPECIES FOUND IN MANY ENVIRONMENTAL AND CLINICAL SETTINGS.

Kristen Snyder and Mark Gallo, Niagara University, NY 14109.

*Staphylococcus aureus* is a prevalent bacterial species found in many environmental and clinical settings. Due to their nature as pathogens and involvement in the transfer of antibiotic resistance genes, swabs were taken from the noses of numerous deer carcasesses around the Western New York region in order to determine where antibiotic resistance genes are found, what types of genes are found, and how they may be transferred from one strain to another. The samples were used to isolate different strains of *Staphylococcus aureus*. Chromosomal DNA isolation was then performed, as well as pulse-field gel electrophoresis to compare the different strains. A number of DNA samples have been collected and PCR will be performed on rRNA for sequencing and strain identification. Pulse-field gel electrophoresis has shown incredible diversity within the samples, and this information will help to determine whether clonal strains are responsible for the antibiotic resistance genes, or whether it is due to the transmission and transfer of genes in the natural environment. The ultimate goal is to use microarray analysis with a microarray chip composed of antibiotic resistance genes, toxin genes, and virulence factor genes to allow for the genotypic characterization of the *Staphylococcus aureus* strains. (Poster presentation.)

## NMR RELAXATION STUDIES INCLUDING WATER SUPPRESSION TECHNIQUES.

Hanna Sobstyl and Markus Hoffmann, Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

NMR spectroscopy relaxations studies are widely used to explore intermolecular interaction and dynamics present in chemical systems of interest. Oftentimes, a strong solvent signal interferes with NMR measurements. There are a number of different solvent suppression techniques but these have not yet been implemented into NMR relaxation measurements. We will show $T_1$ and $T_2$ relaxation measurements of aqueous surfactant system with successful water suppression. We will also present general background information on water suppression techniques. (Poster presentation.)

## MOLECULAR PHYLOGENY IN THE GENUS STREPTOCARPUS.

Jessica M. Stampfle, Sarah E. Caro and Michael A. Kotarski, Academic Center for Integrated Sciences, Department of Biology, Niagara University, NY 14109.

*Streptocarpus* and *Saintpaulia* are closely related genera in the Gesneriad family of plants. Previous work using ribosomal DNA internal transcribed spacer (ITS) sequences suggest that *Saintpaulia* is nested within the genus *Streptocarpus*. A 757 base sequence of exon 2 of the *chalcone synthase* (CHS) gene of four species of *Streptocarpus* and several species of *Saintpaulia* were used to produce a relatedness tree. This tree is similar to, but not identical to, the tree produced using ITS sequences. (Oral presentation.)

## ANTIMICROBIAL STRUCTURE ACTIVITY RELATIONSHIP STUDY OF PARA-SUBSTITUTED PHENOL DERIVATIVES.

Jeffrey St. Denis, Walter Steiner, and Ronny Priefer, Niagara University, NY 14109.

Due to the increase in the number of pathogenic bacteria, a novel compound exhibiting antibiotic activity through the mechanism of non-specific membrane disruption must be developed. Phenol derivatives have shown activity against both gram-positive and gram-negative bacteria, but no comprehensive structure-activity-relationship (SAR) study has been undertaken. This work incorporates the values of pKa and log P to develop an equation for estimating antimicrobial activity of para-substituted phenol derivatives. By monitoring zone of inhibition at multiple phenol concentrations, the activity of the compound is determined (Activity = $V_{max}/K_m$) using the Prism 3 (GraphPad Software, San Diego, California, USA) program through the Michaelis-Menten and Lineweaver-Burk equations. A clear correlation has been observed for both pKa as well as log P with respect to activity. (Poster presentation.)

## STRUCTURE-FUNCTION ANALYSIS OF THE CUPROUS OXIDASE ACTIVITY IN FET3P FROM *SACCHAROMYCES CEREVISIAE*.

Christopher S. Stoj[1,2], T.J. Augustine[3], Edward I. Solomon[3] and Daniel J. Kosman[2]; [1]Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109; [2]Department of Biochemistry, School of Medicine and Biomedical Sciences, The University at Buffalo, Buffalo, NY 14214; and [3]Department of Chemistry, Stanford University, Stanford, CA 94305.

Baker's yeast, *Saccharomyces cerevisiae*, deficient in high-affinity iron uptake are sensitive to exogenous copper exposure. This phenotype is attributed to the lack of Fet3p cuprous oxidase activity at the yeast plasma membrane, resulting in over-accumulation of the aggressive pro-oxidant $Cu^{I}$, leading to lipid peroxidation and cell death. In addition to their well defined roles as multicopper ferroxidases, Fet3p, as well as human ceruloplasmin, oxidize $Cu^{I}$. The structure of Fet3p has been used to identify possible amino acid residues responsible for this protein's reactivity with $Cu^{I}$. Fet3pM345 is required for the enzyme's reactivity towards $Cu^{I}$. While the Fet3pM345A mutant exhibits wild type spectral and electrochemical behavior, the kinetic constants for $Cu^{I}$ turnover and for single-turnover electron transfer from $Cu^{I}$ to the enzyme are significantly reduced. The specificity constant with $Cu^{I}$ as substrate is reduced by one-fifth while the electron transfer rate from $Cu^{I}$ is reduced 50-fold. This mutation has little effect on the reactivity towards $Fe^{II}$ indicating that M345 contributes specifically to Fet3p reactivity with cuprous ion. These kinetic defects render the Fet3pM345A unable to support wild type cellular copper resistance suggesting there is a finely tuned copper redox balance at the yeast plasma membrane. (Oral presentation.)

## *S. AUREUS* PRESENTS A CONSIDERABLE THREAT TO THE PRODUCTIVITY OF CATTLE DUE TO THEIR HIGH DEGREE OF PATHOGENICITY AND METHODS OF SPREADING ANTIBIOTIC RESISTANCE.

Nathan Tompkins and Mark Gallo, Niagara University, NY 14109.

*S. aureus* presents a considerable threat to the productivity of cattle due to its high degree of pathogenicity and methods of spreading antibiotic resistance. In order to detect and investigate this particular causative agent of mastitis, a number of steps have been started. First, in conjunction with the Quality Milk Production Services Western Laboratory (Geneseo, NY), milk samples are being collected from dairy cattle with mastitis. Next, after

growing each isolate in *Staphylococcus* selective media, the cell cultures are used for both chromosomal DNA isolation and PFGE analysis. The former procedure has resulted in the collection of at least 30 samples of chromosomal DNA that will be used for subsequent PCR of rRNA gene sequences to ascertain their species identity. PFGE profiles will be created and analyzed to discern the diversity of *S. aureus* (the major species being evaluated). It is the project's main goal to use such experimental information to discern whether clonal strains of *S. aureus* are responsible for mastitis in dairy cattle or if there is instead a transmission of genes from one strain to another. The future creation and use of a low-density microarray chip composed of antibiotic resistance genes, toxin genes, and virulence factor genes, will allow for genotypic characterization in an attempt to address this question. (Poster presentation.)

## ANALYSIS OF BACTERIAL GROWTH IN SOYBEAN OIL AND BIODIESEL.

Eneda Toska and Dr. Hartmann, Department of Chemistry, Nazareth College of Rochester, Rochester, NY 14618.

Biodiesel was made from the transterification process in which soybean oil was combined with methanol, in a present of a catalyst, to produce biodiesel and a by-product, glycerin. Analysis of soil bacterial growth in biodiesel and soybean oil was done. Soil samples were taken from different areas such as camp east, camp north, camp south and farmers kitchen. The experiment was done by placing the soil samples in soybean oil, new and used, and in biodiesel, in different temperatures such as room temperature, body temperature and -7deg Celsius, to see if any bacterial growth occurred. Cloudiness presented bacterial growth. The spectrophotometer was used to measure absorbance of the oil and biodiesel immediately when the soil was added. Then, the spectrophotometer was again used to measure the absorbance values of the soil with biodiesel/soybean oil after 2-3days growth time. The absorbance values were compared. If it was an increase in absorbance value after 2-3 days bacterial growth occurred. The soil from camp south area showed some bacterial growth mostly in room temperature and at body temperature. The camp south soil/oil solution was cultured in non nutrient agar plates but no growth or isolation of bacteria occurred. (Poster presentation.)

## THE EFFECTS OF ESTROGEN ON SOMAL SIZE IN THE CA3 REGION OF THE HIPPOCAMPUS.

Arber Uka and Joan Magnusen, Division of Natural Sciences, Mathematics & Physical Education, Keuka College, Keuka Park, NY 14478.

Frozen sections of brains from six ovarectomized monkeys and from six ovarectomized monkeys that received estrogen replacement were examined to investigate a possible correlation between lack of estrogen and a reduction in cell body (or somal) size of pyramidal cell neurons. Neuron cell bodies were visualized using indirect immunohistochemical staining for the neuron marker protein NeuN. Sections were fixed in 4% paraformaldehyde, endogenous peroxidases were blocked in 3:1 methanol:3% hydrogen peroxide, blocked with 10% horse serum and incubated in primary antibody against NeuN overnight. The next day, the sections were incubated in biotinylated secondary antibody (horse anti-mouse) and then with avidin-biotin horseradish peroxidase which amplified the signal. Finally slides were incubated with diaminobenzidine tetrahydrochloride (DAB) which provided a substrate for the peroxidase and produces a brown color where the primary antibody originally bound. Slides were dehydrated through a graded alcohol series, Nissil stained for nuclei and transferred through alcohols to xylene and coverslipped.

The tagging of the NeuN protein stained the gray matter on the monkey brains. The CA3 region of the hippocampus was identified on each of the slides and NeuN positive cells with located with nuclei visible to identify both the cell body and its widest portion. An ocular micrometer was used to measure the diameter of the soma of a sample of cells on each slide. The experimenter was blind to the identity of the sections examined. The results show that the ovex cells were about 18% smaller than their ovarex + estrogen counterparts. The experiment suggests that in the absence of estrogen, cells of the hippocampus (CA3 section) are smaller. Smaller neurons are known to have fewer dendrites and spines. Thus, the hippocampus that develops in the absence of estrogen might be less capable of forming or accessing memories. (Poster presentation.)

## MOLECULAR MODELING AND COMPUTATIONAL ANALYSIS OF ANTIBACTERIAL PROPERTIES IN PARA-SUBSTITUTED PHENOL DERIVATIVES.

Mallory van Dongen, Mary McCourt, and Ronny Priefer, Niagara University, NY 14109.

Phenol is a known antibacterial reagent. Recently a study has been carried out in which phenol derivatives with various side chain substitutions have been used as possible antibacterial reagents. The purpose of that study was to develop a comprehensive structure-activity-relationship analysis of these phenol derivatives. Side chains were modified to include chain extension as well as modification to include nitrogen, oxygen, or halogenation. The efficiency of the antibacterial system was correlated to the side chain structure. SYBYL running on an HP1230 was used to develop a computational and structural analysis of these phenol derivatives. MOPAC charges were calculated to determine an electrostatic rationale for the efficiency of side chains. The objective of this computational study is to formulate a mathematical model to predict the antibacterial activity of substituted phenols. (Poster presentation.)

## ELSIE CLEWS PARSONS: "A CARRIER OF CULTURE RATHER THAN ITS FREIGHT".

Randi Vengelen and Rebecca Harrison, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Born in 1874 to a wealthy family in New York, Elsie Clews immediately felt the desire to abandon her elitist surrounding. In 1896 she attended Barnard College. She then continued her studies at Columbia University, receiving her Master of Arts and Ph.D. in sociology. After receiving her PhD in 1899, Clews returned to Barnard College to teach and lecture until 1905. Clews married her husband Herbert Parsons in 1900. Her career was initiated with her prolific writing. She wrote many books and articles on a variety of topics. The majority of her work (as a sociologist) was sparked by her concern for the ways the expression of one's personality is affected by the conventions of society. As World War I was brewing, Parsons began to abandon her work as a sociologist, in her exploration of anthropology and folklore. At the age of forty, Elsie Clews Parsons decided to devote the rest of her life to fieldwork, studying mostly the Pueblo Indians and several other cultures in Mexico. She tended to look on folklore as a source for understanding cultural diffusion. Parsons was widely recognized for her prolific career. From 1919 to 1920 she was the President of the American Folklore Society. From 1916 to 1925 Parsons participated as Treasurer and President of the American Ethnological Society. Her most momentous accomplishment was being elected as the first female President of the American Anthropological Association in 1940. After a successful and influential career, Elsie Clews Parsons died in 1941. (Poster presentation.)

## GENE EXPRESSION ANALYSIS USING MICROARRAYS OF PRION POSITIVE AND NEGATIVE YEAST STRAINS.

Amanda Watkins, Timothy Burdett, Dusten Pecor, and Irene Evans, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Gene expression in eukaryotes containing prion proteins (PrP) can be easily studied in the model organism, *Saccharomyces cerevisiae,* due to its relatively small and well- characterized genome. Experimentally shown to lack nucleic acids, these 'infectious' protein-only structures manage to convert the 'normal' form of a functioning protein (Sup35) into a different conformation. In the study of prion proteins found in yeast, two genetically identical strains of yeast that differ only in the conformation of Sup35, a prion-like yeast protein, are analyzed. In the [PSI+] strain, Sup35 assumes a prion conformation while in the [psi-] strain, the Sup35 gene product is in its non-prion conformation and functions as a translation release factor protein. The way in which these conformational differences of the Sup35 gene product affect gene expression in yeast can be experimentally investigated using spotted oligonucleotide DNA microarrays. DNA microarrays are powerful tools used to analyze gene expression in vivo because they allow simultaneous measurement of the level of transcription of all genes in the genome. Through use of the Array 50 Kit provided by Genisphere, both the [PSI+] and [psi-] cDNA isolates are tagged with a 3DNA capture reagent containing either Cy3 (green fluorescence) or Cy5 (red fluorescence) and hybridized to a glass array slide on which the entire yeast genome is printed. Statistically defined standards of data reproducibility are met by eliminating any non-biological factors through the refinement of the entire microarray procedure. Non-biological factors shown previously to interfere with data reproducibility include the oxidation and degradation of the Cy5 fluorescent label primarily by ozone. We are investigating various methods to provide an ozone-free or reduced

ozone environment. We are trying to reduce high background and flares on array slides post-scanning, as well as protect light-sensitive reagents from causing signal fading. The results of analyzing eight to twelve data sets will be discussed with regard to which genes are over- and under-expressed in the [PSI+] and [psi-] yeast strains. (Poster presentation.)

## THE EFFECT OF DIETARY CALCIUM ON GROWTH AND CALCIUM CARBONATE SHELL COMPOSITION IN AQUATIC SNAILS.

Emily Wright, Division of Natural Sciences, Mathematics, & Physical Education, Keuka College, Keuka Park, NY 14478-1274.

Snail shell calcium carbonate levels are controlled by many factors, one being the amount of calcium in the snail's diet. Here I report preliminary results of the effects of dietary consumption of pond snails on their growth (body mass) and shell calcium carbonate content. Three feeding groups of twelve snails were established, each with different dietary calcium availabilities. Initial body mass was taken before the snails were exposed to respective feeding groups and weekly thereafter for three weeks. Initial and final shell calcium carbonate content was also determined by a titration analysis to determine changes in calcium carbonate levels in the snails in respective feeding groups over the duration of the experiment. After the three week exposure period, it was determined that in *Physa* pond snails, dietary calcium is directly related to growth and calcium carbonate levels in their shells. Snails that were exposed to only low amounts of dietary calcium lost body mass by an average of 0.6g and lost about 2% calcium carbonate in their shells in a three week period. Snails that were exposed to high amounts of dietary calcium gained body mass by an average of 0.4g and gained about 1% calcium carbonate in their shells in the same three week period. Snails that were exposed to medium amounts of dietary calcium maintained body mass and had fairly constant levels of calcium carbonate in their shell. (Poster presentation.)

## TERRITORIAL BEHAVIOR IN FIDDLER CRABS, DEFENSE AND INTERACTION.

Chelsea Yaskow, Division of Natural Sciences, Mathematics & Physical Education, Keuka College, 141 Central Ave, Keuka Park, NY 14478.

Fiddler crabs are very social and behaviorally complex creatures. A major part of their behavior is the defense of their territory usually determined by the location and area surrounding their burrow. It has been observed by other researchers that both males and females will defend their burrow/territory against intruders.

This experiment attempted to document three different behaviors associated with the fiddlers' burrow including burrow activity, threats, and combat. Six crabs were used in this experiment, three males and three females. The 'burrow tank' was assembled with 15cm of sand tapering down to the water level creating the 'shore'. A barrier was also added in order to separate the two sides of a tank labeled A & B, and manipulate the crabs to establish territory. The removal of the barrier signified the introduction of intruders and acted as a catalyst for potential conflict between crabs on side A and side B. Artificial burrows were made by pushing the index finger pushing into the sediment and curling the tip of the finger to create a "J" shaped burrow.

Over a fourteen day period the crabs' data was recorded on the crabs' burrow activity and use of the burrow, threats to possible invaders, and combat resulting from a wandering crab. After the removal of the barrier it was believed that male B, the largest of the males, would be able to defend his territory and possibly win territory over A side males. Females were also expected to participate in the defense of their established burrows. Each of these three behaviors were observed when the physical barrier was between the two sides, and after the barrier was removed.

Before and after separation, burrow activity occurred almost immediately. Males were the first to begin use of the burrows. Males were also the first to begin defense of their burrows. Because there were two males on side A, threats occurred during the separation period. Combat however did not occur until the barrier was removed and only between males B and A1. Females did not participate in threats or combat in this study.

This study reiterated the observations that when territory is established, males will defend their burrows against intruding males even in a laboratory setting. This background study suggests the morphology of the fiddler crab burrow is varied by different factors such as size, sex and shore level. The general "J" shape seems to be varied in order to accommodate the fiddler crab for different behaviors or uses such as reproduction or refuge during high tide. A future study will investigate morphological differences between burrows. (Poster presentation.)

## GENESEE VALLEY GLACIAL HISTORY EXTENDED FROM 35,000 TO 49,000 YEARS BP, COINCIDENT WITH OCEANIC HEINRICH EVENT H-4.

Richard A. Young, Department of Geological Sciences, SUNY Geneseo, Geneseo, NY 14454.

Sixty-eight new radiocarbon ages on wood, bone, pelecypods, and plant remains establish that a major glacial advance occurred in the Genesee Valley 35,000 $^{14}C$ years ago, prior to the last recognized ice age. This Middle Wisconsin ice advance across the ancestral Genesee River floodplain buried a 36,000- to 49,000-year-old, spruce-dominated forest, including mammoth bones and teeth. The oscillatory advance created two glacial lake sequences separated by a short ice recession. The timing of this two-phase glacial advance coincides with the age of Heinrich Event H-4 in the North Atlantic Ocean. Heinrich Events are sudden massive ice advances that result in the discharge of unusual numbers if icebergs into the ocean. Six of these unusual glacial events have been identified and dated from ocean core studies. Understanding the origin of such events is considered important to studies of ice sheet instability and rapid climatic change. The same climatic events recorded in ocean sediment cores are mirrored in the detailed ice core records from Greenland and Antarctica.

The Genesee Valley evidence demonstrates that Middle Wisconsin glaciers extended well south of Lake Ontario, previously a matter of significant debate among Canadian geologists. The Middle Wisconsin record from the Genesee Valley is the most detailed such record in the eastern United States, and it triples the number of significant radiocarbon ages available for glacial deposits in western New York. The bone ages are apparently the oldest $^{14}C$-dated mammoth remains in the continental United States. The evidence uncovered to date implies that there is a much more extensive glacial record in western New York for Middle Wisconsin time that is probably preserved in sediments buried within the deeper valleys in the western Finger Lakes region. Details concerning this study appear in the 34$^{th}$ Binghamton Geomorphology Symposium on Ice Sheet Geomorphology published as Volume 75, Issues 1-2, of the journal, Geomorphology, p. 226-247, published in April 2006. (Oral presentation.)

# THIRTY-FOURTH ANNUAL SCIENTIFIC PAPER SESSION

## SUNY COLLEGE AT GENESEO
## GENESEO, N.Y.
## November 10, 2007

## LARRY J. KING MEMORIAL LECTURE

### Intelligent Design: Scientific Creationism's Next Generation. Faster, Smarter, and Still Wrong.
### Dr. Charles Mitchell, SUNY Distinguished Teaching Professor & Chair, Department of Geology, University of Buffalo.

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### INVESTIGATION OF THE MITOCHONDRIAL GENOME FOR VARIANTS THAT PROTECT AGAINST HEARING LOSS.

Osarhieme Aghayere, Noradilin Abdullah, Andrea Braganza, Amanda Souza, Brianca Parker, Robert D. Frisina, and Dina L. Newman, Department of Biological Sciences and the International Center for Hearing and Speech Research, Rochester Institute of Technology, One Lomb Memorial Drive, Rochester, NY 14623-5603.

Presbycusis is a type of sensorineural hearing loss that affects the elderly population. People suffering from presbycusis first have difficulties hearing sounds in the higher frequencies and later on, they cannot hear frequencies common in speech. Studies have shown that there is a strong genetic component to presbycusis susceptibility (30-40%). Interestingly, correlations have been observed especially in mother-child and sibling-sibling pairs but not in father-child pairs. This suggests a mechanism of inheritance: that one or more factors on the mitochondrial (mt) genome could influence susceptibility to presbycusis. The population for this study consists of ~500 individual subjects, all over the age of 58 years. Approximately 99% of the subjects are of European descent. Most of them have been classified into the 10 European haplogroups by genotyping at 9 defining single nucleotide polymorphisms (SNPs). In previous work done in the lab, we have found that men who belong to haplogroup K seem to have better hearing than men from all other haplogroups. Therefore we sequenced the entire mitochondrial genome for twelve subjects, whose haplogroups are known, and found 141 polymorphisms. We are choosing to genotype SNPs that appear to be specific to haplogroup K. So far we have designed 6 assays for genotyping our entire population of around 500 subjects. Four of these assays are RFLP and two are TaqMan. RFLP is Restriction Fragment Length Polymorphism; which uses restriction enzymes to differentially cut a piece of DNA, depending on its sequence. TaqMan uses fluorescent probes that anneal specifically to particular alleles. Results will help us determine which loci in the mitochondrial genome protect people from hearing loss. (Poster presentation.)

### USING RADAR INTERFEROMETRY TO CALIBRATE REGIONAL SCALE GROUNDWATER MODELS.

Greg Babonis, 780 Natural Sciences Center, SUNY at Buffalo, Buffalo, NY 14260.

Only 2.5% of all water on Earth is fresh water, and approximately 70% of that fresh water is locked up in glaciers and permanent snow cover. With 0.3% residing in lakes, rivers and reservoirs, the remaining 29% of potable water exists in the subsurface. For the United States alone, 50% of the drinking water comes directly from groundwater. Understanding the role of groundwater transport is of vital interest in global water management for

both resource regulation and quality, yet little is known about the influence of sub-surface water cycling at the sub-continental or continental scale.

One indicator of shallow groundwater flow is surface water, which can be considered as an outcropping of groundwater and directly reflects how subsurface heads drive water from higher to lower elevations. If the elevations of surface water sources can be measured on regional scales, then numerical models of groundwater flow can be used to predict large-scale groundwater transport. Synthetic Aperture Radar (SAR) is a technique well suited for this task due to its capability of deep-canopy penetration, and sensitivity to moisture.

This study will determine surface water elevations on a regional scale by applying remote sensing techniques to isolated wetlands and seepage lakes in Vilas County, Wisconsin. A wetland classification system will be developed based upon radar backscatter return. The accuracy of the classification system will be assessed through groundtruthing. The relationship between our classification system and viewing platform parameters will be defined then extrapolated to other SAR platforms. Finally, the wetland backscatter data will provide the elevation inputs to calibrate numerical models of groundwater flow that allow both: the prediction of large-scale groundwater transport and the effective management of groundwater resources. (Poster presentation.)

## INVESTIGATION OF AN ELECTROPHILIC ADDITION THAT CONTRAVENES MARKOVNIKOV'S RULE.

D. Banas, D. Buckley, and E. Helms, Bailey 219, SUNY Geneseo, Chemistry Department, 1 College Circle, Geneseo, NY 14454.

The electrophilic addition of HCl to an alkene is often one of the first reactions learned in an organic chemistry class. It is also taught that this reaction follows Markovnikov's rule, which states that the hydrogen will attach to the carbon with fewer substituents while the chlorine will attach to the carbon with more substituents. However, according to the literature the reaction of HCl with atropic acid, an α,β-unsaturated carboxylic acid, does not follow this rule. We suggest that the reaction follows an alternate mechanism that involves a 1,4-addition of HCl across the conjugated alkene and carboxyl group as opposed to the normal 1,2-addition across the alkene. AM1 semi-empirical molecular orbital calculations were used to determine the energies of the two possible carbocations of the 1,2-addition and of the carbocation of the 1,4-addition. Our data suggests that carbocation produced by the 1,4-addition is the most stable. We also carried out the reaction using DCl. The product was analyzed using $^{1}$H NMR spectroscopy to determine the location of the deuteration. By determining the amount of deuterium incorporation at the α position, the mechanistic pathway suggested by the molecular modeling can be supported. (Poster presentation.)

## HISTONE DEACETYLATION DOES NOT APPEAR TO PLAY ROLE IN DEX-INDUCED LOSS OF E-CADHERIN EXPRESSION IN A431 CELLS.

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One common sign of an aggressive epithelial cancer is the absence of the cell to cell junction protein, Epithelial (E)-cadherin. The mechanism of E-cadherin loss is varied ranging from gain of transcription factors that suppress E-cadherin expression (Snail, Sip-1 and E2A) to methylation of the E-cadherin gene and/or histone deacetylation. The vulvar cancer cell line A431 has many characteristics of normal epithelial cells, expressing E-cadherin, and forming junctions associated with epithelial cell types. A431 cells experience loss of E-cadherin when treated with the glucocorticoid, dexamethasome (dex). We examined the hypothesis that downregulation of E-cadherin by dex is caused by histone deacetylation. A431 cells that had experienced dex-induced loss E-cadherin (A431D) expression were treated with the deacetylating agent, Tricostatin A (TSA) (dissolved in ethanol) for 3 and 6 days. Parental A431 cells were also treated with TSA for comparison of phenotype and growth characteristics. The A431D cells did not show reexpression of E-cadherin after 3 or 6 days as visualized by immunofluorescence microscopy. Both parent A431 cells and the A431D cells treated with TSA showed slightly slower cell growth and some evidence of apoptosis as compared to the ethanol treated controls. Our study suggests that dex-induced loss of E-cadherin in the A431 cells is not due solely to histone deacetylation. Our studies do not rule out the possibility that histone deacetylation may play a part in silencing of E-cadherin however, it suggests that if it does, it is working in conjunction with a second mechanism such as DNA methylation. This possibility is being explored. (Poster presentation.)

## BURROW OXYGEN DYNAMICS OF THE FRESHWATER CHIRONOMID LARVAE.

A. M. Bantelman and W. J. Edwards, Department of Biology, DePaul Hall, Niagara University, NY 14109.

Hypoxia is a growing problem in freshwater ecosystems worldwide, typified by Lake Erie. In the central and western basins of Lake Erie macrobenthos species such as *Hexagenia limbata* (mayfly) and *Chironomus* spp. are present. These taxa, as well as other burrowing macrobenthos species, use burrow irrigation in order to obtain food and oxygenated water. Burrowing macrobenthos species increase oxygen demand by oxygenating anoxic sediment via their own respiration. Mayfly and chironomid larvae were collected from the central basin of Lake Erie and placed in mesocosms where sediment oxygen demand was tested using oxygen probes and a hot film anemometer. Burrow irrigation in both species resulted in an increase in sediment oxygen demand, which may contribute to hypoxia in the lake. Burrowing macrobenthos species contribute to dissolved oxygen dynamic and should be analyzed further. (Poster presentation.)

## FISHES OF HONEOYE CREEK.

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The purpose of this survey was to determine the population structure and diversity of fishes in Honeoye Creek in western New York. A fisheries survey had not been conducted in this stream for nearly twenty-five years. Honeoye Creek originates as the outlet of Honeoye Lake and flows northwestward to the Genesee River. A backpack electro-fisher was used to sample nine sites in Ontario and Monroe County portions of the stream. Two 100 meter reaches were sampled at each site for a total of 18 sampling runs. Fish species, abundances and length (mm) data were recorded at each site. Concurrent water quality measurements included dissolved oxygen (mg/L), temperature (°C) and specific conductance (µs/cm). Thirty-five fish species representing eight families were encountered. Dominant taxa included cutlips minnow (*Exoglossum maxillingua*) from the Cyprinidae Family, and bluegill (*Lepomis macrochirus*) and pumpkinseed (*Lepomis gibbosus*) from the Centrarchidae Family. Several fish were collected that had not been recorded previously from Honeoye Creek, including rainbow darter (*Etheostoma caeruleum*), spottail shiner (*Notropis hudsonius*), and johnny darter (*Etheostoma nigrum*). Fish community diversity (H') was moderate, ranging from 1.73 to 2.53. Sorensen's index of similarity was used to compare changes in community structure along the length of the creek. (Poster presentation.)

## INVESTIGATING THE OSMOTOLERANCE OF *ENTEROBACTER SAKAZAKII* USING TRANSPOSON MUTAGENESIS.

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*Enterobacter sakazakii* is a Gram-negative bacterium that is ubiquitously found in the environment and is a rare cause of bloodstream and central nervous system infections. Those at greater risk for infection are newborns with significantly low birth weight, premature infants or infants who are immunocompromised. The bacterium is known to cause neonatal meningitis, necrotizing enterocolitis, hydrocephalous, and 40%-80% of cases result in death. Infants who survive often experience seizures and developmental delays. Studies have shown that the vehicle for transmission is powered infant formula, which is used as substitute for breast milk.

When many bacterial species are exposed to osmotic stress, protective mechanisms are induced that increase the organism's survival rate. In this study, transposon mutagenesis is used to identify gene products that increase the survival rate of *E. sakazakii* in highly osmotic situations. Unlike DNA microarrays or proteomics, transposon mutagenesis allows the identification of a gene regardless of how its' expression is regulated, and it also provides the possibility of interrupting the biosynthetic pathway of non-protein cellular components.

The transposon EZ-Tn5™ <R6Kγori/KAN-2> was randomly inserted into the genome of *E. sakazakii,* thus creating a library of mutants. To date we have screened 1350 *E. sakazakii* insertion mutants for survival in 40% sorbitol, and have confirmed 4 osmotolerance mutants. To identify the transposon insertion point in the confirmed mutants, the genomic DNA from the area around the transposon was sequenced. The DNA sequence was then translated into protein for all 6 reading frames and then used to search the protein database to determine the probable function of the interrupted genes. So far, three mutants have been sequenced. Mutant I12 showed a gene interruption

in a locus that matches the *rhs* family genes, specifically in an area that codes for ankyrin repeats; N3 has an interruption in a gene that is similar to the *wecC* gene, and AD12 interrupted a portion of the genome that is upstream of a gene encoding a putative glycosyl transferase. The exact role these proteins have in the osmotolerance of *E. sakazakii* is, as of yet, undetermined. Recent work has focused on the targeted deletion of the gene coding the ankyrin-like protein. (Poster presentation.)

## BACTERIAL PRODUCTION OF BIODEGRADABLE PLASTICS FROM BIODIESEL PROCESS WASTER GLYCEROL.

Gregory D. Boyd, Matthew R. Martino, and Christopher T. Nomura, Department of Chemistry, SUNY-ESF, 1 Forestry Drive, Syracuse, NY 13210.

The byproduct of the transesterification of triglycerides to produce biodiesel is glycerol. Although glycerol has several applications, the current market is saturated, thus, finding new uses for glycerol produced with biodiesel will be of the utmost importance. In this study we evaluated the ability to transform low-value glycerol from biodiesel production into a value-added, biodegradable polyhydroxyalkanoate (PHA) polymer using the bacterium, *Pseudomonas putida* KT2440. PHAs are biodegradable plastics produced from renewable biomass with potential uses as bulk commodity plastics and in medical applications. Although a variety of PHAs have been made in recombinant and native microorganisms, a major obstacle to their widespread use has been the expense of large-scale production. Use of low-value glycerol as a carbon feedstock to be transformed to biodegradable plastics could significantly lower the price of PHA production and create a new marketplace for the anticipated excess waste glycerol from biodiesel production. (Poster presentation.)

## THE NANO SIZE DEPENDENCE OF CONJUGATION OF THE AMYLOID BETA PROTEIN ON THE SURFACE OF GOLD COLLOIDAL NANOPARTICLES.

Nicole Briglio, Hyunah Cho, and Kazushige Yokoyama, Box 0652, 10 MacVittie Circle, Geneseo, NY 14454.

Proteins immobilized at an interface are expected to behave differently from their counterparts in bulk solutions, and understanding the interactions of the proteins on the interface surface is crucial to designing a bio-composite device. Our particular interest is in conformational changes in Amyloid Beta protein solution (Abeta) on the surface of gold colloidal nanoparticles. The absorption spectroscopy was utilized to identify changes in the optical property of the gold colloidal nanoparticles coated with Abeta for a pH range of 2 to 10. Color changes were seen in different pH values as the size of the gold colloid was varied from 5 nm to 100 nm. The pH value for color change varied from pH 4.5 to 5.8. Considering that bare gold colloid changes color around pH 3, the surface net charge of the gold colloid must have been altered due to the conjugation of the Abeta protein on the colloid surface. (Poster presentation.)

## BIOLOGICAL ASSAY FOR TYPE II DIABETES.

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Millions of Americans are diagnosed with Type II Diabetes each year. Current methods of treatment include the use of medication to help control high blood glucose levels. These attempts do not treat the underlying cause of the disease. Current research has shown that the protein tyrosine phosphatase 1B (PTP1B) is over active and therefore dephosphorylates the tyrosine residues found in the insulin receptor. As a result insulin cannot bind and glucose cannot move into the cells. The aim of this research is to develop an inhibitor to slow this dephosphorylation process. An assay is currently being developed to demonstrate the behavior of PTP1B. (Poster presentation.)

## DEVELOPMENT OF A NEW GASTROINTESTINAL MOTILITY ASSAY IN THE ZEBRAFISH.

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Gastrointestinal motility disorders such as constipation, gastroparesis and Hirschsprungs disease are common. Treatment options for these disorders are limited. Therefore a new model system is desirable that will contribute to a

more complete understanding of the mechanisms that to regulate motility, and also to identify novel drug targets to treat dysmotility. I have shown that Gleevec, a tyrosine kinase inhibitor, prevented development of coordinated GI motility in zebrafish larvae. These results suggest that zebrafish require interstitial cells of Cajal to develop complex coordinated motility patterns, similar to the mouse model and to humans. The zebrafish GI tract is anatomically and physiologically similar to humans, containing enteric neurons, smooth muscle, and the Interstitial Cells of Cajal (ICC). Zebrafish larvae are transparent and GI motility can be observed *in vivo*. Using digital imaging and spatiotemporal analysis coordinated contraction patterns are quantified. However, these experiments do not directly measure GI transit time which reflects the outcome of motility. For example, uncoordinated contractions may move intestinal contents, but not propel it efficiently in an oral to anal direction. The objective for these experiments was to develop a functional GI motility assay using a specific fluorophore and a spectrophotometer. These experiments were performed during the summer MERCK-AAAS fellowship program at SUNY Brockport. Zebrafish spontaneously ingest Rhodamine-b labeled dextran suspended in the media. After loading larvae were placed in 24 well plates containing 500 µl of water. Propulsive GI motility will eliminate marker over time, and the marker concentration will be proportional to GI motility. Total fluorescence emission was measured 24 hours after loading. Larvae pre-treated with Gleevec showed decreased fluorescence emission compared to control larvae. These data are consistent with spatiotemporal analysis suggesting that ICC are necessary for development of coordinated propulsive motility. This new functional assay enables quantitative GI motility experiments to be performed in zebrafish larvae. Supported by MERCK AAAS and NIH DK07158801. (Poster presentation.)

## EXAMINATION OF THE EFFECT OF N-CADHERIN AND VIMENTIN EXPRESSION ON CELL MOTILITY.

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Cadherins are glycoproteins that are crucial in the maintenance of cellular organization through calcium dependent mediation of cell-cell interactions. In many types of cancer downregulation of Epithelial cadherin (E-cad) leads to decreased cellular adhesion, loss of contact inhibition, and increased proliferation, which are observed characteristics of carcinogenesis. Similarly, an upregulation of Neural cadherin (N-cad) leads to increased cell motility and invasiveness. Loss of E-cad and gain of N-cad expression are now biological markers of carcinogenesis in some cancer types. In addition to N-cad, vimentin expression is another biomarker signaling poor prognosis in some types of cancers. Recent evidence suggests that N-cad and vimentin may actually interact intracellularly. While N-cad expression has been shown to increase cell motility, it is unclear if vimentin expression plays a part in this increased motility as well. Using a scratch assay to compare cell motility over a period of twenty-four hours, we were able to determine the motility rate in six cell lines. Each cell line had varying levels of expression of N-cad and vimentin protein. We hypothesized that N-cad and vimentin would have a higher rate of motility than N-cad or vimentin alone or cells expressing E-cad but no N-cad or vimentin. Our preliminary results, however, suggest the opposite trend. (Poster presentation.)

## CHARACTERIZATION OF QUORUM SENSING SIGNALS FROM BACTERIA ISOLATED FROM FIELD GRAPEVINE TUMORS.

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*Agrobacterium vitis* is a soil bacterium that is the causal agent of crown gall disease on grape vines. The bacterium can survive systemically within the grapevine and tumor, thus reducing vine vigor. *A. vitis* regulates necrosis on grape vines and plasmid transfer among *Agrobacterium tumefaciens* through a gene regulatory mechanism of bacterial communication known as quorum sensing (QS). QS is a cell density-dependent mechanism which regulates these disease causing traits in grape. *A. vitis* regulates this process using small communication signals known as *N*-acyl homoserine lactones (AHLs). An AHL consists of a fatty-acyl chain ligated to a homoserine lactone ring structure. In this work, 42 bacterial isolates previously characterized as non-*Agrobacterium* from field grape tumors were screened for AHL production using T-streak assays, well-diffusion signal detection assays and thin layer chromatography (TLC) combined with signal detection overlay assay. Eighteen (18) strains were confirmed to produce at least one AHL signal while twenty-four (24) strains were confirmed to be negative for

signal production. This work would determine if non-*Agrobacterium* isolates could contribute AHL signals on the grapevine and contribute to grape pathogenesis by pathogenic *A. vitis* strains. (Poster presentation.)

## SORPTION IMPACT OF CHLOROFLUOROCARBONS TO CARBONACEOUS MATTER ON GROUNDWATER AGE-DATING.

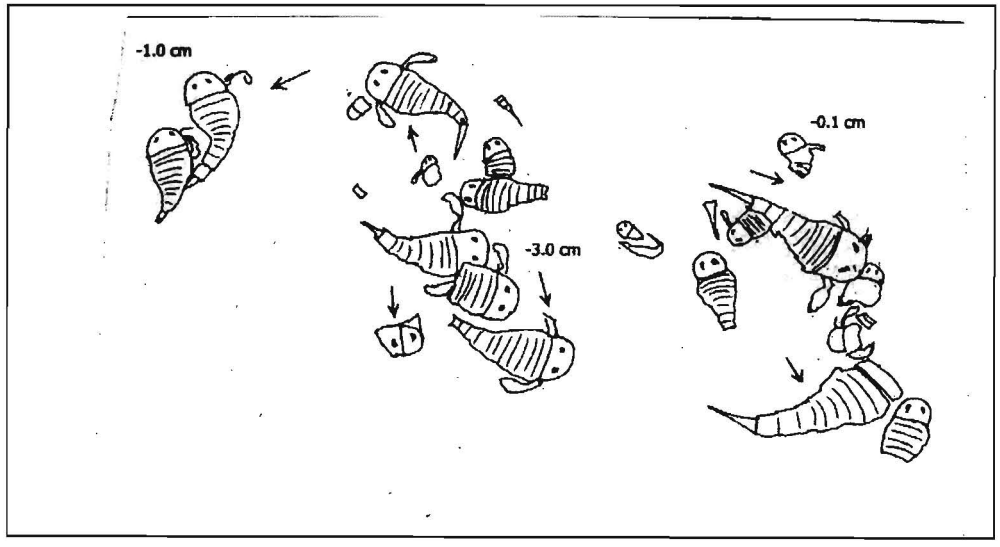
Sungwook Choung and Richelle M. Allen-king, Dept. of Geology, SUNY Buffalo, 876 Natural Science Complex, Buffalo, NY 14260.

The chlorofluorocarbons (CFC), CFC-11, CFC-12, and CFC-113, have been used as environmental tracers for groundwater age-dating. Most studies of CFC age-dating assume either conservative behavior (no sorption) or linear sorption with low $K_{OC}$. However, sorption of other hydrophobic organic chemicals to thermally altered carbonaceous matter such as char, soot, and kerogen is exceptionally stronger than to bulk soil organic matter. Although CFCs have low water solubility, sorption studies of CFCs to various forms of carbonaceous matter (CM) have not previously been reported.

This study focuses on determining the sorption of CFCs to two forms of CM, which is the first step in evaluating the effects of sorption on groundwater age-dating. Sorption experiments using batch techniques were performed with wood char as a representative of thermally altered CM forms and commercial humic acid as a representative of amorphous organic matter. Batch experiments using five different aqueous phase CFC concentrations ranging over four orders of magnitude were employed to develop sorption isotherms. The humic acid sorption reached equilibrium quickly while equilibration with wood char required about 100 times longer. Nonlinear sorption behavior to char was observed, but humic acid showed relatively linear sorption behavior. Comparison between wood char and humic acid $K_{OC}$ values indicates that sorption of CFCs to wood char is $\geq$ 100 times stronger than sorption to humic acid at low dissolved concentrations. Considering the strong sorption to thermally altered CM, the retardation factor was greatly increased in comparison to the estimates from previous studies. These results suggested that CFCs can be significantly retarded even in low thermally altered CM contents. Therefore, this study shows that groundwater age-dating on the basis of CFC techniques may require consideration of retardation in aquifer environments containing thermally altered CM. (Poster presentation.)

## EURYPTERID PRESERVATION: A GREAT LATE SILURIAN STORM EVENT (TEMPESTITE) PRESERVED WITHIN THE '*EURYPTERUS* BED' OF THE WILLIAMSVILLE FORMATION, BERTIE GROUP OF ONTARIO, CANADA.

Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, NY 14609.




Eurypterid Windrow: Generalized sketch of a slab of uppermost Williamsville Waterlime showing numerous eurypterid molts preserved and probable currents at time of deposition within a scoured depression. The flat surface is the A-B Event Horizon.

The Bertie Group of the Niagara Peninsula of Ontario, Canada in the type area has yielded thousands of specimens of eurypterid remains during the past few decades. One particular horizon, Williamsville A, representing the lower 20 inches (0.5 m) of the Williamsville Fm., is replete with the eurypterid *Eurypterus lacustris* (Harlan), specimens of which are found in museums all over the world. As interpreted previously, the upper boundary of Williamsville A, at the contact with Williamsville B, appears to represent a widespread storm event that scoured previously deposited sediment, leaving behind a blanket of typically marine brachiopod debris and sedimentary structures indicating strong current activity.

A large slab of uppermost Williamsville A (see graphic above), measuring xx cm by xx cm and 3 cm thick preserves 17 eurypterid specimens representing two species, viz. *Eurypterus lacustris* and *Eurypterus dekayi*. As interpreted herein, the slab preserves a good example of eurypterid molts preserved within a scoured depression. The molts consist of 15 individuals dorsal down and 2 individuals dorsal up.

Eurypterids are commonly found in windrows of oriented material on bedding planes. The specimen described here is an example of a windrow, but exhibits two important features. One, the remains are preserved within a depression. Two, the remains are oriented in such a way as to indicate that they were deposited via a gyre, i.e. circular/spiral currents that aligned some molts together in one direction, and others in other directions. See suggested current flow on above chart and note thickness of the depression. It is likely that a Late Silurian storm, possibly of hurricane strength, caused the preservation of countless specimens of fauna and flora just beneath the Williamsville A-B contact. The storm ended with a sheet of brachiopod debris. (Poster presentation.)

## A RE-EXAMINATION OF DIRECTIONAL AND PALEOINTENSITY RESULTS FROM THE KIAMAN REVERSED POLARITY SUPERCHRON AT KIAMA: A SINGLE CRYSTAL APPROACH.

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Long-term paleointensity trends are largely based on comparisons of values from the Cretaceous Normal Polarity Superchron and the preceding and succeeding mixed polarity intervals. Numerous data sets including single plagioclase crystals, submarine basaltic glass and the natural remanent magnetization of submarine basalt suggest an inverse relationship between reversal frequency and field strength over the last ~180 million years. Here we extend this examination further into the geologic record by examining the Kiaman Reversed Polarity Superchron. A resampling and new examination of detailed stepwise demagnetization data from whole rock samples demonstrates complex magnetizations in some of the flows. This complexity probably reflects subsequent geologic events, and the propensity to record such secondary signals in non-ideal magnetic carriers present in whole rock samples. Alternatively, single plagioclase crystals may yield data that can see through the later geologic history as they can contain minute magnetic inclusions. Preliminary paleointensity studies of unoriented plagioclase crystals from the Bombo flow and Dapto latite demonstrate that the single crystal approach is a viable technique to see beyond laboratory and geologic alteration. Results using several variations of the technique will be presented. (Oral presentation.)

## MIDDLE DEVONIA CONODONTS FROM THE HALIHAN HILL BED, OATKA CREEK FORMATION, WESTERN NEW YORK.

Robert D'Andrea, Department of Geological Sciences, SUNY Geneseo, Geneseo, NY 14454.

The Eifelian-Givetian stage boundary has yet to be accurately placed in the Appalachian Basin. The boundary is defined by the appearance of the conodont *Polygnathus hemiansatus* and subsequently as a shift from the appearance of the *ensensis* fauna to that of the *hemiansatus* fauna. The Oatka Creek Formation type locality in Leroy, NY represents one likely location where the boundary may be located. The Halihan Hill Bed in the lower Oatka Creek Formation yielded *Polygnathus robusticostatus*, *Icriodus angustus*, *Icriodus expansus*, *Icriodus brevis*, and *Tortodus cf. Totodus shultzei* Aboussalam. These conodonts indicate that the Halihan Hill Bed is Givetian in age. Thus, the Eifelian-Givetian boundary is below the Halihan Hill Bed and above the Cherry Valley Formation of the Union Springs Subgroup. (Poster presentation.)

## EXPRESSION AND PURIFICATION OF THE MULTICOPPER OXIDASE FET5 FROM *SACCHAROMYCES CEREVISIAE.*

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Iron and copper are essential for the maintenance of normal organismal function. Studies have shown patients with decreased copper levels display similar characteristics (ataxia, lowered hemocrit, and reduced mitochondrial functions) as patients that are iron deficient. In fact, it has been well established that individuals with decreased copper levels are iron deficient. The correlation between copper and iron can be better understood by examining a family of enzymes called the multicopper oxidases (MCOs). Throughout this research, Fet5, a putative (MCO), will be isolated from the baker's yeast *Saccharomyces cerevisiae* to better understand the copper-iron connection in eukaryotes. This research will use *Pichia pastoris,* a methylotrophic yeast, to express Fet5 because it has a high level of protein expression. The overall aim of the current study is the expression and purification of the MCO Fet5p. (Poster presentation.)

## LOCALIZATION OF MELANIN-CONCENTRATING HORMONE RECEPTOR-1 TO CAVEOLAR MEMBRANES.

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G protein-coupled receptors (GPCRs) have been identified within the caveolar region of mammalian cells. The recently discovered Melanin-concentrating hormone receptor-1 (MCHR-1) is a member of the GPCR superfamily, and has been shown to function in the regulation of food consumption and energy metabolism. Mice with a deleted MCHR-1 gene display characteristic traits, including leanness, hyperactivity, increased food intake, and resistance to diet-induced obesity. The MCH receptor has also been isolated in pancreatic and fat tissue. Fat cells begin their journey as pre-adipose cells, culminating in the formation of adipose tissue as differentiation occurs. Of interest to note, fat cells accumulate caveolin-1 and cholesterol during this process. Caveolae are cholesterol- and sphingolipid-rich regions that cluster within the plasma membrane. These caveolar areas have been shown to participate in cell signaling and desensitization. Caveolin-1, an integral membrane protein and a key component of caveolae lipid rafts, binds cholesterol. Our hypothesis is that altered MCH signaling pathways may contribute to the appetite dysfunction of those individuals with eating disorders, such as anorexia and obesity. Increased (or decreased) amounts of adipose tissue, and thus caveolae, may play a central role in the signaling of MCHR-1, resulting in the observed pathology. Our research has shown the presence of MCHR-1 in caveolae-associated lipid rafts via a detergent-free method, ultracentrifugation, and Western blotting. In addition, 1.0-μM MCH exposure has been shown to have no effect on MCHR-1 localization to caveolae membranes within a ten minute time course. Preliminary co-immunoprecipitation data implies that there may be a direct interaction between MCHR-1 and caveolin-1. Cholesterol depletion drugs were used to assess the role of caveolae in MCH functioning. Our data suggest that cholesterol depletion decreases the levels MCHR-1 at the plasma membrane, as measured by ELISA. These results provide a potentially important link between dietary cholesterol intake and MCHR-1 signaling. (Oral presentation.)

## MIDDLE DEVONIAN TENTACULITIDS FROM THE CHITTENANGO SHALE, OATKA CREEK TYPE LOCALITY, LEROY, NEW YORK.

Patrick Donohue, Department of Geological Sciences, SUNY Geneseo, Geneseo, NY 14454.

Based on conodonts the Eifelian-Givetian (E-G) Stage boundary in the northern Appalachian Basin is within the lower Hamilton Group between the Cherry Valley Member of the Union Springs Formation and the Stafford Member of the Skaneateles Formation. The E-G boundary corresponds to the end of the Kacák Event, but has not been precisely placed in the northern Appalachian Basin. The Chittenango Shale of the Oatka Creek Formation at the type locality along Oatka Creek is one of three possible strata for the Otamari Shale equivalent and E-G boundary. The tentaculitids Nowakia (Dmitriella) sulcata postsulcata? n.n. ALBERTI 1993 and Viriatellina fortistriata? LÜTKE 1985 were recovered from the lower Chittenango Member, approximately 2 m above the Halihan Hill Bed. These taxa are not known to range into the Givetian and suggest that the boundary is higher in the Chittenango.

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Lütke, F. 1985 Devonian tentaculites from Nevada (USA). Courier Forschungsinstitut Senckenberg, 75:197-226. (Poster presentation.)

## THE RECONCILLIATION OF MORPHOLOGICAL AND MOLECULAR EVOLUTIONOF IGUANAS.

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There have been comprehensive comparative studies on the morphology of iguanas, primarily on skeletal and soft tissue characters. Studies using mitochondrial DNA to reconstruct evolutionary relationships (among iguanas) have also been published. Nuclear genes are currently being examined to assist in this reconstruction of those relationships. Morphological and molecular data suggest conflicting evolutionary histories for iguanid lizards. Morphological data suggest that the genus *Iguana* and *Cyclura* are sister groups. Molecular data suggest that *Iguana* is, instead, a sister group to *Sauromalus*. There is also disagreement about the placement of the genus *Ctenosaura*. Studies have compared morphological and molecular trees from a statistical perspective, but have ignored the evolution of specific morphological features as a means of evaluating hypothesis support. A different mechanism is needed to test competing hypotheses. As an alternative, I identified 12 key morphological characters that drive the morphological hypothesis of evolutionary relationships. These characters are temporal scales, size of anterior auricular scales, chinshields II, chinshields III, number of ventral transverse scale rows within a caudal segment, parasagittal gular folds, dewlap, squamosal bone, cristae of ventrolaterales of the parabasisphenoid bone, angular bone shape, anterior extent of surangular bone, and length of second ceratobranchials. I mapped these characters onto both trees to determine how much less parsimonious their evolution is on a molecular tree vs. a morphological tree. The evolution of morphological characters on the morphological tree is 354 steps long, while 367 steps on the molecular tree. My analyses will map those 13 additional steps as an attempt to evaluate their evolution in the context of the ~40 million year evolution of iguanas. (Poster presentation.)

## CHS IN FERNS.

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The *chalcone synthase* (CHS) genes are present in all plant species. As time passes, the accumulation of mutations leads to fewer similarities among the gene sequences providing a measure of the relatedness among organisms containing the gene. CHS is an ideal gene for phylogenetic analyses and will be used to examine fern evolution. Various fern species were analyzed to determine whether or not they contain the CHS genes. A Southern blot was performed using fern genomic DNA. The blot shows that ferns do in fact have CHS. Future studies will focus on cloning the gene from a genomic library of fern DNA. (Poster presentation.)

## MUTATION OF *RELA* GENE DISRUPTS *N*-ACYL HOMOSERINE LACTONE PRODUCTION AND GROWTH CHARACTERISTICS IN A *SPHINGOMONAS SP.* ISOLATED FROM A GRAPE FIELD CROWN GALL TUMOR.

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Bacterial isolates were collected from grape field crown gall tumors. One-hundred and twenty-eight isolates were purified and characterized for bacterial communication signals called *N*-acyl-homoserine lactone (acyl-HSL). An isolate, Rr-2-17, was found to produce significant amounts of acyl-HSLs and identified as a member of the *Sphingomonas* genus using 16S rRNA gene sequencing. *Sphingomonas* sp. isolate Rr2-17, was subjected to genetic mutagenesis using transposon, Tn5. Approximately 800 kanamycin-resistant mutants were screened for disruption of acyl-HSL signal production. Mutant named HX-699, was identified by its lack of acyl-HSL production in cross-streak bioassays. DNA sequence analysis of the mutated region in mutant HX-699 showed homology to known *relA/spoT* genes. The *relA/spoT* are commonly involved in the regulation of genes in response to bacterial cell nutrient starvation, a response known as the stringent response. In this response bacteria acclimatize to a shortage of

nutrients through a global signal called (p)ppGpp, the product of the *relA/spoT* locus. The cell surface and growth characteristics were altered in mutant HX-699. Mutant phenotypes could not be restored by the addition of acyl-HSL signals from parent strain Rr2-17. These findings suggest that the stringent response affects acyl-HSL signal production, cell surface development and growth clumping phenotypes in members of the *Sphingomonas* genus. (Poster presentation.)

## EXAMINING THE VERTICAL EXTENT OF DROUGHT IN THE WESTERN UNITED STATES.

C. Garrity, Department of Geography, SUNY Geneseo, 1 College Circle, Geneseo, NY, 14454.

Spatial examinations of drought have historically ignored a vertical moisture component. In this research, I use Palmer Drought Severity Index (PDSI) data by climate division to identify surface moisture conditions and standardized NCEP/NCAR Reanalysis (NNR) specific humidity data to identify the vertical extent of drought in the western United States, for the period 1973-2002. To answer the question, what is the vertical extent of drought, I calculated moisture profiles for drought conditions using a Geographic Information System (GIS). Discriminant analysis provided a method of determining the extent to which the vertical moisture profiles of drought are distinguishable from vertical moisture profiles of wet surface conditions.

The results show that the vertical extent of drought in the western U.S. for the period. 1973-2002, extended through the lowest levels of the profile. Discriminant analysis showed that low-level moisture was the most important discriminator between the dry and wet surface conditions. Temporal and spatial sensitivity analyses revealed finer differences by decade, season, and sub-region of the dataset. Moisture profile characteristics coincide with seasonal changes in dominant precipitation mechanisms over the study area, convection in warm seasons, and cyclonic activity in winter. (Oral presentation.)

## USING TOPOGRAPHIC RELIEF AS A STRAIN MARKER IN NEOTECTONIC SETTINGS.

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Transpressional models have greatly increased our understanding of the processes active at obliquely convergent plate boundaries. The original model involves strike-slip motion parallel to the boundary accompanied by contraction across the boundary and elongation in the vertical dimension. Vertical elongation results entirely in the flow of material upwards towards surface—i.e. the development of topographic relief when applied at the plate boundary scale. When this traditional form of transpression is used at large scales it ignores the effects of erosion and isostatic compensation. We present a two-dimensional numerical model of the convergent component of transpression that incorporates both of these factors. Airy isostasy is used to describe the effects of isostatic compensation. Previous workers developed an empirical relief vs. erosion rate relation which is used to describe the effects of erosion. The model is used to investigate the effects of erosion rate and rate of convergence on development of topography and crustal roots. Model results suggest the topographic relief in convergent settings is more dependent on the total amount of contraction than the rate of plate motion or the rate of erosion. Application to a well constrained tectonic setting, the Alpine fault zone in New Zealand, shows the model does a reasonable job of describing the known topography and crustal root thickness, This suggests that application of this model to less well constrained settings may provide additional information on the tectonic history of such areas. In particular, it implies that topographic relief may be used as a strain marker for estimating the total amount of deformation in neotectonic settings where other markers are unavailable. (Oral presentation.)

## GENETIC POLYMORPHISMS AND HDL METABOLISM IN CORONARY ARTERY DISEASE.

Megan Gombert, Deborah Leonard, Brent Williams, and Michael Merhige, Biology Department, 5795 Lewiston Rd., Niagara University, NY 14109, and The Heart Center of Niagara, 571 Tenth St., Niagara Falls, NY 14302.

The high number of patients with heart disease in Niagara County has led to in depth studies of the many factors affecting heart disease. The concentration of high-density lipoprotein (HDL) is an important factor in determining a patient's risk of developing coronary artery disease. HDL plays an important role in reverse

cholesterol transport, the removal of cholesterol from atherosclerotic lesions and transport to the liver for excretion. Four genes that have been shown to regulate this process are apolipoprotein A-1, lipoprotein lipase, cholesteryl ester transfer protein, and adenosine triphosphate binding cassette transporter A1. The linkage disequilibrium plots of these genes were examined, representative single nucleotide polymorphisms (SNPs) were identified, and primers were designed so that patients undergoing cardiac positron emission tomography (PET) at the Heart Center of Niagara could be genotyped. Once genotyping is complete the data will be correlated with clinical data including HDL levels and disease status to identify SNPs that can serve as markers for CAD risk. (Poster presentation.)

## GLEEVEC INHIBITS DEVELOPMENT OF COORDINATED GI MOTILITY IN ZEBRAFISH LARVAE.

Scott Gordon and Adam Rich, Dept. of Biological Sciences, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

**Background:** Interstitial cells of Cajal play a major role in the regulation and coordination of contractile activity in the human gut. ICC deficiency has been correlated with clinical dysmotility, and ICC are required for normal motility patterns in the mouse model. Our lab previously identified ICC in adult and larvae zebrafish but the role of ICC in GI motility in the zebrafish has not been confirmed. **Aims**: To determine the time course for development of coordinated GI motility in the zebrafish, and the contribution of ICC to this process.

**Methods**: Zebrafish larvae are transparent and muscular contractions of the GI tract can be directly observed. Zebrafish larvae were anesthetized, immobilized in 1.2% agar, and digital images were collected every second for 10 minutes. Image sequences were analyzed using spatiotemporal mapping techniques to identify and quantify coordinated motility patterns in larvae at 5, 7, and 9 days post fertilization (dpf). Spontaneous motility begins at 4 dpf, and regular patterns are consistently observed by 7 dpf. The role of ICC was determined using Gleevec, a tyrosine kinase inhibitor, as a pharmacological tool to lesion ICC. Gleevec specifically inhibits the Kit receptor in the mouse model. and has been shown to block ICC growth in mouse neonates and in cell culture. Images were collected from Gleevec treated larvae at 5, 7, and 9 dpf.

**Results:** Larvae treated with Gleevec (40 μM) showed a general decrease in contraction frequency, distance and velocity compared with untreated controls. A smaller effect was observed for 5 dpf larvae.

| | Control | | | 40 μM Gleevec | | |
|---|---|---|---|---|---|---|
| **Age** | **Frequency** | **Distance** | **Velocity** | **Frequency** | **Distance** | **Velocity** |
| **5 dpf** | 1.49 ± 0.42 | 313 ± 75 | 11.0 ± 2.3 | 1.41 ± 0.31 | 400 ± 73 | 12.0 ± 2.9 |
| **7 dpf** | 1.36 ± 0.23 | 363 ± 124 | 11.0 ± 2.3 | 0.99 ± 0.29 | 319 ± 61 | 9.9 ± 2.5 |
| **9 dpf** | 1.01 ± 0.17 | 347 ± 92 | 10.2 ± 2.9 | 0.85 ± 0.14 | 278 ± 80 | 9.0 ± 4.6 |

**Conclusion:** These results indicate that Gleevec inhibited development of ICC networks resulting in a disruption of the normal development of coordinated motility patterns. At 5 dpf ICC are only beginning to develop and motility patterns are incoherent. Therefore inhibition of ICC development is not expected to alter GI motility. Motility patterns are easily observed when image sequences are replayed, and in spatiotemporal maps.

Supported by MERCK AAAS and NIH DK07158801. (Poster presentation.)

## APOPTOSIS AND OXIDATIVE STRESS IN THP-1 MACROPHAGES.

Chris Greene, Deborah Leonard, and Robert Greene, Biology Department, Academic Center for Integrated Sciences, Niagara University, NY 14109.

Oxidative stress plays a key role in the differentiation and activation of monocytes into macrophages and their subsequent transformation into lipid-dense foam cells. These foam cells undergo apoptosis in atherosclerotic lesions and contribute to the development and growth of the lipid rich necrotic core that leads to life threatening events such as stroke and myocardial infarction. This study aims to gain a better understanding of this process by studying the mechanisms involved in oxidative stress induced apoptosis of cultured foam cells. The THP-1 monocytic leukemia

cell line was used as a model system. Differentiated cells were exposed to elevated levels of oxidized LDL, glucose, Fe2+ ascorbate or 7-ketocholesterol to create an oxidation rich environment. Cell viability and apoptosis levels were monitored in treated cells using fluorescence microscopy with acridine orange/ethidium bromide staining, flow cytometry and DNA laddering assays. Foam cell formation was confirmed in cells treated with oxidized LDL and increased levels of apoptosis were seen in cells treated with Fe2+ ascorbate and 7-ketocholesterol as compared to the controls. Since only a subset of differentiated macrophages undergo apoptosis, further work will utilize laser scanning confocal microscopy to compare markers of oxidative stress with levels of apoptosis. Gene expression profiles for markers of oxidative stress will also be measured in treated and control THP-1 macrophages. (Poster presentation.)

## THE ROLE OF THE MRX COMPLEX AND NON-HOMOLOGOUS END JOINING IN MITOCHONDRIAL DIRECT REPEAT-MEDIATED DELETION.

Joy Hagan and Rey A. Sia, Department of Biological Sciences, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Mitochondria are essential organelles required for cellular respiration and the generation of most of the cellular ATP. Mitochondrial genome maintenance is essential for the normal function of the cell. Deletions within the mitochondrial DNA (mtDNA) have been found to be associated with a variety of human neuromuscular and age-related diseases. The work in the lab centers on identifying genes involved in recombinational processes that may lead to deletions within the mtDNA. The lab has focused on the genes involved in the formation of the MRX complex as well as those involved in non-homologous end joining (NHEJ). The MRX complex consists of the products of the *RAD50*, *MRE11*, and *XRS2* genes. The proteins involved in NHEJ are encoded by the *KU70* and *KU80* genes. NHEJ is a major nuclear DNA repair pathway that functions to repair double stranded breaks (DSB) in DNA in the absence of significant homology. The MRX complex lines up the ends of DSBs in order to prepare them for ligation. Ku70p and Ku80p stabilize the loose ends while the MRX complex repairs the break. Xrs2p has been shown to recruit a ligase complex in order to seal the DSB (1). The specific goal of this work is to determine whether these genes are involved in direct repeat-mediated deletion (DRMD) events localized to the mitochondrial genome of the budding yeast, *Saccharomyces cerevisiae*. The lab has constructed deletion strains for each of the above genes. Each deletion strain contains both a nuclear and mitochondrial DRMD reporter integrated into the respective genomes. Fluctuation analysis was carried out to determine the frequency of DRMD events from which a rate was calculated using the method of the median for each deletion strain. In the absence of these genes, a 2- 4 fold decrease can be seen in the rate of mitochondrial DRMD while a 1.3- 2.3 fold decrease was observed in the rate of nuclear DRMD events.

Reference: (1) Krogh, B. O. & Symington, L. S. (2004). Recombination proteins in yeast. Annu. Rev. Genet., 38, 233-271. (Poster presentation.)

## A PALEOECOLOGICAL APPLICATION OF PROBABILISTIC LATENT SEMANTIC ANALYSIS.

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Probabilistic latent semantic analysis is a recent advance in text analysis that enables documents and words to be associated with certain subjects or topics. The basic idea is to construct a probability model in which a latent concept gives rise to term frequencies within documents. Terms and documents are assigned to topics from which they have the highest probability of occurring. This method can be applied to data from paleoecological data to uncover affinities of taxa to certain environments represented by the lithological properties of sampling horizons.

A typical paleoecological analysis involves taxon counts from a number of bulk samples, often arrayed across some presumed paleoenvironmental gradient. The objective is often to use taxon count distributions to elucidate the underlying environmental gradient by identifying groups of taxa that co-occur consistently and characterize particular sets of samples that may also share lithologic similarities. A standard approach to such data uses distance metrics (e.g., similarity coefficients) and employs them in cluster analysis to group samples via taxon composition (Q-mode) and to group taxa via their occurrence in samples (R-mode). The two sets of clusters are then reconciled to display sets of similar samples combined with the taxa that dominate them, with the goal that the sample-taxon associations offer insight into how biofacies are arrayed across ancient environments.

This new method is demonstrated and compared to published two-way clustering results using two data sets, a neontological sample of molluscan remains from the Virgin Islands (Miller, 1988) and a paleontological sample on marine invertebrates from the Centerfield Member of the Hamilton Group of the Middle Devonian of New York State (Brett et al., 2007). (Oral presentation.)

## AN ANALYSIS OF THE VSV COMPNENTS NECESSARY FOR INTERFERON BETA SUPPRESSION IN HOST L929 CELLS.

Nathan Haseley, Kait Riegel, Arthur Totten, Connie Rink, Sarah Alef, Kathryn Boa, and Dr. Maureen Ferran, Department of Biological Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, NY 14623.

Vesicular Stomatitis Virus (VSV) is a member of the Rhabdoviridae family. This virus has been studied as a model system and more recently as a possible oncolytic agent. Five multifunctional viral proteins are encoded for within the negative sense, single stranded RNA genome, including the Nucleocapsid (N) protein, the phosphoprotein (P), the Matrix protein (M), the Glycoprotein (G) and the Large protein (L). The M protein is of particular interest as it instigates most of the cytopathic effects observed during infection, including cell rounding, inhibition of host transcription and translation, blockage of nuclear trafficking, and a possible weakening of the mitochondrial membrane. The M protein is also known to play a significant role in Interferon beta (IFN-β) suppression. IFN-β is a critical component of the cellular immune response that functions to limit the spread of viral infection by disrupting transcription and translation, which eventually results in apoptosis of the infected cell. VSV is highly sensitive to very minute amounts of IFN-β, therefore the virus is able to suppress interferon production allowing infection to proceed. It has not yet been determined if the M protein alone is able to suppress IFN-β, or if other viral proteins must interact with the M protein to bring about IFN-β suppression. Here, we present an ongoing project in which the viral proteins from two sets of closely related strains of VSV, which induce differing amounts of IFN-β, were cloned into GFP expression vectors. These constructs are being used to identify which viral protein(s) is responsible for IFN-β suppression in mouse L929 cells. (Poster presentation.)

## USING DIGITAL ELEVATION DATA TO ANALYZE GLACIAL LANDSCAPE FEATURES—AN EXAMPLE FROM NEW YORK STATE.

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Recent advancements in the availability and quality of Digital Elevation Models (DEMs) have resulted in dramatic representations of topography. Visualization utilities included with Geographic Information Systems software can be used to generate hillshade maps from DEMs that effectively illustrate this concept. This development has resulted in a powerful technique for detailed mapping of surficial features and represents an evolutionary step forward in how we utilize and view topographic information. To illustrate the potential of this mapping technique, we have obtained a 10 meter resolution DEM for New York State from the United States Geological Survey (USGS) Digital Clearinghouse. Using the Spatial Analyst utility found in ArcGIS 9.2, we have created a high-resolution hillshade map for the entire state. 6568 streamlined features located within the New York Drumlin Field have been digitized from the DEM and their respective length, width, and orientation have been recorded in a geodatabase. A prediction surface of feature elongation (length/width) has been generated using the Geostatistical Analyst in ArcGIS 9.2. Previous work has suggested that elongation of these features may be related to the thickness of glacial drift upon which they reside. Therefore, we have developed an isopach map showing the depth to bedrock for several locations within the region of study. A direct relationship among feature elongation and depth to bedrock is not evident upon comparison. Other controlling factors, such as the internal composition of the features and the velocity of ice responsible for their formation must be considered and methods for testing these ideas are proposed. (Poster presentation.)

## CHARACTERIZATION OF BIOENGINEERED MAIZE PRODUCING A BACTERIAL QUORUM SENSING SIGNAL.

Erin Horstman, Natasha Balakrishna, Dawn Carter and Michael Savka, School of Biological Sciences, Rochester Institute of Technology, Rochester, NY.

*Pantoea stewartii* subsp. *stewartii* (*Pnss*) is a bacterial pathogen that causes Stewart's wilt disease on sweet corn and leaf blight disease on maize by producing a biofilm in the xylem vessels. The expression of the Stewartan capsular polysaccharide (CPS) virulence factor, which is responsible for the development of the biofilm, is regulated by a quorum-sensing regulon. Quorum sensing is a type of bacterial cell-to-cell communication, for the regulation of gene expression via chemical signals. The signal used for regulation of the quorum sensing pathway in *Pnss* is *N*-(3-oxohexanoyl)-L-homoserine lactone (3-oxo-C6-HSL). The overall goal of our project is to determine if maize can be successfully bioengineered to be resistant to infection by *Pnss*. Specifically this work focuses on the genetic and biochemical characterization of the bioengineered maize in first generation (R1) progeny plants. The initial transformation was performed by the insertion of the *yenI* gene from *Yersinia entercolitica* in to Hi II maize, which resulted in the production of 3-oxo-C6-HSL within the plant. Production of the signal by the maize was confirmed by signal separation and detection assays in 115 RO bioengineered plants. R1 progeny were produced by crossing signal producing RO Hi II maize with untransformed inbred B73 maize. We are currently analyzing R1 progeny plants for 3-oxo-C6-HSL signal and transgene insertion. The results will determine if the expression of the quorum-sensing signal within maize will confer resistance against disease development by disrupting xylem colonization and biofilm development of *Pnss*. (Poster presentation.)

## BIOENGINEERED MAIZE PRODUCING QUORUM SENSING SIGNALS TO DISRUPT BIOFILM FORMATION IN *PANTOEA STEWARTII.*

Shandra Iannucci, Rochester Institute of Technology, Rochester, NY.

The overall goal of this project is to evaluate the effectiveness of bioengineering maize to be resistant to the bacterial pathogen, *Pantoea stewartii* subsp. *stewartii* (*Pnss*). *Pnss* causes Stewart's Wilt disease on sweet corn and leaf blight disease on maize by producing a biofilm in the xylem vessels. *Pnss* utilizes the bacterial cell-to-cell communication signal *N*-(3-oxohexanoyl)-L-homoserine lactone (3-oxo-C6-HSL) to regulate the production of the Stewartan capsular polysaccharide (CPS) virulence factor and *Pnss* biofilm development. Hi II maize was bioengineered to produce the 3-oxo-C6-HSL signal by expression of YenI. YenI, from *Yersinia enterocolitica*, has been shown to direct the production of 3-oxo-C6-HSL in tobacco. Signal separation and detection assays have now characterized accumulation of 3-oxo-C6-HSL by our bioengineered Hi II maize. Signal-producing bioengineered Hi II has been crossed with pollen from untransformed B73 and we are currently analyzing the new generation for transgene insertion and number. As our research proceeds, *Pnss* will be used to infect 3-oxo-C6-HSL producing bioengineered maize and controls not producing signal. The development of biofilm by *Pnss* in the xylem vessels of these plants will be visualized by confocal laser scanning microscopy to determine if premature expression of CPS biosynthesis will alter biofilm development. Results will determine if expression in maize of the cognate quorum-sensing signal to *Pnss* will disrupt xylem colonization and thus reduce the level of disease. (Oral presentation.)

## SYNTHESIS AND CARACTERIZATION OF TWO HYDROXYALKYCARBORANE DERIVATIVES USING IONIC LIQUIDS.

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Two hydroxyalkylcarborane derivatives were synthesized using an ionic liquids approach. Both carboranes were made from decaborane, and either an appropriately protected α,ω-terminal alkynol or a symmetrical alkyn-diol. These reactants yielded the mono-substituted or di-substituted product respectively. The protected alkylhydroxycarboranes were then deprotected using TBAF or acid hydrolysis to afford the corresponding alkylhydroxycarboranes in modest yields (~50%). (Poster presentation.)

## DEVELOPMENT OF MICELLE MODELS USING CO-SOLUBILITY STUDIES OF CHOLESTERYL LAURATE AND CHOLESTERYL MYRISTATE FROM DSC MEASUREMENTS.

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This study uses physical chemistry techniques to develop models for making micelles. These micelles are then used as nanoscale directed drug delivery vehicles called cholestosomes. These cholestosomes carry drugs into cells and can be used to deliver to tumors. The ability to cross the blood brain barrier and bring drugs to the brain is a key advantage to these vehicles. The study uses cholesteryl dodecanoate, or commonly called laurate, and cholesteryl myristate as a model system. These two components are being used as a result of published X-Ray structural work, which indicated packing arrangements, as well as Differential Scanning Calorimeter, DSC, studies that showed co-solubility over a specified concentration range. Together we will use this experimental information as well as molecular modeling studies to design the micelle to deliver drugs to the cells. The DSC provided phase data that can be used to model co-solubility diagrams. Co-solubility of these cholesteryl esters is determined by several factors including tail length and the degree of unsaturation in the tail of the components in the binary system. Proof of principle experiments for cholestosome production and delivery have been carried out. (Poster presentation.)

## VISUALIZATION OF SPATIO-TEMPORAL VARIABILITY IN PALEO-FIRE REGIMES.

J. Kernan, Department of Geography, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

Over the past few decades. fire history studies have focused on the temporal variability of fire regimes. Much of this research was conducted in dry western US forests characterized by frequent, low-severity fire regimes. These fires scar the cambium of trees, but rarely cause mortality. Measures of central tendency, such as the mean point fire interval (MPFI) and composite mean fire interval (CMFI) have been derived from these fire scars. Such measures are useful in understanding the frequency of fire, but the aspatial nature limits the range of scientific inquiries and management issues that can be addressed. The assignment of a single statistical measure to an entire study area can mask heterogeneity in the fire regime, and prohibit fine grain analyses on the effects of micro-climate and local topography on fire. Such aspatial measures also prevent managers from using research results to inform decision-making on issues such as planning hazard reduction efforts, allocating fire fighting resources, and reintroducing fire as a natural disturbance process.

In recent literature, it has been acknowledged that a more thorough understanding of spatial variability is critical to understanding fire as an ecological process, and to broaden the scope of scientific questions and management applications addressed through fire research. A geographic information system (GIS) is a powerful tool for exploring the spatial pattern of ecological problems. In this study, fire scar datasets from four sites in the dry ponderosa pine (*Pinus ponderosa*) forests of the Cascade Range in Washington State were converted to two-dimensional estimates of paleo-fire perimeters. Map overlay processes were used to derive a surface map showing fine grain trends in mean fire interval at the site level, or a spatial mean fire interval (SMFI). The resulting surface offers a rich, visual representation of spatio-temporal variability that facilitates further ecological inquiries and is accessible to a wide range of users including scientists, forest managers and the public. The resulting representations suggest relationships between fire frequency in different portions of a study sites and topographic features such as stream valleys and draws, which burn frequently, and ridges or highly dissected topography which may act as firebreaks. Statistical measures (MPFI and CMFI) were calculated to demonstrate how much more nuanced the SMFI approach is. (Oral presentation.)

## MICROINJECTION INTO ZEBRAFISH LARVAE FOR GASTROINTESTINAL TRACKING.

Jessica Kovall and Adam Rich, Dept. of Biological Sciences, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

**Background:** The zebrafish model is useful for its vertebrate development and genetic screening. During development the zebrafish is transparent so that organogenesis can be directly observed. Our lab is interested in the functional development of the gastrointestinal (GI) tract. Direct injection of a marker dye into the GI tract is desirable to improve contrast to observe GI motility, and to quantify propulsion of intestinal contents resulting from GI motility. **Aim:** The goal of this experiment is to develop a microinjection technique that will inject a known

volume of dye into the zebrafish larva GI tract. Dye movement will be determined using time lapse imaging and GI transit time will be quantified. **Methods:** Glass pipettes, or microinjection needles, are created using a Sutter Instrument P-80 pipette puller. Tips broken by hand to form a micropipette with a suitable tip size, loaded with dye, and calibrated. Calibration involves using a pressure injector to eject a boluses of dye into oil and the size of the ejected drop is measured, and ejection volume is calculated using the equation for the volume of a sphere. It is possible to adjust ejection volume by varying tip diameter, ejection pressure and duration. Larvae are anesthetized and immobilized via mounting in agar. Glass pipettes are positioned with a micromanipulator into the larva's mouth and dye is injected into the larva with the pressure injector. Time-lapse digital imaging will be used to document dye movement in the GI tract.

**Results:** Glass pipettes with tip diameters of approximately 20 μm gave drops with a radius of 75 μm, corresponding to 1.8 nL. The mouth of a 7 dpf larva is approximately 100 μm in diameter. The effects of injection pressure, duration, and tip size on sphere volume will be presented. Methods to hold larvae in a suitable position for dye injection into the mouth are under development. **Conclusions:** We are currently developing methods to inject a specific volume of dye into the mouth of a larva to quantify propulsive GI motility. More work is necessary to develop a convenient method for microinjection into the larva mouth.

Supported by MERCK AAAS and NIH DK07158801. (Poster presentation.)

## THE RELATIONSHIP OF PROTEIN DENATURATION AND PROTEIN-SURFACE INTERACTIONS USING HUMAN LYSOZYME.

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The objective of this research was to gain a better understanding of the impact protein conformational changes have on the protein-surface interactions using the protein lysozyme. Fluorescence spectroscopy will be used to measure the conformational changes and the surface binding-interactions of the lysozyme protein. Two types of measurements, steady-state and time-resolved fluorescence, will be used to measure the conformational changes of the lysozyme.

In our first approach, we covalently attached a fluorophore, acrylodan, to the disulfide bridges located within the protein. Since lysozyme has four cysteine-cysteine residues, there is a possibility of four probes attaching to the protein. The number of probes that attach to the lysozyme may vary by the following factors: the accessibility of the bridges, the concentration of the acrylodan solution, and the time allowed for the lysozyme and acrylodan to react.

At this point, the fluorescence spectrometer has been tested for its lifetime capabilities using known standards. Steady-state and lifetime measurements were made on 2-aminopurine (2ap), p-terphenyl (pT), POPOP, rose Bengal (Rsb), and rhodamine B (Rb) using methanol and distilled water as the solvents. First, the absorbance of each probe was measured to check its labeling efficiency. Once the absorbance was determined, each sample was measured using fluorescence spectroscopy. We have yet to run the fluorescence spectrometer using lysozyme with acrylodan probes. In our second approach, we are using site-directed mutagenesis to modify specific Tryptophan (Trp) residues such that the observed signal is correlated to a domain-specific location in the protein. There are six Trp residues located within the lysozyme protein. Trp is a natural fluorescent amino acid that will be altered to code for a non-fluorescent amino acid in order to reduce the number of signals being measured by the fluorescence spectroscopy.

Currently, we are performing a pMAL protein fusion and purification to modify the human lysozyme (hLYZ) gene. This system works by cloning the hLYZ gene into an expression vector, pMAL-c2, downstream from the malE gene creating a maltose-binding protein (MBP) and lysozyme-fusion protein. At this point, the hLYZ gene has been inserted into the pMAL-c2 expression vector. The fusion protein will be purified and the lysozyme protein isolated. Once the lysozyme is obtained, a turbidimetric assay using *Micrococcus luteus* (*M. luteus*) cells can be used to determine the activity of the purified lysozyme protein. This expression plasmid will be used as the substrate for the proposed site-directed mutagenesis. The modified lysozyme will then be characterized using spectroscopy on the native and modified lysozyme. The ultimate goal of this research is to determine the relationship of the protein adsorption to a polymer substrate. The sorption/desorption equilibrium and surface binding of the lysozyme can then be analyzed. (Poster presentation.)

## CONSTRUCTION OF A BIOLUMINESCENT BIOSENSOR BASED ON *PANTOEA STEWARTII* QUORUM SENSING RECEPTOR PROTEIN, *ESAR*.

K. Kurniyati, D. Carter, M. Savka, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

*Pantoea stewartii* subsp. *stewartii* (*Pnss*) is a bacterial pathogen that causes Stewart's wilt and leaf blight diseases on sweet corn and maize, respectively. *Pnss* grows in the plant xylem and produces an exopolysaccharide (EPS) slime layer called Stewartan that interferes with vascular transport. Production of Stewartan is cell density dependent and governed by the EsaI/EsaR quorum sensing (QS) system. Previous work has shown that the EsaR directly interacts with the promoter region upstream of the *rcsA* gene to promote Stewartan synthesis. Presented here is a strategy to construct an EsaR-dependent bacterial biosensor for the detection of the EsaR cognate QS communication signal, 3-oxo-C6-homoserine lactone (3-oxo-C6-HSL). The constructed reporter plasmid consists of the inducible EsaR binding promoter region upstream the bioluminescent reporter operon, *luxCDABE*, which is hypothesized to produce light in the presence of 3-oxo-C6-HSL QS signals. This EsaR-dependent reporter plasmid will be transformed into an esaI$^-$, esaR$^+$ *Pnss* strain to test the activity and functionality of the biosensor in the presence of various QS signals including EsaR cognate signal, 3-oxo-C6-HSL. Progress to date includes construction of the reporter plasmid and functionality assays of the constructed biosensor. This biosensor will be used to detect EsaI-produced AHL signals in corn plants bioengineered to produce the EsaR cognate AHL signal, and to characterize QS signal mimics produced by genotypes of maize that differentially respond to *Pnss* infections. (Poster presentation.)

## PALEOCLIMATIC PERSPECTIVES ON THE GLOBAL WARMING PETITION.

Benjamin J. C. Laabs, Department of Geological Sciences, SUNY Geneseo, 1 College Circle, Geneseo, NY, 14454.

The Global Warming Petition Project states that "an international agreement that would ration the use of energy and of technologies that depend upon coal, oil, and natural gas and some other organic compounds" is "based on flawed ideas". Indeed, the economic and social implications of this agreement are significant and have prompted much political debate in the United States; yet, the international scientific consensus is that rising greenhouse gas levels in the atmosphere have and will continue to cause global-scale warming of Earth's surface. Petitioners of the Project cite a recently-published article that attempts to refute this consensus by presenting regional-scale and short-term climate data that disagree with trends observed in numerous global-scale and long-term records. This approach to climate reconstruction overlooks many important global-scale processes that respond to changes over relatively long time scales, and therefore inherently minimizes the potential impact of future climate change.

The importance of scale in climate-science research must be recognized in order for research to be effectively conducted and interpreted. Although a great deal remains to be learned about the dynamic processes of Earth's climate system, much of the foundation for the current knowledge of the climate system comes from interpretations of proxy data (such as tree rings, sediments, fossils and glacier ice) from the paleoclimatic record. Specifically, reconstructing trends in climate change over periods of $10^5$ to $10^1$ years has revealed many of the interrelationships of surface temperature, greenhouse gas concentrations in the atmosphere, glacier-ice extent, ocean-water chemistry and sea level over this range of timescales. In addition, careful synthesis of proxy data from a large number of regions has afforded several useful reconstructions of global-scale trends in climate change. If the scientific basis for the Global Warming Petition Project continues to avoid recognizing the utility of examining climate trends over broad spatial and temporal scales, the value of its research will be limited and it will fail to contribute to the advancement of climate science. (Oral presentation.)

## A RESISTIVE SENSOR USING MULTIWALLED CARBON NANOTUBE COMPOSITE FOR THE DETERMINATION OF ACETONE IN AQUEOUS AND URINE SAMPLES.

Gina Lein[1], K.S.V. Santhanam[1,2] and L. Fuller[3]; [1] Department of Chemistry, [2] Center For Materials Science and Engineering and [3]Microelectronic Engineering, Rochester Institute of Technology, Rochester, NY 14623.

An acetone sensitive composite has been synthesized using multiwalled carbon nanotubes (diameter 60-100 nm) and a polymer. The sensor is constructed by depositing this composite onto a silicon wafer chip (1 mm length)

having two gold electrodes separated by a tenth of a millimeter. The sensor resistance in distilled water was measured before and after injection of acetone into the medium. The resistance change is linear with concentration of acetone. The response and recovery times of the microsensor have been evaluated. The measurements were also made in more basic and acidic media. The microsensor sensitivity has also been measured. The microsensor response to acetone in urine was evaluated by successive injections of acetone into urine sample. The performance of microsensor was compared with the Bayer strips that are available in the market; the strips do not respond to acetone (respond to acetoacetic acid) putting the microsensor at an advantageous position for the determination of acetone. The mechanism by which the microsensor responds to the acetone, has been examined and it appears that the original pyramidilization angle and misalignment of pi orbital that is present in the carbon nanotubes, changes upon adsorption of acetone on the active sites causing it to go from more metallic (conducting) to a less metallic (conducting) state. Upon desorption the original pyramidilization angle is restored, thus enabling the dip microsensor to be re-useable. Thus the microsensor could be successfully used for diabetic acetone.

We acknowledge with thanks the complimentary strips provided by the Bayer Company. (Poster presentation.)

## THE FORMATION OF THE UNIVERSE.

Ingo H. Leubner, Rochester Institute for Fundamental Research, 35 Hillcrest Drive, Penfield, NY 14526.

The condensation of solid material from a dilute into a concentrated form is a phase transition (crystallization). This is exemplified by the crystallization of water vapor into snow or by the crystallization of sugar from an aqueous solution. In these crystallizations, one precursor forms the crystals. Similarly, the process of the formation of the Universe, the Big Bang, is the condensation of energy into particles (electrons and protons), which are also a form of energy. Thus, from a mechanistic view, the Big Bang falls into the category of crystallization or phase-transfer. The known principles of nucleation and physics were applied to the process of the formation of particles and the origin of the Universe.

The present radiative decay of matter in the Universe leads to its dissociation, and to an energy singularity as was present before the Big Bang. The reaction products of the decay of stellar objects are photons. According to Einstein, photons carry twice the gravity of energy-equivalent mass. The re-assembly of energy is thus assured by relativistic gravity doubling during the radiative mass decay.

The formation of mass from the pre-Big Bang energy singularity leads to the prediction of gravity as anti-energy, and the present radiative decay as energy-gravity recombination. Using the model for the solar system correctly predicts the water-ice transition on Mars at 3.6 billion years ago. The (Big) Bang – Fizzle – (Big) Bang (BFB) process is thus determined by the present conditions and by known physical science. This eliminates the proposition of dark energy, dark matter, and the invasion of parallel universes (branes) as viable hypotheses. Of course, the model predicts the formation of electrons and protons as stable particles in the present universe.

The BFB process leads to the conclusion that the pre-Big Bang state consisted of a (zero dimension) Bose-Einstein state of photons (bosons) and that the formation of electrons and protons (fermions) leads to the present (three-dimensional) state of the Universe.

The discussion of the Big Bang and the formation of the universe as a crystallization or phase-transfer process is a contribution to a subject that has thus far been thought of as intractable. (Oral presentation.)

## PROMOTER REGION VARIATION IN *GJA1* IS NOT ASSOCIATED WITH AGE-RELATED HEARING LOSS.

Patricia Libby, Robert D. Frisina, and Dina L. Newman, Department of Biological Sciences, Rochester Institute of Technology, 153 Lomb Memorial Dr., Rochester, NY 14623.

Presbycusis, commonly called age-related hearing loss, is a prevalent disorder that affects the lives of many elderly people. There are currently no known genes that cause presbycusis. The candidate gene for this research is *GJA1*, which codes for connexin 43. Connexins are gap junction proteins that allow potassium ion transport within the ear. The results of a previous project suggest a correlation between the transcriptional regulation of the gene *GJA1* and presbycusis (in a small sample, presbycusics seemed to have a high incidence of promoter region variation). Subjects were tested at the International Center for Hearing and Speech Research at RIT with a series of standard and advanced audiometric tests. One hundred samples from a pool of ~500 individuals, all >58 years old, were chosen. These included the 50 individuals with the best hearing (as determined by average pure tone threshold from 1-4 kHz in the better ear), and the 50 individuals with the worst hearing. The promoter region of *GJA1* of all

100 individuals was sequenced and eight single nucleotide polymorphisms (SNPs) were found. All of the variants were low frequency (<10%), and no significant difference was observed between cases and controls. Therefore mutations in the promoter region of gene *GJA1* are not associated with presbycusis. (Poster presentation.)

## OSTEOPONTIN: A CANDIDATE GENE IN CORONARY ARTERY DISEASE RISK ASSESSMENT.

Cara Lucas, Deborah Leonard, Brent Williams, and Michael Merhige, Biology Department, Academic Center for Integrated Sciences, Niagara University, NY 14109 and The Heart Center of Niagara, 571 Tenth St., Niagara Falls, NY 14302.

Niagara County has the highest rate of coronary artery disease (CAD) in New York State creating a unique environment in which to conduct cardiac research. Chronic inflammation of the arteries, or atherosclerosis, is one of the main causes of CAD. A study of expression patterns of inflammatory cytokines and their receptors was conducted to identify possible correlations with the severity and progression of CAD as monitored by positron emission tomography and myocardial perfusion imaging (PET-MPI). Expression arrays from these studies identified osteopontin as one of the cytokines showing elevated expression in patients with stress-induced perfusion defects. Therefore it was hypothesized that genotyping osteopontin polymorphisms and monitoring expression of osteopontin in peripheral blood cells will support its identification as a candidate gene in CAD risk assessment and as a monitor of disease progression. To determine if a known single nucleotide polymorphism in the osteopontin promoter correlates with expression in peripheral blood cells, allele specific PCR primers were designed and fluorescence melting curves were used for genotype determination. Patients with the three genotypes were matched for traditional risk factors and relative expression of osteopontin mRNA was measured with quantitative SYBRGreen RT-PCR. Results from this study have showed a significant effect of genotype on osteopontin expression. Future studies will examine the relationship between osteopontin genotype and gene expression and disease state as measured by PET-MPI. (Poster presentation.)

## ANTIBACTERIAL PROFILE OF PHENOLIC SALTS.

Janelle Ludwig, Walter W. Steiner, and Ronny Priefer, DePaul Hall 206, Niagara University, NY 14109.

The use of phenol as an antibacterial agent dates back to Joseph Lister in 1867; who was the first to use any kind of chemical sterilizing technique during operations. Since then derivatives have been synthesized that have shown increased antimicrobial activity. Most recently, Triclosan, (5-chloro-2-(2,4-dichlorophenoxy)phenol) a phenol derivative, has found wide-spread use in everyday products; from surface-cleaners to toothpaste. Studies within our lab have shed light on the how derivatization of the phenol backbone can alter activity. In addition we have determined that counterions can play a role in effecting antibacterial efficacy. Our current study is on the synthesis of salts of phenol derivatives and determining their activity. To date, we have already seen a difference in activity of compounds by converting them to their salt form. (Poster presentation.)

## MULTIPLE ANTIBIOTIC RESISTANCE FOUND IN BACTERIA FROM WILD GREEN FROGS.

Jillian Lund, Kevin Posman, and F. Harvey Pough, Biology Department, Rochester Institute of Technology, Rochester, NY.

An increase in the incidence of antibiotic resistant enteric bacteria has been observed in wild vertebrate species that have never had direct contact with humans. In the United States, livestock farms may be contributing to this problem through their use of antibiotics to promote growth and prevent infection. We are testing this hypothesis by comparing the antibiotic resistance of enteric bacteria sampled from *Lithobates clamitans* at sites in central New York with different levels of exposure to livestock wastes. (Poster presentation.)

## TRACKING LAVA LAKE FLUCTUATIONS AT VILLARRICA VOLCANO, CHILE.

Leila Marzeki, 4315 Chestnut Ridge Rd. Apt. 6, Amherst, NY 14228.

Fluctuations in the level (±80m) of the lava lake of Villarrica Volcano, Chile occur regularly. The lava lake fluctuates in height with cycles of gradual build up over months followed by sudden withdrawal. Filling and

draining of magma in the lake reflects dynamic behavior in the lower conduit and magma chamber. Height fluctuations of lava lakes are considered common, yet surprisingly virtually no quantitative information on this exists. Data will be extracted from thermal data from Moderate Resolution Imaging Spectroradiometer (MODIS) satellites, photographic archives and summit observations since 1984. Temperature data for each lava lake pixel in successive images will be extracted to generate temperature variations over time. This will shed light on the physical processes controlling the behavior of the lava lake by providing information on the temporal scale of the fluctuations over the last 23 yrs. A preliminary analysis of Geostationary Operational Environmental Satellite (GOES) data for 1999 illustrated good agreement between thermal and seismic data when the magma free surface was <90 m below the crater rim. This limit was determined by viewing constraints of the satellite. Combining the height and thermal data will support the correct 'Hot Spot' alert level being established for Villarrica Volcano. (Poster presentation.)

## DEVELOPMENT OF METAONOMIC PROFILE FOR SUDDEN CARDIAC DEATH USING NMR.

Jessica Mason[1], Jeff St. Denis[1], Dr. Ron Priefer[1], Dr. Mary McCourt[1], and Dr. Vijay Iyer[2]; [1]Department of Chemistry, Biochemistry and Physics, Niagara University, NY; and [2]SUNY at Buffalo School of Medicine, Buffalo, NY.

Identification of molecules can lead to insight into the biochemical mechanisms of disease. Nuclear magnetic resonance (NMR) spectroscopy has proven to be one of the most powerful tools in producing a comprehensive profile of metabolic signals. We are attempting to develop a metabolic profile of sudden cardiac death using pig blood samples. The samples were blinded and half were diseased and half were from healthy animals. Spectra were obtained from 12 blood serum samples using H-NMR. The samples were prepared by diluting the serum 180 uL with 420 uL of 0.9% NaCl in H2O. A 400 MHz NMR was then used to obtain the spectra. Prediction of results were based on initial scans and statistical methods. (Poster presentation.)

## THE EFFECTS OF SEROTONIN ON GI MOTILITY IN ZEBRAFISH LARVAE

David Maywright and Adam Rich, Dept. of Biological Sciences, SUNY Brockport, 350 New Campus Drive, Brockport, NY 14420.

**Background**: Interstitial cells of Cajal (ICC) play a major role in the regulation and coordination of contractile activity in the human gut. ICC deficiency is correlated with clinical dysmotility. For example, diabetic patients commonly experience bloating and delayed gastric emptying after a meal and have decreased numbers of ICC. Serotonin is a neurotransmitter and also regulates neuronal cell proliferation and survival. The majority of serotonin is produced in the gut, where it contributes to regulation of GI motility. Recently serotonin has been shown to regulate proliferation of cultured mouse ICC. Our lab previously identified ICC in adult and larvae zebrafish but the role of serotonin in regulating ICC proliferation and survival has not been examined. **Aims**: To determine the effects of serotonin on the development of coordinated GI motility in the zebrafish. **Methods**: Zebrafish larvae are transparent, and muscular contractions of the GI tract can be directly observed. Zebrafish larvae were anesthetized, immobilized in 1.2% agar, and digital images were collected every second for 10 minutes. Image sequences were analyzed using spatiotemporal mapping techniques to identify and quantify coordinated motility patterns in larvae at 7 days post fertilization (dpf). ). Spontaneous motility begins at 4 dpf, and regular patterns are consistently observed by 7 dpf. Larvae were exogenously treated with serotonin, the agonist BW 72386, or the antagonist SB 204741 at 5dpf. Solutions were changed twice daily, and images were collected at 7dpf. **Results**: Two image sequences, 600 images over 10 minutes, were collected from 2 or 3 different larvae for each experimental condition. Each drug treatment had individual controls to account for variability between groups of larvae. Data in Table 1 is presented as average ± standard deviation. Serotonin increased contraction frequency and velocity. SB 204741, a serotonin antagonist, had no significant effect and BW 72386, a serotonin agonist, decreased contraction frequency and decreased contraction velocity. **Conclusion:** If serotonin enhances ICC growth and proliferation then we expect improved regulation of GI motility. Therefore we expect more coherent contractions, beginning in the proximal intestine and completely propagating to the distal intestine. Exogenous serotonin enhanced frequency and velocity, but there was no effect on contraction distance. The serotonin agonist decreased frequency and velocity, but these effects are opposite to serotonin. Further experiments, using different doses, and beginning treatment at 4 dpf, are necessary.

| TABLE 1 | Frequency (cpm) | | Distance (μm) | | Velocity (μm/sec) | |
|---|---|---|---|---|---|---|
| | **Control** | **5HT** | **Control** | **5HT** | **Control** | **5HT** |
| Serotonin (1 μM) | 1.56±0.1 | 2.16±1.8 | 340±65 | 339±86 | 7.4±1.1 | 8.68±2.9 |
| | **Control** | **SB 204741** | **Control** | **SB 204741** | **Control** | **SB 204741** |
| SB 204741 (1μM) | 1.38±0.2 | 1.35±0.6 | 280±65 | 275±97 | 10.8±6.3 | 10.1±4.0 |
| | **Control** | **BW 72386** | **Control** | **BW 72386** | **Control** | **BW 72386** |
| BW 72386 (1μM) | 1.12±0.2 | 1.03±0.2 | 409±79 | 368±80 | 10.9±2.0 | 7.7±2.2 |

Supported by MERCK AAAS and NIH DK07158801. (Poster presentation.)

## ISOLATING AND CHARACTERIZING THE EXPRESSION PATTERN OF BRACHYURY AND TBRAIN IN THE ENDOMESODERM DEVELOPMENT OF *EUCIDARIS Tribuloides.*

Danielle Meadows and Hyla Sweet, PhD, Department of Biological Sciences, Rochester Institute of Technology, CBET, 123 Lomb Memorial Drive, Rochester, NY 14623.

The long-term goal of our research is to study the evolution of mesoderm development in echinoderms. The objective of this project is to isolate and determine the expression patterns of two of these genes, more specifically two T-box transcription factors Brachyury and Tbrain, in *Eucidaris tribuloides*, a primitive sea urchin. *Eucidaris tribuloides* has significant differences in mesoderm development when compared to derived sea urchins. Using NCBI, homologues of the genes were found from different organisms. The sequences were then aligned to show highly conserved regions. Degenerate PCR primers were designed to recognize and bind to these regions. These primers were used with PCR and cDNA template from *Eucidaris* embryos to amplify EtBrachyury (EtBra) and EtTbrain (EtTbr). The PCR products were separated by size using gel electrophoresis. Bands of the predicted size were cut from the gel and purified. These PCR fragments were cloned, sequenced and confirmed to be EtBra and EtTbr. Using the sequence of these fragments, we have been studying the temporal and spatial expression patterns of the two genes. Preliminary results of the temporal expression show that both genes are expressed in oocytes through the larval stage. In spatial expression, EtBra is expected to show a similar expression pattern to that found in other echinoderms, in a ring around the blastopore. Tbrain has been shown to have a very different expression pattern across the echinoderm phylum. It is possible that EtTbr could be expressed in a fashion similar to that of the derived urchins. of it could be expressed in a fashion more like that of star fish and sea cucumbers. Once the expression patterns for *Eucidaris tribuloides* are complete, we will compare these expression patterns to the known expression patterns of Brachyury and Tbrain in other animals. (Poster presentation.)

## PHOTODYNAMIC THERAPY AND FLOW CYTOMETRY ANALYSIS OF APOPTOSIS IN MCF-7 BREAST CANCER CELLS.

Theresa Mihalic and Robert S. Greene, Academic Center for Integrated Sciences, Niagara University, NY 14109.

Photodynamic Therapy (PDT) has been shown to be a successful human cancer clinical treatment. The photodynamic compounds used have the ability to generate reactive oxygen species that are cytotoxic to tumor cells upon exposure to visible light. The compounds 2-(1-hexyloxyethyl)-2-devinyl pyropheophorbide-a (HPPH) and meso-tetra (4 N trimethlanilinium) porphine (TMAP) are two such photodynamic compounds. Flow cytometry analysis of MCF-7 breast cancer cells in culture was performed after exposure to these compounds and visible light. Staining with propidium iodide and the Invitrogen YO-PRO Vybrant Apoptosis Assay nucleic acid stain indicated occurrence of apoptosis, increasing in a time dependent manner with the highest percentage of apoptosis occurring after 24 hours. Consistent with previous findings, comparison of light and dark treatments indicated both light and

dark interactions contributing to apoptosis in both compounds. Addition of the compounds also induced visible changes in the morphology and culturing characteristics of MCF-7 cells. Upon harvesting, the cells became more adherent in the presence of Gibco TrypleLE Express (trypsin-like enzyme) and addition of the compounds also caused the cells to aggregate in solution. Confocal microscopy results of cell morphology in before and after treatments will also be presented. (Poster presentation.)

## A MULTI-ALGAL BASED *DAPHNIA PULICARIA* FEEDING EXPERIMENT: IS THE FATTY ACID COMPOSITION OF AN ORGANISM REPRESENTATIVE OF ITS DIET?

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Interest in omega-3 (ω3) fatty acids has been rapidly increasing since the late 1980's and early 1990's due to the observed benefits of incorporating ω3's into the human diet. Omega-3 fatty acids are termed "essential fatty acids" because they cannot be synthesized biochemically except in the case of primary production and must be obtained from an individual's diet. In a bottom up approach, we are able to trace ω3 fatty acids as well as total fatty acid load from their origin, primary production to predation and assimilation at the secondary consumption interface in a model aquatic system. Our objectives for this experiment were to: 1). Determine if the fatty acid composition of *Daphnia p.* fed *Scenedesmus acutus* differs from the fatty acid composition of *Daphnia p.* grown on three different algal diets of *Scenedesmus a.* + EPA, *Navicula pelliculosa* and *Chlamydamonas reinhardti* and 2). Determine whether the fatty acid composition of *Daphnia p.* is representative of its diet. We hypothesized that the fatty acid content of *Daphnia p.* will be function of diet and should differ based on fatty acid composition of the algal species it is fed. Two particular fatty acids are of interest; eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), both are ω3's and are being evaluated as potential candidates for use as fatty acid biomarkers (FABM). (Oral presentation.)

## THE SYNTHESIS AND ANALYSIS OF DIARYLDITELLURIDES AND DIARYLTELLURIDES FROM A SERIES OF ESTER-SUBSTITUTED ANILINE: IMPACT OF ELECTRON DENSITY ON THE REACTION CHEMISTRY AND ON THE PROPERTIES OF THE TELLURIDE PRODUCT.

Heather Mulford and Dr. Margaret E. Logan, Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Diorganotellurides have antioxidant properties because of the ability of the tellurium to donate electrons to a reactive oxygen species. Electron-rich diaryltellurides and alkylaryltellurides such as those in which the aryl ring is an aniline, have the best antioxidant properties. Ester-substituted diaryltellurides are of interest because they can be converted to water-soluble compounds by hydrolysis to the carboxylate, and because the carbonyl group can be used to anchor the antioxidant to a polymer support. A series of ester-substituted anilines were prepared, varying the number of methylene groups between the nitrogen and the ester from one to three. This provided information on the effect of differences in electron density at the nitrogen on subsequent chemistry as well as on antioxidant properties. The preparation of diarylditellurides can diaryltellurides from these aniline ester compounds, as well as the analysis of the antioxidant properties of the compounds by cyclic voltammetry will be described. (Poster presentation.)

## THE SYNTHESIS OF WATER SOLUBLE CATIONIC TELLURIDE ANTIOXIDANTS.

Makoto Nagahama, Rey A. Sia, and Margaret E. Logan, Department of Chemistry and Biological Science, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Reactive oxygen species (ROS) such as superoxide and hydroxyl radical are unstable, and known to damage DNA and components of cell structure. Mitochondria produce most of these ROS during cellular respiration. If the organisms fail to intercept the ROS and repair the damages, mutations can result. The mutation caused by damage especially to the mitochondrial DNA (mtDNA) is associated with diseases such as cancer, aging, heart disease, diabetes mellitus, Alzheimer's, and Parkinson's disease. In recent studies by other groups, it was found that conjugation of antioxidants such as vitamin E to cationic triphenylphosphonium (TPP) groups can be used to deliver these antioxidants into mitochondria. The antioxidant properties of electron-rich aryl-tellurides led us to prepare the corresponding TPP analogs as probes of oxidative damage and repair in yeast. Much as the TPP group facilitates

entry into the mitochondria, its hydrophobicity limits the water solubility of molecules that contain it. In this presentation, progress toward the synthesis of an aryltelluride containing both the TPP group and water solubilizing groups will be described, as well as the yeast assay that will be used to characterize them. (Poster presentation.)

## MODELING POTENTIAL HAZARDS IN THE BELHAM VALLEY, SOUFRIÈRE HILLS VOLCANO, MONTSERRAT.

Sarah Ogburn, SUNY at Buffalo Department of Geology, 876 Natural Sciences Complex, Buffalo, NY 14260.

Soufrière Hills Volcano is an andesitic, dome forming volcano located on the island of Montserrat in the Lesser Antilles. The Belham River Valley on Montserrat is contentious because it defines the northwestern boundary of the newest exclusion zone, which was revised in January, 2007 after a large lava dome overtopped the western crater wall. A major pyroclastic flow (pf) in the valley could still jeopardize the ~1200 people still living just north of the limit of the exclusion zone (Fig. 1). Ignimbrite deposits, up to 3m thick, were recently found in the Belham Valley, indicating a large explosion generated column-collapse pfs in the valley at some point in the volcano's history (1). My investigation into worldwide, dome-forming eruptions revealed that while large explosions soon after (within 2 years) dome growth are rare, it is quite common for an explosion to occur within 10 years of a dome-forming event (2). The current eruption has been ongoing since 1997. Given the close proximity of the population to the volcano, hazard analysis on the island has little room for error and accurate modeling of the spatial distribution of possible pfs is extremely important. Assessing the impact will be accomplished by modeling three types of pfs—column collapse, dome collapse, and surge-derived. Each of these flow types have been generated during the current eruption and each are distinct in terms of mobility (3). The model to be used is TITAN2D.

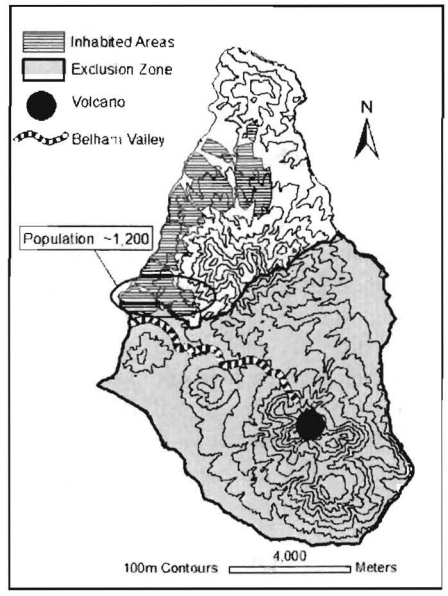


**Figure 1: 2007 Volcanic Risk Map.**

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## SURFACE FUNCTIONALIZATION OF CARBON NANOTUBES WITH UV AND VUV PHOTO-OXIDATION.

L. Oliveira, T. Debies[1], K. S. V. Santhanam and G. A. Takacs. Department of Chemistry, Center for Materials Science and Engineering, Rochester Institute of Technology, Rochester, NY 14623, and [1]Xerox Corporation, Webster, NY 14580.Multi-walled (MWNT) paper [1] and single-walled (SWNT) powder carbon nanotubes were studied using UV and Vacuum UV (VUV) photo-oxidation which use low-pressure mercury lamps and emission downstream from argon microwave plasmas, respectively. Such gas-phase techniques are primarily atomic line sources of 253.7 and 184.9 nm UV, and 106.7 and 104.8 nm VUV radiation, respectively. X-ray photoelectron spectroscopy (XPS) is a very effective analytical technique for measuring the surface modification within the top 2-5 nm of the sample and showed these gas-phase photo-oxidation processes to be controlled procedures for introducing oxygenated functional groups (C-O-C, C=O, O-C=O and O=C-O-C=O) on the nanotubes surface. SWNT showed higher levels of oxidation with shorter treatment times than MWNT. MWNT paper gave higher levels of oxidation with VUV (primarily oxygen atoms) than with UV (mainly ozone) treatment [1]. SWNT powder with VUV treatment produced similar results as the previous UV photo-oxidation studies of SWNT paper and SWNT powder.

Reference:

[1] M. Krysak, A. Jayasekar, B. Parekh, L. Oliveira, T. Debies, K. S. V. Santhanam, R. A. DiLeo, B. J. Landi, R. P. Raffaelle and G. A. Takacs, Sixth International Symposium on Polymer Surface Modification, Cincinnati, OH, June 11-13 (2007). (Poster presentation.)

## THE FLYNN CREEK IMPACT STRUCTURE AND THE INFILLING OF A DEVONIAN CRATER.

D. Jeffrey Over, Department of Geological Sciences, SUNY Geneseo, Geneseo, NY 14454 and Jürgen Schieber, Department of Geological Sciences, Indiana University, Bloomington, Indiana 47405.

The Flynn Creek structure in Jackson County, Tennessee, is an Upper Devonian impact feature filled by impact related breccias and successive layers of Frasnian clastics of the Chattanooga Shale. The crater, 3.6 km in diameter and approximately 150 m deep, characterized by steep sides and a central wave beveled uplift, is developed in Ordovician carbonates of the Nashville Group. The crater is filled by basal breccia, bedded breccia interbedded with thin black shales, and a thick black shale succession that predates the Dowelltown Member black shale of the Chattanooga Shale that typically overlies Ordovician strata in central Tennessee outside the crater.

Conodonts from the Flynn Creek crater fill were described by Huddle (1963) from five samples in the breccias and the basal black shale. Our study includes samples from the breccia and black shale fill, as well as the overlying Dowelltown. The basal breccia and an uppermost graded interval that contains mixed Ordovician and Devonian conodonts, including *Yaoxianognathus abruptus, Ancyrodella alata*, and *Polygnathus pennatus*. This is interpreted as the fall back ejecta from a marine impact and implies a MN Zone 3 or 4 time of impact. The bedded breccia contains a similar mixed Ordovician and Devonian conodonts, interpreted as material washed into the crater from the surrounding platform. The black shale interbeds suggest generally offshore quiet water deposition and continuation of Chattanooga deposition after the impact. The black shale crater fill contains only Middle Frasnian conodonts, notably *Ancyrodella gigas, Palmatolepis punctata* – early form, and several other palmatolepids indicative of MN zones 5 and 6. The black shales that fill the crater are overlain by the Dowelltown Member, marked by a coarse-grained basal lag deposit. At Hurricane Bridge, approximately 20 km south of the crater, the basal Dowelltown contains *Palmatolepis bohemica*, indicative of MN zones 6 to 8. This indicates that pre-Dowelltown strata filled the crater before further sea level rise and the deposition of Dowelltown black shales that blanket the region. (Oral presentation.)

## MULTILAYER FILM PREPARATION OF POLY(4-VINYLPHENOL) FROM AQUEOUS MEDIA FOR STUDIES AS ANTIMICROBIAL SURFACE COATINGS.

Matthew S. Pinto, Megan A. Baumler, John C. Cadwalader, Jeanette R. Drapo, Michelle L. Ingalsbe, Mallory A. van Dongen, Walter W. Steiner, and Ronny Priefer, DePaul Hall 206, Niagara University, NY 14109.

The phenol moiety stretches the limits of polyanionic polymers that can be incorporated into multilayer films. The adsorption of PVPh from an aqueous media has been successfully accomplished. Multilayered films of the

phenol-based polymers have been prepared using the layer-by-layer assembly technique. The film growth was followed by UV-Visible spectroscopy, while the thickness, roughness, and surface morphology of the films have been examined using interference microscopy and atomic force microscopy. The aromatic character, very weak acidity, and hydrogen bonding capability of 4-vinylphenol and derivatives yield polyelectrolytes with a rich suite of chemical and physical properties that are much different than most traditional weak polyanions. Due to the antimicrobial nature of phenol; these multilayer films are currently under investigation as potential protective surface coating. (Poster presentation.)

## DOES SMALL VARIANCE OF ln K (~0.3) REPRESENT LESS GEOLOGIC HETEROGENEITY? A RECENT LITHOFACIES STUDY AT THE BORDEN AQUFER.

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The variance of ln K has been commonly used to indicate the degree of spatial variability of the hydraulic conductivity (K) distribution in a geologic system. For example, the sandy Borden aquifer with its small ln K variance (= 0.29, Sudicky, 1986), has been considered to be relatively homogeneous. Recently, we collected core samples and mapped lithofacies in the Borden aquifer as part of a collaborative research project to determine spatial cross-correlation between the properties of the aquifer that control reactive transport. A horizontal transect of seventy-two densely-spaced (0.25-1.0m) cores, including those previously collected by Allen-King et al. (2006), allowed us to determine the spatial distribution and lateral dimensions of lithofacies units, which were not clearly discernible in previous studies. Our lithofacies mapping shows the following sedimentary features: dipping strata, channel-like structures, gradational transition among facies units, erosional discontinuities in the low-K materials, and isolated occurrences of silt materials. The lithofacies structures identified in the Borden aquifer imply a potentially important role in groundwater flow and transport processes even with this low variance of ln K. This suggests that the characterization of spatial variability based solely on statistical abstractions without consideration of geologic structure may neglect important and useful information. (Poster presentation.)

## SEX TRAFFICKING IN CAMBODIA: MAPPING DISAFFECTED VULNERABLE COMMUNITIES.

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The traffic in sex-workers is the subject matter of tens of thousands of Websites and numerous international agencies and NGOs. With very few exceptions, these sources rarely specify actual numbers, still less the geographic origins of the girls and women drawn into the trade and consigned for the most part to major cities, most notably in Southeast Asia. One striking exception to this rule was a recent Phnom Penh-based survey conducted by the University of Hawaii, Manoa. This paper focuses on 109 sex-workers' reported origins within Cambodia and augments the Hawaii-based data with additional biographical evidence. With no exceptions, the workers had been recruited from provinces west of the capital and bounding the Mekong River, Cambodia's historic artery of interaction. Moreover, these settings are among the poorest regions in a poor country. The results reinforce the argument that resolving the human bondage endemic in the sex-trade must include developmental initiatives aimed at pockets of persistent regional distress. (Oral presentation.)

## FUNCTIONAL INTERACTIONS BETWEEN MELANIN-CONCENTRATING HORMONE RECEPTORS AND THE ACTIN CYTOSKELETON.

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The prevalence of obesity in the U.S. has increased steadily since the 1980's. Melanin concentrating hormone receptor-1 (MCHR1) knockout mice exhibit a lean, hyperactive phenotype, one that is more resistant to diet-induced obesity. This suggests that MCHR1 is implicated in appetite regulation. MCHR1 is a member of the G protein coupled receptor (GPCR) family. GPCRs are known to influence actin polymerization via several downstream signaling components; however, actin can also influence GPCR trafficking, receptor desensitization, and membrane stability. Today, little is known about how MCHR1 is influenced by actin, and how MCHR1 influences actin

rearrangement. In aim 1 of this study, we investigated the effect MCH had on actin morphology. 3T3-L1 pre-adipocyte cells were treated with 1uM MCH for varying times, fixed, and stained for actin. Slides were blinded and scored into three categories: 1) prominent actin stress fibers, 2) rounded cells with processes, and 3) small round cells. A statistically significant change in actin morphology was observed. In aim 2, we investigated the effect actin had on MCHR1 signaling. Chinese hamster ovary (CHO) cells stably expressing VSVg-tagged MCHR1 were pretreated with10 □M cytochalasin D to disrupt actin polymerization. Cells were then treated with MCH for varying times, and a western blot was performed to visualize MAPK activation. Cytochalasin D caused an increase in activated MAPK expression. This data suggests periplakin, an actin binding protein found to bind MCHR1, may have a significant role in dampening receptor signaling. (Poster presentation.)

## MULTIPLE ANTIBIOTIC RESISTANCE FOUND IN BACTERIA FROM WILD GREEN FROGS.

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Widespread use of antibiotics has caused an increase in the incidence of antibiotic resistant bacteria in the environment. The purpose of this study is to determine if there is a link between the extent of contact of wild animals to agricultural waste and level of antibiotic resistance found in their bacteria. We chose the northern green frog, *Lithobates clamitans*, as an indicator organism to study the spread of resistance. Enteric bacteria were sampled from the cloacae of *Lithobates clamitans* from Will-O-Crest Dairy Farm, RIT campus and Mendon Ponds Park. We selected Gram-negative and oxidase negative bacteria for analysis. Standard antimicrobial disk susceptibility tests of the antibiotics erythromycin, ampicillin, streptomycin, neomycin, gentamicin and tetracycline revealed examples of multiple intermediate resistance in several of these bacteria. (Oral presentation.)

## PROPOSED LOCATION OF EIFELIAN-GIVETIAN MIDDLE DEVONIAN BOUNDARY IN WESTERN NEW YORK USING MAGNETIC SUSCEPTIBILITY.

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The Middle Devonian Eifelian-Givetian Boundary was a time of great change associated with the end of the Kacák Event which occurred along with a global rise in sea level and extinction characterized by organic-rich black shale interval, the end of a magnetic susceptibility low as well as changes in ammonoid, brachiopod, conodont, and trilobite faunas. The boundary is defined by the appearance of the conodont species *Polygnathus hemiansatus*. Magnetic susceptibility can be used as proxy for sea level curves which can be used to find boundaries that are associated with changes in sea level. The Eifelian-Givetian Boundary has not been previously identified in western New York due to constraints in the fossil record. New MS data shows that the boundary could be located between the Cherry Valley Limestone and the Chittenango Shale within the Oatka Creek Member. (Poster presentation.)

## ADHESION OF COPPER TO POLYIMIDE SURFACES MODIFIED BY UV PHOTO-OXIDATION.

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Copper adhesion to polyimides (PIs) is of importance to the aerospace and microelectronic industries. The polyimides (PIs), Kapton-HN500 (PMDA-ODA) and Upilex-S (BPDA-PDA), were surface modified by UV radiation (253.7 nm) in the presence of oxygen at atmospheric pressure. X-ray photoelectron spectroscopy (XPS), a highly sensitive surface analytical technique, was used to observe the surface modification within the top 2-5 nm. XPS analysis showed an increase in the O/C ratio with treatment time which appeared mostly as the carbonyl moiety (C=O). The O/C ratio saturated more quickly for Upilex-S than Kapton. Copper was sputter coated onto the modified PIs surfaces and the peel test showed that the failure of adhesion occurred more rapidly for Upilex-S than Kapton. The type of adhesion failure for the PIs is under investigation. (Poster presentation.)

## POPULATION VIABILITY ANALYSIS IN THE RED-BACKED SALAMANDER, *PLETHODON CINEREUS.*

M.E. Reeb and W.J. Edwards, Department of Biology, DePaul Hall, Niagara University, NY 14109.

Conservation biologists use population viability analysis to predict the likelihood of population extinction and to evaluate conservation plans. The red-backed salamander (*Plethodon cinereus*) serves as a model for evaluating the effect of environmental changes on forest biodiversity. The Oak Hill red-backs, a western New York population fragmented by roads, are a model of limited salamander dispersal, effective population size and population structure, while a lower Niagara River gorge population is a non-fragmented control. Mark-recapture techniques were used to assess the demographics of each site including population size, age distribution, fecundity and survivorship. A matrix based forecasting of future population sizes, stable age structure and reproductive value distribution was used for testing extinction likelihood incorporating stochasticity in the model. (Oral presentation.)

## ANALYSIS OF GENES INVOLVED IN MESODERM DEVELOPMENT IN *EUCIDARIS TRIBULOIDES*: THE SIGNALING LIGAND DELTA.

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One fundamental gene required for the development of the mesoderm in echinoderms is Delta. Delta is expressed by micromere and macromere descendants in the model sea urchin embryo to activate the Notch signaling pathway which ultimately results in mesoderm development. In primitive sea urchins, mesoderm develops differently than in the model sea urchin. Presumably, Delta/Notch signaling occurs differently as well. The objective of this project is to determine the expression pattern of the gene Delta in *Eucidaris tribuloides*, a primitive sea urchin. Three key differences in development lead to the thought that the gene expression might differ: (1) the development in primitive urchins is much slower, (2) the derived urchin has a fixed number of micromeres while the primitive urchin has zero to four micromeres and (3) the primitive urchin lacks primary mesenchyme cells. To determine the temporal expression pattern, reverse transcription PCR was used to amplify EtDelta from several stages of *Eucidaris tribuloides* embryos. The results obtained suggest that Delta expression in *Eucidaris tribuloides* begins simultaneously in development as in derived urchins (blastula stage), such as *Lytechinus variegatus*, but the gene remains expressed for a longer period of time (through the gastrula stage). Our long-term goal is to examine and compare mesoderm development including Delta/Notch signaling in representatives of the echinoderms to understand the evolution of mesoderm development within the phylum. (Poster presentation.)

## CATCH THE RAINBOW: GEOCHEMICAL ANALYSIS OF COLORED SLAG FROM IRONVILLE, ADIRONDACK STATE PARK, NEW YORK.

Irene L. Rizza and Dr. Dori J. Farthing, SUNY Geneseo, Geneseo, NY.

Iron was extensively mined and smelted in the Adirondack Mountain Region during the 19th century. Smelting resulted in multiple slag piles in upstate New York. Ironville, located on the eastern margin of Adirondack state park near the southern tip of Lake Champlain, was the first smelting site to use an electromagnet for beneficiation. It is considered to be the birthplace of the electric age in the United States. Smelting of magnetite for the Crown Point Iron Company began in Ironville in 1844 and continued until the 1890's. The current slag pile at Ironville covers ~4,000 square feet; however a large central portion of the pile has been removed. The slag is highly variegated in color, has a vesicular to ropey appearance and is primarily glassy.

Ironville slag is macroscopically unlike any other slag found in this area of the Adirondack region. A clean face was dug into the slag pile to expose stratigraphy and color variations. Samples of blue, green and purple were collected and analyzed with XRD, XRF and, transmitted light microscopy. Soil samples were also analyzed to determine the degree of chemical interaction between the slag pile and its immediate surroundings. Initial findings indicate little chemical difference in major element concentrations for the slag samples. All slag regardless of color shows high concentrations of $SiO_2$ and CaO. An indirect relationship between CaO and $Fe_2O_3$ has also been noted. Trace element concentrations have similar trends, although there is some variation between colors. This chemical data is essential to understanding the impact of a historical industrial waste site on this region of New York. (Poster presentation.)

## CONTROL REGION ANALYSIS OF THE GENE, ENHANCER OF RUDIMENTARY, IN *DROSOPHILA MELANOGSTER.*

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The *enhancer of rudimentary* gene, *e(r* )is a highly conserved gene located on the X chromosome in *Drosophila melanogaster*. The gene encodes a transcriptional co-factor 104 amino acids in length, and although the exact function is still unclear it has been shown to be involved in pyrimidine biosynthesis, oogenesis, and the cell cycle. Mutations in *e(r)* are characterized by low viability and decreased fertility. They have also been shown to enhance phenotypes caused by mutations in two genes involved in neurogenesis, *Notch* and *deltex*, suggesting a possible role in neurogenesis. In the present study, transgenes of *e(r)* were used to map the sequences necessary for normal expression. All of the sequences necessary for normal *e(r)* expression mapped to a 2,618-bp fragment that included the transcribed region plus 787 bp upstream of the start of transcription. The two introns of *e(r)* were shown not to contain transcription control sequences. These studies also mapped a transcription enhancer to a 5' region from -338 to -787 and a transcription silencer to a 5' region from -45 to -338. Additional deletions in the 5' control region are being analyzed to map the enhancer and silencer more precisely. Bioinformatic tools will be used to identify possible transcription-factor binding sites within these regions. (Oral presentation.)

## THE GENETIC STRUCTURE OF A POPULATION OF RED-BACKED SALAMANDERS, *PLETHODON CINEREUS.*

J. L. Rogemoser and W. J. Edwards, Department of Biology, DePaul Hall, Niagara University, NY 14109.

Terrestrial salamanders are a model organism for conservation genetics due to their sensitivity to climate change, as well as their long lifespan, easy accessibility, and minimal sampling costs. In the North Eastern United States, human activity has resulted in the fragmentation of salamander populations, which could have a negative effect on the organisms, such as decreased fecundity and genetic variation. The red-backed salamander species *Plethodon cinereus* was chosen for the experimental population and the DNA was isolated and amplified using the polymerase chain reaction at seven different microsatellite loci from tail clippings. The genetic structure of the population was determined including the heterozygosity of the population, as well as the number of alleles found at each locus, and Fst, the frequency of alleles, deviations from Hardy- Weinberg, and diversity of the red-backed/lead-backed polygenic phenotype. This data will be used to assess the effects of fragmentation on amphibian populations. (Poster presentation.)

## PHOTOLYTIC PROPERTIES OF DIALKOXY DISULFIDES.

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The dialkoxy disulfide moiety (R-OSSO-R) has been known for over 40 years. Studies have been performed on molecules containing this functionality which illustrate its ability to liberate trappable $S_2$. The mechanism is believed to go through an intramolecular concerted heterolytic cleavage pathway. Recently published work has put this hypothesis into question. To examine this, we have exposed this compound to both thermodynamic and photolytic conditions to reveal this molecule's intrinsic properties. By understanding how this functionality behaves under various conditions, it may be possible to liberate not only $S_2$ but SO gas. (Poster presentation.)

## IDENTIFYING DEXAMETHASONE-INDUCED REGULATORS OF E-CADHERIN EXPRESSION USING PCR ANALYSIS OF CLONAL POPUATIONS OF A431 VULVAR CARCINOMA CELLS.

Erwin Rusli and Jani E. Lewis, Dept. of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

The downregulation or loss of E-cadherin has been shown to correlate with metastasis in many epithelial cancers. The vulvar carcinoma cell line, A431, is an example of an epithelial cell line that loses E-cadherin expression in response to treatment with dexamethasone (dex). Dex is a glucocorticoid used commonly as an immunosuppressant but is not associated with carcinogenesis. Using PCR analysis of RNA from untreated and dex

treated A431 cells, we have identified two transcription factors, STAT5A and E2A that are upregulated in the dex-treated cells. STAT5A has been indirectly linked while E2A has been directly linked to loss of E-cadherin expression in several carcinoma cell lines. Furthermore both of these transcription factors are associated with epithelial to mesenchymal transitions (EMT) characteristic of metastatic cancer. Further analysis using real time PCR is being done to explore the involvement of these two transcription factors in the dex-related loss of E-cadherin in the A431 cell line. (Poster presentation.)

## EFFECT OF DNA SUBSTITUTIONS ON PLANTS CHS STRUCTURE AND EXPRESSION.

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*Chalcone synthase* (*CHS*) is present in all green plants, usually as a small gene family. Analysis of the enzyme has combined genetic, molecular, biochemical and evolutionary approaches and CHS function is the best understood of any plant enzyme. *Gesneria rupincola* (family Gesneriaceae) contains two *CHS* genes (*CHS A* and *B*). The proteins differ by 44 amino acids which are dispersed throughout the protein, including some that may alter the active site. Molecular models of the two proteins were made using SYBYL. Molecular dynamics simulations on the models indicate that the two proteins have novel structures. qRTPCR expression studies using gene-specific primers indicate that the CHS B protein is expressed in all tissues tested except roots and that the CHS A protein is only expressed in certain parts of the flower. (Oral presentation.)

## DATA RESCUE: AGING ENVIRONMENTAL DATABASES.

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This project, funded by a Lake Ontario Coastal Initiative (LOCI) Implementation Grant to the Water Education Collaborative, implemented a process, commonly termed "data rescue", to acquire and preserve grey literature pertaining to Lake Ontario, and subsequently make such data publicly available for future use. Two specific data sets of this grey literature were selected for this project. The first was historical reports prepared by Rochester Gas and Electric Corp. related to its Russell Site located within the nearshore area of Lake Ontario near Rochester, NY. The second set consisted of historical nutrient and water quality data collected by the Monroe County Dept. of Public Health within the Rochester Embayment and Irondequoit Bay. Through this project, RGE information was identified, recovered, catalogued and scanned into fully text searchable electronic files (pdf format). Monroe County data was obtained and exported into Excel spreadsheet files (.xls format) and organized for future use. At the completion of this project, 34 aquatic environmental reports / datasets concerning Russell Station, dating back to 1975 and highlighted by a greater than 30 year database of fish impingement, were scanned into pdf files. Similarly, a 20-year database of intensive water quality monitoring within Irondequoit Bay was compiled, along with a 9 year database of nutrient information collected from up to 13 nearshore sites within the Rochester Embayment. These electronic files were placed upon CDs and submitted to LOCI for ultimate disposition, at an as yet undetermined website, on the internet. In addition to the acquired databases, a brochure describing the project was created and used to promote this work at professional society conferences and meetings. Future data rescue efforts are currently focused upon RGE data collected at Sterling and Ginna Sites on Lake Ontario and within the Genesee River. Longer-term goals include: further information regarding the Rochester Embayment and adjacent waterbodies; student and academic work; and expansion to other Lake Ontario sites. (Oral presentation.)

## FROM THE LAND TO THE LAKE: INFLUENCE OF WATERSHED CHARACTERISTICS IN THE HONEOYE VALLEY.

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Every lake sits at the bottom of a watershed and is thus influenced by the natural and cultural activities that occur in its surrounding upland landscape. Many Finger Lakes studies focus on lake water quality or tributary stream chemistry (especially following storm events) and attempt to link these through sophisticated computer models that take into account local topography, soils and meteorological data. The usual outcome is a lake nutrient budget that can be utilized by local resource managers for prioritizing decisions about where to implement best management practices. To validate these models,

however, also requires knowledge of land use and land cover within each tributary and direct drainage sub-basin of the lake watershed. Real property code classifications are both insufficient and inaccurate for this purpose. Interpretation of aerial imagery alone is prone to error. We combined aerial interpretation with extensive ground surveys to create a "truth image" of the Honeoye Lake watershed. Data files were attributed using the hierarchical classification system of the New York Natural Heritage Program, a widely used and accepted method of ecological community classification in the state. The latest edition is available online at their website, http://www.nynhp.org. Although time-consuming, our research provides superbly detailed and comprehensive watershed information that we believe is critical to the success of holistic management for Honeoye Lake. Our data has already been used to improve the latest nutrient budget model for the lake.

We recognize 10 sub-basins within the larger Honeoye Lake watershed. Five sub-basins are drained by perennial streams and collectively account for 76% of the total watershed area. The other five are drained through intermittent streams and/or by direct runoff to the lake, and account for 24% of the total watershed area. Within these 10 sub-basins we mapped and attributed over 3000 polygons representing 32 community cover types belonging to one of four major systems: riverine, lacustrine, palustrine or terrestrial. The cover types ranged from small cultural features like farm ponds to large natural features like extensive tracts of Appalachian oak-hickory forests. Because the New York Natural Heritage Program also ranks each cover type for its rarity, we were able to identify communities such as silver maple-ash swamp and shale talus slope woodland that have statewide significance. Overall, the mosaic pattern of cover types helps to explain the tremendous biodiversity of the Honeoye Valley. (Poster presentation.)

## TERRESTRIAL ISOPODA MOLECULAR PHYLOGENY.

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Terrestrial isopods (commonly called pill bugs, sow bugs, or woodlice) are inhabitants of both natural and human-altered landscapes. Their social and reproductive behaviors are responsive to natural and anthropogenic changes in environmental conditions (Takeda 1980, Paoletti and Cantarino 2002, Kight and Nevo 2004, Lardies et al. 2004). Isopods contribute to the flow of energy and nutrients in ecosystems, and are bio-indicator species that reflect changes in habitat quality (Alikhan 1995, Zimmer 2002). Terrestrial Isopods have been studied at length in Europe, while in North America they have been only studied sparingly and many of the species bear the names of European forms, although it is unknown if they are in fact the same species. Until recently the evolutionary history was based mainly on morphology alone, which can correlate unrelated groups in the same taxonomic group. To date our lab has focused on the species *Philoscia muscorum, Porcellio dilataus, Oniscus asellus, Armadillidium vulgare,* and *Trachelipus rathkei.* The 12s and 16s mitochondrial genes of each sample are being sequencing. The phylogenic trees generated thus far have indicated that *Trachelipus rathkei* appears to be paraphyletic with some of the subjects morphologically identified as *Trachelipus rathkei* are in fact more closely related to *Armadillidium vulgare* than to other *Trachelipus rathkei* subjects. Also the molecular data complied to date supports the close relationship of the two members of the Porcellionidae family investigated thus far, *Porcellio dilataus* and a portion of the *Trachelipus rathkei* population sampled. (Poster presentation.)

## MACROMOLECULAR CROWDING AND THE KINETIC EFFECTS ON LACZ RESTRICTION SITES.

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Macromolecular crowding is a term used to describe the total macromolecular content that occupies a fraction of the cell. Different crowding agents, for example, dextran were used to determine the kinetics on the conformation and activity of restriction enzymes in a non-ideal solution. Dextran was used over time along with different molecular weights to establish changes in the kinetics of the two different restriction sites (Sac I and Nde I) in the LacZ constructs. At a two percent concentration of crowding agent, the results show that as molecular weight of the crowding agent increases the rate of restriction increases. From the data, it can be observed that the crowding agent forces the reaction to go to completion and accelerates the rate of restriction. Therefore, the crowding agent accelerates the rate of restriction due to both percent and total molecular weight. (Poster presentation.)

## ALLELOPATHIC EFFECTS OF *BRASSICA RAPA.*

Thomas Suchy and George Briggs, Biology Dept., SUNY Geneseo, Geneseo, NY 14454.

Wisconsin fast plant (*Brassica rapa*) is widely used in education and research because it is easily grown and can complete its life cycle (seed to seed) in less than five weeks. We found that *Brassica* plants exhibit substantial allelochemical effects, inhibiting seed germination and plant growth of both itself and other species. *Brassica* seeds planted in pots that had a previous generation of *Brassica* grown in them germinated at one-third the rate of seeds planted in control pots. Growth from the seeds that do germinate is remarkably inhibited, with plant height and weight decreasing to less than 50% of control plants. Flowering is delayed and flower production is reduced. This allelopathic effect was also exhibited on other species, both radish and lettuce. We are conducting additional experiments to isolate and identify the chemical responsible for these effects and to examine its mode of action. (Poster presentation.)

## BIOGEOCHEMISTRY OF CORAL REEFS.

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Coral reefs are dynamic and diverse ecosystems with a wide range of plants, animals, and fish living in close proximity. The waters above reefs are teeming with life and the efficient recycling of materials in this system lead to the clear water which plants and humans appreciate. Sustaining the high populations of plants and animals requires a constant supply of nutrients and essential compounds such as fats, proteins, and carbohydrates. We are using chemical and stable isotope techniques to quantify and identify sources of these compounds in coral reefs in the Florida Keys, and to recognize the roles that plants and animals play in sustaining a healthy coral reef.

We show that the concentrations of fatty acids in corals and their symbiotic algae (zooxanthellae) differs between areas of high water quality relative to those growing in low water quality areas. The production of essential fatty acids and the influx of materials from outside the reef are greater in particular reefs and that nutrients produced within reefs are critical to the survival of corals. (Oral presentation.)

## THE EFFECT OF A PHOSPHONIUM-BASED IONIC LIQUID ON FRESHWATER BIOFILMS.

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Although ionic liquids are thought to be environmentally friendly solvents, the data supporting these claims are lacking. As ionic liquids cannot evaporate, the most likely route of environmental contamination is via water. The microbial community would be the first group of organisms to be affected by such an effluence. However, most toxicity studies of ionic liquids conducted so far have not been optimal, as they have not mimicked environmental conditions. If the study used bacteria at all, it was a single species of bacteria grown in a lab, not a multi-species biofilm from the environment. Also, despite being a major class of ionic liquids, the toxicity of phosphonium based ionic liquids has not been widely studied.

Freshwater samples were collected from Silver Lake, Perry, NY and subjected to 5, 10, 50 or 100 ppm of trihexl(tetradecyl)phosphonium chloride for up to 3 days. A crystal violet staining procedure, followed by an absorbance reading was used to compare biofilm growth. The addition of ionic liquid decreased biofilm growth by an average of at least 70% compared to the control in all concentrations and time periods. Most concentrations of ionic liquids showed a greater decrease in growth as time went on. In established biofilms, as ionic liquid concentration increased, the decline in growth steadily increased. However, the established biofilms were not affected as greatly as the developing biofilms. These data suggest that ionic liquids have a greater detrimental effect to developing biofilms than established biofilms, while still being harmful to both kinds. (Poster presentation.)

## CONSTRAINING THE EIFELIAN-GIVETIAN BOUNDARY (MIDDLE DEVONIAN) USING CONODONT BIOSTRATIGRAPHY, WESTERN-CENTRAL NEW YORK.

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Previous research into the location of the Eifelian-Givetian Boundary interval in New York State has been unsuccessful due to the lack of diagnostic conodonts and insufficient field collection. The boundary has typically been constrained to the interval between the Stafford Member of the Skaneateles Formation and Cherry Valley

Member of the Oatka Creek Formation. The conodonts *Polygnathus linguiformis klapperi, Po. linguiformis linguiformis and Icriodus platyobliquimarginatus* have been recovered from the Cherry Valley Mbr. Although the index specimen for the boundary has not been recovered, the presence of *Polygnathus linguiformis klapperi, Po. linguiformis linguiformis and Icriodus platyobliquimarginatus* have further constrained the E-G boundary to within or just above the Cherry Valley in New York State. (Poster presentation.)

## INTERFERON mRNA PRODUCTION CORRELATIONS WITH NF-KB ACTIVATION IN CELLS INFECTED WITH M-DEFECTIVE STRAINS OF VESICULAR STOMATITIS VIRUS.

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Infection of mammalian cells with wild-type (wt) vesicular stomatitis virus (VSV) results in the inhibition of host RNA and protein synthesis, and suppression of interferon (IFN). In contrast host RNA and protein synthesis inhibition is delayed, and IFN production is induced, in cells infected with the mutant T1026R1 (R1) strain. We have found that the IFN-suppressing wt virus blocks NF-κB activation, while NF-κB is activated in mouse L929 cells infected with the IFN-inducing R1 strain. To determine if the M protein is involved in regulation of NF-κB, we compared the ability of recombinant viruses containing wild type and defective M proteins to activate NF-κB. Little NF-κB was activated in cells infected with a recombinant virus encoding a wt M gene, while NF-κB activation was noted in cells infected with M-defective viruses. These results suggest that IFN gene expression is primarily blocked at the transcriptional level or a point upstream of this event in wt-infected cells.

To establish a correlation between NF-κB activation and IFN mRNA expression in VSV-infected cells. relative Real-Time PCR was used. IFN mRNA expression increased significantly after 4 or 5 hours in cells infected with R1 or M-defective viruses, while very little IFN mRNA was detected in wt-infected cells (when compared to mock-infected cells). To establish a functional link between NF-κB activation and IFN mRNA production, R1-infected cells were treated with Bay 11-7082, a compound that inhibits NF-κB activation by blocking phosphorylation of IκB-α. This treatment significantly decreased IFN mRNA production, suggesting that IκB-α phosphorylation is necessary for NF-κB activation in R1-infected cells. Taken together, these findings suggest that the M protein specifically regulates expression of the IFN gene by regulating activation of NF-κB. (Oral presentation.)

## THE EOCENE-OLIGOCENE CLIMATIC TRANSITION IN NW ARIZONA: IMPACT ON LANDSCAPE EVOLUTION AND RELEVANCE TO THE ORIGIN OF GRAND CANYON.

R. A. Young, Department of Geological Sciences, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

A significant world-wide change cooled the earth from relative warmth in early Eocene time (ca. 50 Ma) to much cooler and more arid conditions in the southwestern U.S. by early Oligocene time (ca. 33 Ma). This global change corresponds with the appearance of the first significant ice cap in Antarctica. Sea surface temperatures declined as much as 5 to 10 degrees, and the average annual global temperature declined by about 8 degrees Celsius. The middle Eocene Epoch corresponds with the end of the Laramide orogeny in Arizona and Utah, a period of major compression and crustal shortening as the Farallon plate was subducted under western North America. Major western rivers flowed eastward from topographically higher Laramide thrust sheets onto the Colorado Plateau at this time. This represents a reversal of current physiographic conditions exemplified by the modern, west-flowing, Colorado River.

Recently dated Paleogene arkosic sediments in the western Grand Canyon region record subtropical weathering (deep red soils) and landscape features that contrast sharply with the younger Grand Canyon stratigraphy and physiography. Freshwater lakes occupied areas north and south of Grand Canyon, in contrast with the more arid conditions that accompanied the emergence of the modern Grand Canyon landscape. The onset of Oligocene cooling and aridity is marked by an abrupt stratigraphic change from thick arkosic (exotic) soils and dense vegetative cover to an interval of soil removal and the deposition of widespread braided river conglomerates, derived largely from local Paleozoic carbonate strata. This marked terrestrial disconformity clearly separates the events associated with the waning Laramide orogeny from the middle Tertiary extensional faulting and widespread volcanism (Basin and Range orogeny) that set the stage for the formation of the Grand Canyon. The excavation of most of the Grand Canyon during the last 5-6 Ma, can only be understood by reconstructing the events of the preceding 10 Ma. This

critical interval is characterized by a lack of well-dated rock units, due to a scarcity of fossiliferous terrestrial sediments and a significant hiatus in late Tertiary regional volcanism. The preservation of a 50 to 60 million-year-old landscape stands in marked contrast to the directly adjacent Grand Canyon physiography, long considered a product of rapid canyon incision and widespread regional denudation. The field mapping and delineation of the Eocene-Oligocene disconformity is an important key to separating the early and late Cenozoic geologic history of the western Colorado Plateau. (Oral presentation.)

## CHARACTERIZATION OF TWO HYDROCARBON DEGRADING BACTERIA ISOLATED FROM A SOYBEAN FIELD IN MENDON, NY.

C. Zito and Dr. J. Lodge, Department of Biological Sciences, Rochester Institute of Technology, CBET-Bldg 75, 153 Lomb Memorial Drive, Rochester, NY 14623.

Two bacterial isolates were found that can degrade various hydrocarbons by enriching soil samples from a soybean field in Mendon, NY with a mixture of medium chain length alkanes, gasoline, and motor oil. The isolates, SOY1 and SOY2, degraded various hydrocarbons including several hydrocarbons such as STP octane booster, several synthetic motor oils, and crude oils, which were not part of the selection mixture. SOY1 and SOY2 degraded an alkane mix over a range of pH values, 7 to 10, with a sharp decrease in activity seen below pH 6. SOY1 degraded an alkane mix in media containing NaCl as high as 2%, while SOY2 only showed good activity up to 1% NaCl. SOY1 showed broader substrate utilization than SOY2 with activity being high on several different types of organic waste. SOY1 and SOY2 were also effective in growing on various crude oils with the exception of Smakover crude oil (contains a high level of aromatic compounds). Both SOY1 and SOY2 may be important in generating custom blends of bacteria for the degradation of hydrocarbon-based organic waste. (Poster presentation.)

# THIRTY-FIFTH ANNUAL SCIENTIFIC PAPER SESSION

## NAZARETH COLLEGE
## ROCHESTER, N.Y.
## November 1, 2008

## LARRY J. KING MEMORIAL LECTURE

### Using Satellite Imagery from NASA to Study the Ancient Mexican Past (Zapotec Culture)
**William Middleton, Ph.D., Department of Archeology and Anthropology, Rochester Institute of Technology**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### THE IMPACT OF RESTRICTING DEVELOPMENT ON WATER QUALITY.
Katrina Abdalla, Biology Department, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

Nitrate and phosphate serve as the major nutrients in open waters. Increasing the nitrate or particularly the phosphate levels can lead to stream eutrophication. Large amounts of suspended solids also impact streams, as light penetration of stream water is blocked, thus inhibiting photosynthesis. The town of Pittsford has elected to limit housing development, which reduces storm water discharge into tributaries of the East Branch of Allen Creek. The goal of this research was to determine if Pittsford's objective will have a positive effect on water quality. Three water catchments were compared by measuring phosphate. nitrate and suspended solid levels, one having no development, one with controlled development and the other highly developed. The water samples from catchments in the towns of Mendon, Henrietta, and Brighton demonstrated that in less developed areas, fewer nitrates, phosphates, and suspended solids exist, thus increasing stream quality. (Poster presentation.)

### ATTITUDE TOWARDS PHYSICS AND PHYSICS PERFORMANCE: A COMPARATIVE STUDY, THEORIES OF LEARNING, AND PROSPECTS IN TEACHING PHYSICS.
Rolando A. Alimen, Ph.D., Research Coordinator, John B. Lacson Foundation Maritime University-Molo, Iloilo City, Philippines.

This study aimed to determine the performance and attitude towards Physics using comparative data-analysis for the period of five years, 2000 and 2005. The data gathered were further utilized to investigate learning theories and prospects in teaching Physics. The sources of data were obtained from the "GPA" and "Attitude towards Physics." Results revealed that attitude and performance in Physics among engineering students had declined in the period of five years. Theories of learning explored in the study were Bandura's Theory of Social Learning, Operant Conditioning by B.F. Skinner, John Dewey's Experiential Learning, David Kolb's Experiential Learning, and Kurt Lewin's Field Theory. Rethinking the lecture method, creative activities in the teaching of Physics, necessity of a substantial teacher re-training, starting with the existing curriculum and culture as the starting point of educational reform, and formulation of a set of learning objectives, strategies, and activities for fostering creativity in Physics were the prospects in teaching Physics underscored in this investigation. (Poster presentation.)

## ASSESSMENT OF FISH FAUNA AT VILLA IGANG, PUERTO DEL MAR, GUIMARAS, PHILIPPINES.

Rolando A. Alimen, Ph.D, Victor B. Jaleco, Ph.D., Marine Engineering Department, John B. Lacson Foundation Maritime University-Molo, Iloilo City, Philippines; and Cornelio M. Selorio, Jr., College of Fisheries and Ocean Sciences, University of the Philippines in the Visayas, Miag-ao, Iloilo, Philippines.

John B. Lacson Foundation Maritime University in its response to the issue of global marine preservation proposed a Marine Reserve at Villa Igang, Puerto del Mar, Nueva Valencia, Guimaras. The initial stage of this proposal was to conduct a marine investigation of fish population and diversity in the area. To give baseline data leading to the realization of such proposal, this study was conceived. Thus, this paper determined the species of fish found in the area and their status in terms of biomass and density. Six stations of the area were evaluated for fish visual census in reef slope and reef flat to identify and assess the status of reef fish. Fishes were classified as indicator target and non-target. In all, about 180 reef fish species belonging to 34 families were identified and dominated by the family Pomacentridae (Damselfish). Results also showed that the decline of fish density and biomass is mainly due to overfishing in the locality. Further prospects as to how the area can be protected are recommended. (Poster presentation.)

## NMR DIFFUSION AND RELAXATION STUDIES ON AQUEOUS SURFACTANT SYSTEMS.

Vincent A. Badali and Markus M. Hoffmann, The College at Brockport, SUNY, 350 New Campus Dr., Brockport, NY 14420.

Aqueous surfactant solutions display interactions on a molecular level that are influenced by temperature and composition. When the solution reaches the critical micelle concentration, the surfactant molecules are known to aggregate to form micelles. Our studies involve the partitioning of organic fragrance molecules, in particular D-limonene, into the micellar aggregates. For example, where does the D-limonene reside, and are the micelles large enough to incorporate D-limonene? To address questions like these, Nuclear Magnetic Resonance (NMR) was used to measure the relaxation times ($T_1$ and $T_2$) and the diffusion coefficient of each of the components in the aqueous surfactant system. So far, one complete data set of surfactant in water has been obtained and will be presented. These results, coupled with the independently determined viscosity of the surfactant systems, were used to find the size of the surfactant aggregates. Surprisingly, the micelles were found to be too small to contain D-limonene. (Poster presentation.)

## A PHARMACEUTICAL ANALYSIS OF IBUPROFEN DRUG RELEASE USING DISSOLUTION TESTING.

R. Best, 149 Collamer Rd., Hilton, NY 14468; Dr. I. Kimaru, 3690 East Ave., Rochester, NY 14618; and Dr. F. Zhao, 3690 East Ave. Rochester, NY 14618.

The rate of drug release from different dosage formulations of ibuprofen in relation to the human digestion system illustrates a real life pharmaceutical analysis application. In order to determine these rates, dissolution testing of three dosage formulations (Advil tablets, capsules and gelatin capsules) of ibuprofen was performed. Dissolution media was selected that mimicked to some extent the physiological conditions encountered in the stomach and small intestines. The amount of drug release was quantified using UV/Vis spectroscopy upon the dissolution samples. The results indicate that the dissolution of ibuprofen is dependent on the pH of the physiological environment where the release of ibuprofen generally takes place in the small intestines at neutral pH and not under the acidic conditions found in the stomach. This project introduces simple pharmaceutical analysis of over the counter medications. (Oral presentation.)

## LOCOMOTION IN *BULINUS TRUNCATUS* IS ALTERED BY INFECTION WITH *SCHISTOSOMA HAEMATOBIUM*.

Kian Bichoupan, Biology Department, SUNY Geneseo, Geneseo, NY.

Schistosomiasis is a parasitic disease that affects 200 million people globally. An experiment was conducted to better understand the effect of infection with *Schistosoma haematobium* on locomotion in the intermediate host *B. truncatus*. Parasitized and unparasitized snails were placed in clear plastic aquarium on top of a grid. A video

camera was placed above the aquarium to record the movements of the snails over a ten-minute interval. Movement trials for each snail were done independently. After the data were collected, infected and uninfected snails were tested for differences in rate of travel, total distance traveled, and rotation. Uninfected snails traveled at faster rates and rotated a greater amount than infected snails. The total distances traveled and time in rest phases were not significantly different between the infected and uninfected snails. Our results support alteration of the behavior of the snail host by the parasite as a result of infection. The results from this experiment are consistent with previous studies of another human schistosome, *Schistosoma mansoni,* and its intermediate host, *Biomphalaria glabrata.* It is still under investigation whether or not this altered behavior is adaptive for the parasite. (Poster presentation.)

## WORK TOWARDS A LIBRARY OF ISOFLAVONE DERIVATIVES.

Kyle F. Biegasiewicz, Jeffrey D. St. Denis, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Isoflavones are a class of organic compounds that are almost exclusively found in members of the bean family including soybeans, chickpeas, alfalfa, and peanuts. They are commonly known for their beneficial antioxidant traits as well as their recognizable activity against certain types of cancer. They have most recently been recognized for their inhibitory activity against breast and colon cancer.

This project is based on a novel three step synthesis of a library of isoflavone derivatives including ones such as Daidzein, an isoflavone and well known antioxidant found commonly in soybeans. The synthesis involves an enamine addition, a ring closure and halogenation, and finally a Suzuki coupling. This synthesis provides evidence of an efficient pathway to the synthesis of future isoflavones of interest. (Poster presentation.)

## BAIT PREFERENCES OF TERRESTRIAL ISOPODS IN A DECIDUOUS FOREST IN WESTERN NEW YORK.

Kathryn Boa, Brittany Bourdon, Nahid Carter, Sandra Dedrick, Amber Gulley, Danny Lin, Peter Lin, Erin Pence, Katrina Scheiner, Charles Yarrington, F. Harvey Pough and Elizabeth Hane, Rochester Institute of Technology, Department of Biological Sciences, 85 Lomb Memorial Dr., Rochester, NY 14623.

Terrestrial isopods, more commonly known as pillbugs, are important because they are thought to be bioindicators of heavy metal and pesticide contamination in soil. An important aspect of studying their ecology is the collection process, and because this varies by study, we sought to determine the best bait for collecting isopods. We randomly placed bait of each type (apple, carrot, potato and turnip; cut in half) in 40 exclosures to protect the bait from squirrels and deer. Bait was placed in a beech/maple forest for two days during moist soil conditions. In all, we collected 92 isopods distributed amongst 10 species. After correcting for bait surface area, a significant preference for carrots was found, while apples were avoided (chi-square; $0.05>p>0.25$). Due to this preference, we hypothesize that isopods may be found on a particular bait based on either presence of pesticides or nutritional needs. Further work is needed to investigate these patterns. (Poster presentation.)

## INVESTIGATION OF THE MITOCHONDRIAL GENOME FOR VARIANTS THAT PROTECT AGAINST HEARING LOSS.

Andrea Braganza and Dina L. Newman, Department of Biological Sciences, RIT, 153 Lomb Memorial Dr., Rochester, NY 14623.

Presbycusis is a disease of the elderly, where as people age they start to lose their hearing, first in the higher frequencies and later in the lower frequencies too. Genetic as well as environmental factors cause presbycusis. However no genes have yet been identified that influence susceptibility to the disease. Previous studies have shown a correlation between mother and child but not father and child in the development of presbycusis. Since mitochondrial DNA (mtDNA) is a non- recombining molecule that is inherited maternally; we hypothesize that there are DNA variations in the mt genome which cause certain people to either be susceptible to or protected from developing presbycusis. Differences in mtDNA sequences are only due to mutations. Therefore as time passes, mutations accumulate sequentially along less and less related molecules that constitute independent lineages known as haplogroups. In previous work done in the lab on the nine European haplogroups and presbycusis, we have found that men who belong to haplogroup K seem to have better hearing than men from all other haplogroups. Therefore

we sequenced the entire mitochondrial genome for twelve subjects whose haplogroups are known, and found 141 polymorphisms. We are currently genotyping SNPs that appear to be specific to haplogroup K in order to find the genetic differences that cause the phenotypic differences. From recent studies we found a new set of SNPs that can be used to more accurately classify people into the nine major European haplogroups. Therefore we have begun genotyping our samples for these new SNPs as well. If this data proves to be significant we can use this new set of SNPs to more accurately classify our samples into their respective haplogroups. (Poster presentation.)

## PRESETTLEMENT VEGETATION OF THE CONNECTICUT TRACT IN WESTERN NEW YORK.

Evelyn Brister, Elizabeth Hane, and Karl Korfmacher, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Analysis of the vegetation data in settlement-era property surveys can aid our understanding of historical landscape change. By demonstrating how past vegetation differs from current patterns, historical studies can identify the impacts of human land use, results of long-term ecological processes, and degree of change in forest composition and wetland distribution. The 100,000-acre Connecticut Tract in western New York was first surveyed in 1811. Surveyors recorded two types of data: information about the trees which marked lot corners and rank-ordered lists of timber along the survey lines. We transcribed and analyzed both types of data, and using ArcGIS software we mapped species composition and community type. The line descriptions correlate well with current community distributions, with beech–maple–basswood covering much of the study area both then and today. Comparisons to the National Wetlands Inventory Database revealed that many of the wetlands that were present in 1811 still exist today, particularly in the Byron-Bergen Swamp and in the wetlands along the Lake Ontario shoreline. However, survey results indicate that many wetlands between Ridge Road and the Erie Canal have been lost, possibly during the construction of the canal in the 1820s. We found that an analysis of both bearing tree and line description data helps to overcome gaps due to incomplete records. (Oral presentation.)

## THE INHIBITION OF PTP1B AS A TREATMENT FOR TYPE II DIABETES.

Sarah Brodzik, Christopher Stoj, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Millions of Americans are diagnosed with Type II Diabetes each year. Current methods of treatment include the use of medication to help control high blood glucose levels. These attempts do not treat the underlying cause of the disease. Current research has shown that the protein tyrosine phosphatase 1B (PTP1B) is over active and therefore dephosphorylates the tyrosine residues found in the insulin receptor. As a result insulin cannot bind and glucose cannot move into the cells. The aim of this research is to develop an inhibitor to slow this dephosphorylation process. The standard assay for PTP1B activity has been completed. Several compounds have been screened for inhibition activity and two compounds have inhibited the enzyme. Additional compounds will be tested in the future. (Poster presentation.)

## GEOCHEMISTRY AND GEOCHRONOLOGY OF A GRANITE-MIGMATITE DOMAIN IN SOUTHWESTERN MAINE.

Claire P. Burdick, Shannon M. McAdam, and Paul B. Tomascak, Department of Earth Sciences, SUNY-Oswego, Oswego, NY 13126.

The Sebago Migmatite Domain (SMD) in southwestern Maine encompasses the homogeneous Sebago granite pluton (c. 400 $km^2$; 293 ± 2 Ma) as well as a broad (c. 5000 $km^2$) surrounding region of heterogeneous granitic bodies and migmatites of unknown crystallization age. Understanding the complex metamorphic-igneous history of the SMD is being undertaken via an integrated study including undergraduate students at SUNY Oswego and Buffalo State College. The Oswego portion of the research entails collection and interpretation of elemental, radiogenic isotope, and geochronological data. Migmatites are high grade, granite-like metamorphic rocks, which have been considered in many locations to be the leftovers of granite production. Although they commonly occur together in mountain belts with granitic rocks, understanding potential genetic relationships among these rocks is complicated by numerous factors, thus necessitating an integrated approach to research. The goal of this part of the

project is to constrain granite sources and in particular to test the hypothesis that the Sebago pluton, surrounding granites and the migmatites are part of a single magmatic event in the late Carboniferous to early Permian.

Samples zircon ($ZrSiO_4$) samples for U-Pb geochronology were processed by conventional, labor-intensive methods (crushing, sieving, dense liquid flotation, magnetic concentration, and hand-selecting). Grains were scanned by electron probe microanalyzer to examine internal homogeneity via back-scattered electron and cathodoluminescence imaging. Selected grains were then digested and their Pb and U were separated by ion exchange chromatography under ultra-clean lab conditions. Samples were analyzed by thermal ionization mass spectrometry at the Radiogenic Isotope Laboratory at Syracuse University. Zircon from a sample of undeformed granite from the eastern margin of the SMD crystallized in the mid-Devonian (c. 380 Ma), demonstrating that at least some component of the magmatism in the area is not consanguineous with the Sebago pluton.

Bulk rock samples of granites and homogeneous migmatites were ground into powder and major and trace element concentrations determined by a combination of X-ray fluorescence and inductively coupled plasma mass spectrometry in the Geoanalytical Laboratories of Washington State University. In addition, sub-samples of individual components of heterogeneous migmatite samples (leucosomes and melanosomes) were painstakingly separated by hand and subsequently analyzed by the same methods. The data returned to date (primarily major elements) do not invalidate the hypothesis of a relationship between granites and migmatites in the area. (Poster presentation.)

## USING RT-PCR TO EXAMINE THE TEMPORAL EXPRESSION PATTERN OF DELTA AND ITS DOWNSTREAM GENES IN *EUCIDARIS TRIBULOIDES*.

YuLin Chen, Rochester Institute of Technology, 102 Andrews Memorial Drive, Rochester, NY 14623.

Mesoderm development in the Echinoderm phylum differs between species. Our lab uses a primitive sea urchin, *Eucidaris tribuloides (Et)*, to study the evolution of mesoderm development in this phylum. *Et* was compared to the derived sea urchins, *Strongylocentrotus purpuratus (Sp)* and *Lytechinus variegatus (Lv)*. In contrast to the derived sea urchins, the primitive urchins are more similar to the common ancestors based on fossil evidence. These two types of sea urchins differ in their morphology as well as their development. *Et* takes longer to develop, has a variable number of micromeres, and lacks the primary mesenchyme cells. Since interactions of different genes influence the development of mesoderm in sea urchins, we anticipate that some of these genes will have different expression patterns to explain some of the developmental differences seen in *Et*. The *Delta/Notch* signaling pathway plays an important role in the development of mesoderm in derived sea urchins. Determining the expression pattern of *Delta* in the primitive urchin will allow for comparisons between the two species. To accomplish the goal of generating temporal expression pattern of *Delta* in *Et*, Reverse Transcription Polymerase Chain Reactions (RT-PCR) were conducted using cDNAs from different stages of embryos and *Ubiquitin* was used as a positive control. Preliminary results show that *Delta* is expressed from the early blastula stage to the late gastrula stage in *Et*. Genes downstream from *Delta* were also examined and the results indicate that the genes are expressed earlier than in derived sea urchins. (Poster presentation.)

## THE SIZE THAT COMMON *EURYPTERUS* SPECIES ATTAINED (LATE SILURIAN BERTIE GROUP OF NEW YORK AND ONTARIO, CANADA.

Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, NY 14609.

Across New York State and southwestern Ontario, Canada, the 'common' eurypterids occur in countless numbers within a sequence of rocks termed the Bertie Group. Within the lower portion of the group, i.e., the Fiddlers Green Formation, the eurypterid *Eurypterus remipes* is the characteristic taxon found within the preserved biota.

Stratigraphically higher, the common form is *Eurypterus lacustris*. Generally, *E. remipes* is found in a small/medium size (~5–8 inches), while *E. lacustris* occurs in a medium/large size (~6–9 inches). Interestingly, in the Niagara Peninsula of Ontario, Canada, some of the smallest (0.5–2 inches) eurypterids (*E. remipes*) are found in the Fiddlers Green Formation (Ellicott Creek Member). Whether size-sorting, i.e. segregation according to the size of individuals or fragments, is the principle reason for the distribution observed is not known at present, although size-sorting has often been observed within these eurypterid-bearing units not only in the case of eurypterid material, but also associated animal and plant remains (cephalopods, gastropods, horseshoe crabs, etc.). Regionally, it appears that storms frequently carried or floated all kinds of organic debris, much as they do today, into widespread areas of

shallow water deposition that existed shoreward of stromatoporoid banks/shoals and bands of microbialite mounds. It is suggested that much sorting took place as material moved shoreward and currents distributed molted eurypterid remains in bands (windrows) within the fine dolomitic muds.

The Peabody Museum of Natural History contains one of the largest collections of eurypterid material ever assembled (Ciurca Collection) with a very wide assortment of ranges of size and preservation. Specimens of *Eurypterus* sp. indicate, by extrapolation of preserved parts, that the common eurypterids attained a size of about 16–18 inches in length, a condition not recorded by complete material reported from the waterlimes of New York and Ontario.

A new specimen proves that these eurypterids attained an even greater size. A telson discovered in the Williamsville 'A' Waterlime is an exceptional 6 inches in length, the largest found to date, and was recently added to the invertebrate collections of the Peabody Museum in New Haven, Connecticut. Two large specimens of nearly complete *E. lacustris*, with telsons measuring 3 inches in length, were photographically enlarged to a size where the telsons became 6 inches in length. This photographic enlargement indicates that a eurypterid with a 6-inch telson reached over 2 feet in length from the tip of the carapace to the tip of the telson. It also shows that the carapace of the animal (*E. lacustris*) reached approximately 7 inches in width.

This study is being extended to a 'common' fossil found in the Pittsford Member of the lower Vernon Formation (Salina Group), viz. *Eurypterus pittsfordensis*, as a very large collection of 'Pittsford Shale' material is now available for study. (Poster presentation.)

## CHIRAL IONIC LIQUIDS AS STATIONARY PHASES IN GAS CHROMATOGRAPHY.

Brendan Clifford, and Irene Kimaru, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Chiral ionic liquids are closely related to ionic salts. Like salts, ionic liquids are composed of a cation and an anion. The major difference between the two is the phase of material. Ionic liquids are asymmetrically substituted with different length groups to prevent the packing of cations/anions into a uniform lattice. We present the synthesis and characterization of L- and D-alanine and L- and D-leucine *t*-butyl ester bis(perfluoroethyl)sulfonylimide ($BETA^+$) using a simple anion metathesis reaction. The same reaction was carried out to synthesize (S)-(3-chloro-2-hydroxypropyl)-trimethylammonium ($CHTA^+$) $BETA^-$. It is anticipated that these chiral ionic liquids will be used as stationary phases for the separation of enantiomeric species. (Oral presentation.)

## THE ROLE OF THE MRX COMPLEX AND NON-HOMOLOGOUS END JOINING IN MITOCHONDRIAL DIRECT REPEAT MEDIATED DELETIONS.

Garry Coles[1], Joy Hagan[1], Laura Schiraldi[2], Lidza Kalifa[2], Elaine Sia[2], and Rey Sia[1]; [1]Dept. of Biological Sciences, SUNY College at Brockport, Brockport, NY and [2]Dept. of Biology, University of Rochester, Rochester, NY.

Mitochondria are essential organelles required for cellular respiration and the generation of most of the cellular ATP. Mitochondrial genome maintenance is essential for the normal function of the cell. Deletions within mitochondrial DNA (mtDNA) have been found to be associated with a variety of human neuromuscular and age-related diseases. The work in the lab centers on identifying genes involved in recombinational processes that may lead to deletions within mtDNA. The lab has focused on the genes involved in the formation of the MRX complex as well as those involved in non-homologous end joining (NHEJ). The MRX complex consists of the products of the RAD50, MRE11, and XRS2 genes. The proteins involved in NHEJ are encoded by the KU70 and KU80 genes. NHEJ is a major nuclear DNA repair pathway that functions to repair double stranded breaks (DSB) in DNA in the absence of significant homology. The MRX complex positions the ends of DSBs in order to prepare them for ligation. Ku70p and Ku80p stabilize the loose ends while the MRX complex repairs the break. Xrs2p has been shown to recruit a ligase complex in order to seal the DSB (1). The specific goal of this work is to determine whether these genes are involved in direct repeat-mediated deletion (DRMD) events localized to the mitochondrial genome of the budding yeast, *Saccharomyces cerevisiae*. The lab has constructed deletion strains for each of the above genes. Each deletion strain contains both a nuclear and mitochondrial DRMD reporter integrated into the respective genomes. Fluctuation analysis was carried out to determine the frequency of DRMD events from which a rate was calculated using the method of the median for each deletion strain. In the absence of these genes, a 1.7- 6.5 fold decrease can be seen in the rate of mitochondrial DRMD while a 1.3–2.6 fold decrease was observed in the rate of nuclear DRMD events.

Reference: (1). Krogh, B. O. & Symington, L. S. (2004) Annu. Rev. Genet., 38, 233-271. (Poster presentation.)

## THE SPATIAL EXPRESSION OF *DELTA* IN *E. TRIBULOIDES* USING WHOLE-MOUNT IN SITU HYBRIDIZATION.

Rae Ann Covington and Dr. Hyla Sweet, Biological Sciences Department, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Sea urchins such as *Lytechinus variegatus* and *Strongylocentrotus purpuratus* have been studied for decades and are known for their extensive use as models for development. They are derived urchins belonging to the subclass Euechinoidea of the Echinoderm phylum. *Eucidaris tribuloides* belongs to the small subclass of sea urchins known as Cidaroidea and displays many differences in development to that of the derived urchins (Schroeder, 1981). The *Delta* gene in derived urchins has been found to play a role in mesoderm specification in the sea urchin embryo. Previous studies in *L. variegatus* have shown that *Delta* is expressed in the micromere derivatives during the blastula stage and macromere-derived mesoderm at the late blastula and early gastrula stage (Sweet et. al. 2002). The current project aims to characterize the spatial expression of *Delta* in the primitive sea urchin *Eucidaris tribuloides* by the use of whole-mount *in situ* hybridization (WMISH) using *L. variegatus* as a positive control. Fixed embryos of varying stages were incubated in antisense RNA probes made to bind *Delta* mRNA expressed in the embryo, and results were visualized by immunochemistry. The results thus far have shown the *Delta* gene to be expressed in the vegetal plate of the blastula-stage embryo (~12 hours post-fertilization) and the pigment cells of the mid-gastrula stage embryo. (Oral presentation.)

## MT HAPLOGROUPS: A WEB INTERFACE FOR CONSOLIDATED HAPLOGROUP INFORMATION.

Kyle Dewey, Eric Stevens, Dina L. Newman, and Michael V. Osier, Rochester Institute of Technology, Gosnell Building 08 – Rm 1338, 85 Lomb Memorial Drive, Rochester, NY 14623.

Within the mitochondrial genome, there exist a substantial number of variations. Based upon these variations, people of European descent can generally be placed into one of nine groups, known as haplogroups. Haplogroups are significant to the studies of population genetics and human migrations, for several reasons. The relatively high rate of mutation in the mitochondrial genome means that many variations are recent, often within the last 10,000 years. Such variations can be used as markers, separating populations and elucidating patterns of movement.

Additionally, some genetic disorders, including Parkinson's disease and Alzheimer's disease, are statistically linked to specific haplogroups. From this knowledge, it should be possible to determine which specific mitochondrial variations are associated with such disorders. However, this is no simple task. There are many variations associated with each haplogroup, and many are noncoding. Additionally, only some of the variations that differentiate haplogroups are well established. There exist other, less well known, variations which are specific to individual haplogroups. This all serves to make the task of determining which variations are linked to such disorders extremely difficult.

It is for this reason that the interface mtHaplogroups was created, utilizing the Perl computer language, as well as the HTML and CSS standards. This interface allows a user to search through a database of mitochondrial variations tied to specific haplogroups in a quick and easy manner. For each of these variations, the associated haplogroup(s) is(are) displayed, along with the locus and base pair at which the change occurs, the nucleotide change, the amino acid change, and references that document the change. The interface allows for complex, highly specific searches to be performed, without the need for any special training of the user. Emphasis is placed on the ability to easily explore the information in the database. In addition, authorized users are able to add entries to the database as new data is gathered. In summation, the interface acts as a valuable tool in the research of mitochondrial variations and their relationships to haplogroups. (Poster presentation.)

## MELANIN-CONCENTRATING HORMONE RECEPTOR INTERNALIZATION AND RATE OF SURFACE RECEPTOR RECOVERY.

P. Donohue and L. B. Cook, The College at Brockport, State University of New York, 350 New Campus Drive, Brockport, NY 14420.

MCH Signaling is linked to excessive weight gain; MCHR1 knock-out mice have been shown to resist diet-induced obesity. Desensitization via internalization of the receptor reduces G-protein-coupled receptor signaling. For MCH-mediated signaling, this is hypothesized to suppress hunger. Preliminary data suggest resensitization of cell signaling to MCH takes at least 30 minutes. We are interested in determining the time course associated with MCH receptor trafficking away from and to the plasma membrane following MCH treatment. To determine this time course, we Aim to 1) Measure MCHR1 internalization via fluorescence microscopy and western blot; 2) Determine the best method for MCHR1 extraction from the plasma membrane. While internalization was able to be observed following MCH treatment using fluorescence microscopy, Triton X-100 was unable to isolate sufficient receptor for biochemical analyses. (Poster presentation.)

## THE PHENOL-AMINE HYDROGEN BOND AS A DIRECTOR OF MOLECULAR STRUCTURE.

Jamie Doyle[1], Brittany Forcione[1], Timm Knoerzer[1], and Ben Miller[2]; [1]Department of Chemistry, Nazareth College of Rochester, 4245 East Ave. Rochester, NY 14618; and [2]University of Rochester, Rochester, NY.

The primary aim of this project is to explore the utility of the phenol-amine hydrogen bond as a fundamental structural element, and as an organizing principle for molecular recognition. A detailed understanding of the individual covalent and non-covalent interactions that contribute to the production of a stable molecular conformation is a critical prerequisite to our ability to predict and manipulate molecular structure and function. Recently, a synthetic receptor was synthesized using a tyrosine-functionalized cyclohexane core that organizes itself into a folded conformation based on hydrogen bonding between phenolic group and neighboring amine groups. While the phenol-amine H-bond is a known structural motif, it has received only limited study in solution. In order to better understand the properties of the phenol-amine H-bond, we propose the synthesis of three analogs in which the phenol pKa, and therefore its propensity to hydrogen bond, will be systematically varied. NMR experiments (T1 and T2 relaxation measurements and 2-dimensional NOESY spectra) may be carried out as a function of pH to assess the formation and stability of H-bonded structures. Similarly, the ability of these receptors to bind anions and cations as a function of pH may be assessed by isothermal titration calorimetry (ITC). Second, our method may be extended to pKa determination by ITC to amines, allowing us to probe changes in the amine pKa as a function of hydrogen bonding strength, and providing a general method for the study of amine pKa in other systems. (Poster presentation.)

## UCP2 GENOTYPE AS A POSSIBLE RISK FACTOR IN CARDIOVASCULAR DISEASE.

Jennifer Dunatov, Deborah Leonard, Brent Williams, and Michael Merhige, Biology Department, Academic Center for Integrated Sciences, Niagara University, NY 14109 and The Heart Center of Niagara, 571 Tenth St., Niagara Falls, NY 14302.

Inflammation plays a key role in coronary artery disease (CAD) and atherosclerosis. Mitochondrial uncoupling protein 2 (UCP2) functions as a negative regulator of reactive oxygen species (ROS). Since ROS can cause cellular inflammatory responses, UCP2 may be a risk factor in CAD. Genotyping UCP2 functional polymorphisms may provide and easy way to evaluate CAD risk. In this study the correlation between a UCP2 single nucleotide polymorphism and CAD was examined using positron emission tomography/myocardial perfusion imaging (PET-MPI) to evaluate disease status. Allele-specific primers were designed for a high-throughput genotyping assay using real-time PCR. Two separate RT-PCR reactions each containing the same forward primer but different reverse primers were used to determine genotypes in a Caucasian population of 218 clinical patients. The population was found to be in Hardy-Weinberg equilibrium ($p=0.13$). Allele frequencies were similar to those reported in other studies. Genotype results were used in conjunction with patient clinical data to evaluate whether there is an association between UCP2 genotype and CAD. No significant association was found between patients with mild

diffuse disease and those with CAD (p=0.89). Future studies will examine the effect of UCP2 genotype on gene expression and whether traditional heart disease risk factors affect UCP2 mRNA levels. (Poster presentation.)

## GASTROINTESTINAL TRANSIT ASSAY: FED VERUS FASTED.

N. Filip, M. Heitz, and A. Rich, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Our laboratory has shown that the zebrafish gastrointestinal tract has a similar cellular anatomy, containing interstitial cells of Cajal, enteric neurons, and smooth muscle cells, as humans and therefore may be a suitable model to examine human GI motility. The zebrafish model may assist in developing a better understanding of GI motility, and detection and treatment of human GI motility disorders such as IBS, constipation and gastroparesis. This research focuses on the comparison between the fed and fasted states. In humans GI transit is slower in the fed state compared to the fasted to allow sufficient time for nutrient absorption. This has not been examined in the zebrafish model system. Digital imaging, fluorescence microscopy and spatiotemporal mapping techniques were used to observe contractions and GI transit in the zebrafish. The objective of these experiments was to develop a model outlining the differences in transit time and coordination of the zebrafish GI tract in the fed and fasted states. FITC and Rhodamine were the two fluorescent markers that were used to observe GI transit. Rhodamine was mixed with E3 media to highlight the GI tract. FITC microspheres were mixed with H0 food to track the food moving through the highlighted GI tract. Integrating the use of spatiotemporal mapping provided quantifiable data of the frequency and coordination of contractions. The actual movement of the bolus of food in the GI tract can also be calculated using spatiotemporal mapping analysis. Fed zebrafish larvae displayed slower contraction velocity, but contraction frequency and contraction distance were unchanged from fasted zebrafish. These data support the use of the zebrafish as a model for human GI motility. (Poster presentation.)

## A ONE-CREDIT SEMINAR COURSE CENTERED ON INCREASING STUDENT AWARENESS OF CAREER OPTIONS AND ADVANCED EDUCATIONAL PROGRAMS IN THE SCIENCES.

Edward Freeman, Ph.D., St. John Fisher College, Dept. of Biology, 3690 East Avenue, Rochester, NY 14618.

Over the past three years I have taught a student-centered course (Junior Seminar, BIOL 349) focused on increasing student awareness of potential careers from the Biology major as well as increasing student awareness of the requirements for admission to the advanced educational programs often necessary to pursue careers of interest. This talk will provide an overview of the themes and methods used in the course to facilitate a greater level of student preparation and independence. During the summer of 2008 I also led a group of faculty from various scientific and non-scientific disciplines at St. John Fisher College in the development of courses specific for their student populations. This experience demonstrated that the course can be easily modified to suit the needs of various populations at the undergraduate level. In addition, I have taught the course in the traditional face-to-face format as well as the hybrid format (~80 completed online, ~20% completed face-to-face). Early data from the hybrid course suggests that student learning occurs at comparable levels to that in the face-to-face course. The overall goal of this talk is to provide participants with a brief overview of the topics considered in the seminar course.

Before we begin our conversation you should answer the following question: "How did you know what you wanted to do professionally, and when?" This will set the stage to allow participants to appreciate the series of activities used in the junior seminar course to allow: 1) students to choose careers and 2) students to determine what they must do, prior to graduating from St. John Fisher College, to successfully gain admission to subsequent training programs (to prepare for those careers), or to successfully obtain employment.

**Themes and Questions that will be discussed include:**

- Designing assignments that will allow students to answer the questions:
  - — "What do you want to do after you graduate from college?"
  - — "What type of advanced training programs are needed for your chosen career path?"
  - — "What are the specific requirements for application to your programs of choice?"
- Designing assignments that will allow students to effectively analyze their progress toward their professional goals and to create a short-term plan to achieve those goals.
- Designing activities that will allow students to practice their oral and written communication skills.

• Effective use of campus resources and alumni resources to help students connect with those in target careers. (Oral presentation.)

**SEASONAL VARIATION IN SEXUAL ACTIVITY AMONG CAPTIVE BELUGA WHALES.**
Nicholas Glabicky, Alicia Dubrava, Anthony Dellanno, and Michael Noonan. Canisius College, Buffalo, NY 14208.

Very little is known about the natural history of beluga whales due to the fact that they characteristically inhabit ice bound areas in the high arctic. This study fills in some data about their social relations by studying sexual behaviors among a large group of wild-caught belugas held in captivity at Marineland of Canada. The frequency of sexual behavior was assessed as a function of annual seasons. Male-female contact was most common during spring months and peaked in March. Surprisingly, at all times of the year male-male sexual contact was even more common than male-female contact. This may reflect the way in which males establish a dominance social hierarchy. (Poster presentation.)

**NOVEL SYNTHESIS OF THE ANTI-TUMOR AGENT GENISTEIN.**
James Gordon IV, Jeffrey St. Denis, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Genistein is a naturally occurring isoflavone found primarily in soy products. Previously, genistein was recognized for its strong antioxidative effects as well as astounding estrogenic activity. Most recent studies of genistein suggest tumor repressive properties. We have effectively synthesized genistein from 2,4,6-trihydroxyacetophenone using a novel five-step synthesis. This novel synthesis employs an enamine addition followed by a ring closure and Suzuki coupling, using PEG 10000. (Poster presentation.)

**THE ACOUSTIC SIGNATURE OF ACOUSTIC EPISODES IN CAPTIVE KILLER WHALES.**
Melissa Graham and Michael Noonan, Canisius College, Buffalo, NY 14208.

In the wild, nearly all whale behavior occurs underwater under conditions in which visual observations are impossible. As a consequence, scientists are often left with enigmatic sound recordings that are known to derive from whales, but without any means to relate these sounds to ongoing social behavior. In captivity, an opportunity exists to visually observe and acoustically monitor whales on a continuous basis. In this study, vocalizations characteristic of aggressive interactions in captive killer whales were documented. This will in turn aid wildlife researchers to assess the frequency of acoustic events in wild killer whales. (Poster presentation.)

**ASSESSMENT OF AIRBORNE TOTAL VOLATILE ORGANIC COMPOUNDS (TVOC) OF NIAGARA FALLS RESIDENCES AS COMPARED TO LIFESTYLE.**
Paolo N. Grenga, Megan E. McGahan, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

An indoor air study was conducted in the summer of 2008 to determine the effect(s) of resident lifestyle on the concentrations and distributions of volatile organic compounds (VOCs) in 57 homes in the city of Niagara Falls. Variables investigated include comparisons between smoking versus nonsmoking residences, the use of air conditioning, furnace filter condition, and the presence of pests such as mice, rats, and/or roaches. Examining the latter three variables revealed no significant differences. However, noticeable differences were discovered when comparing the concentration of VOCs in smoking versus nonsmoking homes. Of homes in which one or more smokers resided, the rate of asthma increased by 60%, and VOC levels were 17% higher than comparable nonsmoking residences. (Poster presentation.)

**SYNTHESIS OF $BF_2$ CHELATED AZADIPYRROMETHENE DYE DERIVATIVES.**
Justin Griffiths, Robert Greene, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

$BF_2$ chelated azadipyrromethene dyes fluoresce in the near infrared and have potential applications in photochemical therapy. When irradiated at ~550nm these aza-bodipy dyes react with $O_2$ to form a reactive singlet

oxygen species. Derivatives of the aza-bodipy scaffold have been synthesized via a four step process. These compounds are under investigation for their therapeutic effectiveness and practical applications. A structure-activity-relationship (SAR) study will be conducted based upon these results. (Poster presentation.)

## SYNTHESIS OF A PEPTIDOMIMETIC TERTIARY AMIDE IN THE DEVELOPMENT OF SITE-SWITCHABLE DNA-BINDING MINI-PROTEINS.

B. C. Hauck[1], N. R. Hopkins[1], V. Dodero[2], T. A. Knoerzer[1], and J. L. Mascareñas[3]; [1]Department of Chemistry, Nazareth College of Rochester, 4245 East Avenue, Rochester, NY 14618; [2]Depto de Qca-INIQO, Universidad Nacional del Sur, Bahía Blanca 8000, Argentina; and [3]Departamento de Química Orgánica y Unidad Asociada al C.S.I.C, Universidad de Santiago de Compostela, Santiago de Compostela 15706, Spain.

Our research is focused on basic region leucine zipper (bZip) proteins such as the yeast transcription activator GCN4 which contains a bipartite DNA-binding motif consisting of a coiled-coil leucine zipper dimerization domain and a highly charged basic region that directly contacts DNA. Several models of artificial transcription factors have appeared in the recent literature primarily as the result of replacement of the leucine zipper region by dimer-forming functionality, such as a disulfide bond. In order to further explore models for artificial dimerization, we have designed several structures that possess the capability of binding to DNA in a site-specific fashion. Our efforts are directed toward the design of molecular constructs that can be functionalized with up to 4 different synthetic DNA-binding mini-proteins. In addition, our ultimate goal is to design a system that is not only capable of recognizing more than one specific binding site in the genome, but also possesses the capability of being switched on and off. To this end, we now report the development of small molecule structure based on a tertiary amide that contains appendages of varying capacity for orthogonal functionalization. Two pairs of peptidomimetic appendages are elaborated to facilitate binding of our core structure to mini-proteins via a C-terminal cysteine sulfhydryl group which can displace bromine from terminal α-bromoester functionalities. The third arm is adorned with either terminal alkyne or azide groups to allow for the formation of a tetramer via 1,3-dipolar cycloaddition (Click) chemistry. (Poster presentation.)

## THE EFFECTS OF THE HERBICIDES 2,4 D AND ATRAZINE ON ZEBRAFISH FOLLICULAR MATURATION.

Erik Hefti and Edward Freeman, Ph.D., St. John Fisher College, Dept. of Biology, 3690 East Ave., Rochester, NY 14618.

Meiosis is a cell division process that occurs in sexually reproducing organisms. Meiosis generates haploid gametes (termed sperm in the male and oocytes in the female); sperm and egg join to make a zygote at fertilization. If mistakes occur during meiosis, the resultant gametes may contain an inappropriate amount of genetic material, a condition called aneuploidy. Aneuploid gametes will generate aneuploidy embryos leading, in the human, to conditions such as Down's syndrome, Klinefelter's syndrome and Edwards syndrome. Research has demonstrated that human oocytes are aneuploid more often than oocytes from other organisms. It has also been shown that the age of the human female has a profound impact on the risk of abnormal meiotic division and that aneuploidy may be caused by congression failure. Congression failure is a situation where chromosomes fail to localize properly on the meiotic spindle prior to division.

Folliculgenesis is the complex process by which the oocyte matures in the ovarian follicle. The endocrine environment of the follicle, and therefore of the oocyte, changes throughout folliculogenesis. These controlled changes are necessary to promote proper oocyte development. Numerous research studies have shown that alterations in the oocyte environment, due either to changes in endogenous hormones or the presence of exogenous hormones, greatly impact the quality of the resultant cell. Therefore, changes in the oocyte environment brought on by either endogenous or exogenous hormones are one possible explanation for the high meiotic error rates in the human female. The presence of exogenous hormones is particularly intriguing as many compounds in the environment have been shown to have endocrine activity; these compounds are classified as endocrine disruptors. Endocrine disruptors are chemicals that mimic or block the function of normally occurring hormones in the body. Endocrine disruptors can be used as powerful tools to study meiosis both *in vivo* and *in vitro*. For example, endocrine disruptors have been shown to cause meiotic abnormalities such as cell cycle delay. Therefore,

investigating the effects of endocrine disruptors on oocyte maturation and protein expression may shed light on changes in oocyte function associated with meiotic abnormalities.

There is an extensive body of knowledge related to Zebrafish (*Danio rerio*) developmental biology and genetics. Zebrafish are easy and inexpensive to breed and maintain thus making them ideal animal models to study the impact(s) of specific endocrine disruptors. Finally, follicle enclosed oocytes are easy to isolate, culture and utilize for a number of endpoint assays (i.e. microscopy and protein gel analysis). My research project has been designed to explore the effects of two commonly used herbicides on zebrafish follicle maturation; the two herbicides are 2,4-dichlorophenoxy acetic acid (2,4-D) and atrazine. Both of these compounds have been shown to have adverse effects on normal oocyte maturation in *Xenopus* and other model organisms, though none of the published research has included studies on fish oocytes. The current research is aimed at examining the molecular processes associated with follicle maturation in the zebrafish model. Due to the highly conserved nature of meiosis, understanding the molecular mechanisms of zebrafish follicle maturation may shed light on the molecular processes that occur in other vertebrates, including humans. (Poster presentation.)

## SOLVENT SUPPRESSION IN NMR RELAXATION MEASUREMENTS.

M. M. Hoffmann, H. S. Sobstyl, S. J. Seedhouse, and V. A. Badali, SUNY Brockport, Department of Chemistry, Brockport, NY 14420.

Solvent signal suppression in NMR spectroscopy continues to be a topic of intense research. Solvent suppression is necessitated for research on NMR samples which contain no or only small amounts of deuterated solvents and thus suffer under intense solvent signals. Incentives for solvent suppression are generally two-fold: improved dynamic range and recovery of solute signals masked by the large solvent signal. While very effective NMR solvent suppression schemes have been developed for many NMR experiments, surprisingly, virtually no reports are available for solvent suppression in $T_1$ and $T_2$ relaxation measurements. Since we intended to study $T_1$ and $T_2$ relaxation for industrial surfactants, which are often pre-mixed with water, we embarked in incorporating various solvent suppression schemes in the standard inversion recovery pulse program for $T_1$ and the Carr-Purrcell, Meiboom-Gill (CPMG) pulse program for $T_2$ measurements. The effect on spectral quality and accuracy of the modified pulse programs was assessed using three samples: one with only traces of $H_2O$, one with moderate $H_2O$ and one with dominantly $H_2O$ present. The results will be provided along with general recommendations how best to incorporate solvent suppression in relaxation measurements. (Oral presentation.)

## A COMPARISON OF RETENTION PONDS AND THEIR EFFECT ON WATER QUALITY IN STREAMS THROUGOUT THE IRONDEQUOIT WATERSHED.

Megan Hurley, Department of Biology, Nazareth College, 4245 East Avenue, Rochester, NY, 14618.

Retention ponds are constructed bodies of water used to prevent flooding and downstream erosion, as well as to improve water quality in adjacent streams. Because the retention ponds located in the southeastern suburbs of Rochester vary in size as well as vegetation and discharge, it is important to determine and compare their effectiveness on decreasing the concentrations of certain suspended chemical constituents in the downstream water. While various retention ponds are located in Monroe County, the two most closely studied were a large, open retention basin located on Jefferson Road and a small, vegetated retention pond located in a residential development on Mill Road. Data was collected from points upstream and downstream of the ponds and samples were brought to the lab for analysis. Chemical constituents including phosphates and nitrates were determined using ion probes, while total dissolved solids and suspended solids were analyzed using a conductivity probe and glass filters, respectively. The collected data aids in the conclusion that a vegetated retention pond is more effective at removing chemical compounds from the stream water then a larger, more open basin. A smaller pond in which the discharge is not as high allows more settling of suspended solids as well as certain chemical constituents. As a whole, both types of retention ponds appeared effective in their original purpose of mitigating the adverse effects of storm runoff on stream water quality. (Poster presentation.)

## SYNTHESIS OF A 1,3,5-TRISUBSTITUTED BENZENE RING IN THE DEVELOPMENT OF SITE-SWITCHABLE DNA-BINDING MINI-PROTEINS.

Mark Hutchinson[1], Lindsey Zullo[1], Valentina Bianco[2], Veronica Dodero[3], Timm A. Knoerzer[1], and José Luis Mascareñas[4]; [1]Department of Chemistry, Nazareth College of Rochester, 4245 East Avenue,

Rochester, NY 14618; [2]School of Pharmacy, D'Annunzio University, Chieti, Italy; [3]Depto de Qca-INIQO, Universidad Nacional del Sur, Bahía Blanca 8000, Argentina; and [4]Departamento de Química Orgánica y Unidad Asociada al C.S.I.C, Universidad de Santiago de Compostela, Santiago de Compostela 15706, Spain.

Our research is focused on basic region leucine zipper (bZip) proteins such as the yeast transcription activator GCN4 which contains a bipartite DNA-binding motif consisting of a coiled-coil leucine zipper dimerization domain and a highly charged basic region that directly contacts DNA. Several models of artificial transcription factors have appeared in the recent literature primarily as the result of replacement of the leucine zipper region by dimer-forming functionality, such as a disulfide bond. In order to further explore models for artificial dimerization, we have designed several structures that possess the capability of binding to DNA in a site-specific fashion. Our efforts are directed toward the design of molecular constructs that can be functionalized with up to 4 different synthetic DNA-binding mini-proteins. In addition, our ultimate goal is to design a system that is not only capable of recognizing more than one specific binding site in the genome, but also possesses the capability of being switched on and off. To this end, we now report the development of small molecule structure base on a 1,3,5-trisubstituted benzene moiety that contains appendages of varying capacity for orthogonal functionalization. Two groups are elaborated to facilitate binding of our core structure to mini-proteins via □-bromoester displacement by a terminal cysteine residue on the peptide. The third appendage is adorned with either terminal alkyne or azide groups to allow for the formation of a tetramer via 1,3-dipolar cycloaddition (Click) chemistry. (Poster presentation.)

## THE INFLUENCE OF CD14 ON THE DEVELOPMENT OF CORONARY ARTERY DISEASE AND ITS USE IN CARDIOVASCULAR RISK ASSESSMENT.

Brian Iacomini, Deborah Leonard, Brent Williams, and Michael Merhige, Biology Department, Academic Center for Integrated Sciences, Niagara University, NY 14109 and The Heart Center of Niagara, 571 Tenth St., Niagara Falls, NY 14302.

Although CD14 has been associated with both carotid atherosclerosis in the elderly and acute coronary syndrome there is conflicting data on its role in stable coronary artery disease (CAD). Chronic inflammation of the arterial wall is typically seen in patients that suffer from CAD. An increase in CD14 expression ultimately leads to an increased inflammatory response that might promote the progression of CAD. This study looks at genotypes of a functional polymorphism in the CD14 promoter region (C-260T) and their association with stress-induced perfusion defects in CAD patients.

Patients enrolled in the study were referred for clinically indicated Positron Emission Tomography – Myocardial Perfusion Imaging (PET-MPI) to assess stress related myocardial dysfunction. Allele specific primers were designed for the CD14 polymorphism and genotyping was carried out using real-time PCR. Each patient sample was amplified in two PCR reactions that used either a C or a T allele specific forward primer and a common reverse primer. Analysis of 215 Caucasian patients demonstrated that the study population was in Hardy-Weinberg equilibrium. Allele frequencies were comparable to those reported in previous studies (C=0.55, T=0.45). The patient population was split into two groups, those with mild diffuse disease and those with stress-induced perfusion defects or previously diagnosed CAD. The number of T allele carriers was larger than expected among patients positive for CAD, but this difference was not statistically significant ($p = 0.12$). The next steps in this study will include designing mRNA primers and carrying out qRT-PCR to identify variations in gene expression between genotypes. The risk allele (T) is predicted to be associated with an increase in CD14 mRNA. (Poster presentation.)

## NOVEL CUBANE-BASED CHIRAL LIGAND AND ITS APPLICATION IN THE ASYMMETRIC CYCLOPROPATION.

Michelle L. Ingalsbe and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

A novel chiral cubane-based ligand was prepared in six steps using dimethyl-1,4-cubane carboxylate as its precursor. Its application in asymmetric copper(I)-catalyzed cyclopropanation of styrene with ethyl diazoacetate has been screened. The bulkiness of the ligand has proved to be essential in enantioselectivity, suggesting that interaction with the catalyst is difficult compared to a phenyl-based ligand. (Poster presentation.)

## IDENTIFICATION OF *NOVOSPHINGOBIUM* SP. TRANSPOSON MUTANT DEFICIENT IN QUORUM SENSING SIGNAL PRODUCTION.

C. Jacob, H. M. Gan, and M. A. Savka, Department of Biological Science, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Quorum sensing (QS) signals enable bacteria to communicate with each other and to mediate gene expression in a coordinated manner. We have previously identified a grapevine tumor isolate Rr 2-17 as a member of the *Novosphingobium* genus. *Novosphingobium* sp. Rr 2-17 produces large amounts of the QS signal *N*-acyl-homoserine lactone (AHL). To identify and clone the gene responsible of AHL signal synthesis, *Novosphigobium* sp. Rr2-17 has been electroporated with a transposon to create kanamycin-resistant mutants. Approximately 1200 kanamycin-resistant mutants were screened for AHL signal production with the AHL-dependent biosensor *Chromobacterium violaceum* CV026 strain. An AHL-deficient mutant would target the *luxI* homology, which encodes for the AHL synthase, catalyzing production of AHLs. Putative mutants have been identified and are deficient in AHL production in an assay using the biosensor CV026 strain. Ethyl acetate extracts from the growth supernatants of the putative AHL-deficient mutants are currently being further tested for a deficiency in AHL signal production with a different AHL-dependent biosensor, *Agrobacterium tumefaciens* NTL4 (pZLR4). With biosensor NTL4 (pZLR4), AHLs in a sample will turn on the reporter gene, β-galactosidase, indicated by blue pigmentation. Extracts that fail to activate β-galactosidase activity will confirm potential transposon insertion in the *luxI* homolog of *Novosphingobium* sp. Rr 2-17. The mutated gene containing the transposon will be subject to DNA sequencing and the nucleotide sequence can then be compared to sequences in databases for identification. (Poster presentation.)

## CHARACTERIZATION OF A NEW SEQUENCE-DEPENDENT HOTSPOT OF MEIOTIC RECOMBINATION.

Corey Kalinowski and Walter Steiner, Department of Biology, Box 2032, Niagara University, NY 14109.

Meiotic recombination is a form of cell division in which DNA replication is followed by two cell divisions, resulting in four haploid products. Meiotic recombination between homologous chromosomes occurs preferentially at hotspots, which are sites of double-strand DNA breaks. The factors determining the location of most hotspots are still largely mysterious. However, it is known that a specific nucleotide sequence motif acts a hotspot of recombination at multiple sites in the genome of the fission yeast *Schizosaccharomyces pombe*. This motif, known as *M26*, acts as a binding site for a transcription factor that is essential for activity of the hotspot. Since the *M26* motif can only account for a small fraction of the hotspots in the *S. pombe* genome, our lab has conducted a screen for additional sequence motifs that act as recombination hotspots. We report here the precise nucleotide sequence requirements for one of these hotspots, 5'-SRHCCAATCA-3'. Based on the sequence of this hotspot, we tested the possibility that it is a binding site for that CCAAT-binding factor, a heterotrimeric transcription factor encoded by three genes, *php2*, *php3*, and *php5*. We have determined that a deletion of the *php3* gene significantly reduces activity of the CCAAT hotspot, but not the *M26* hotspot. This result is consistent with the hypothesis that the CCAAT-binding factor is required specifically for activity of the CCAAT hotspot, but not unrelated hotspots. (Poster presentation.)

## THE FIGHT TO GIVE LIFE: THE STORY OF BIRTH ACTIVISM IN ITHACA, NY.

Melendy Krantz, 953 Danby Road, Garden Apt. 27-3-4, Ithaca, NY 14850.

All people share the common experience of birth and we depend on the birthing process to continue the human species. Because it is so central to human existence, it plays a significant role in human culture. In the United States, however, we have competing birth cultures. The dominant culture is that of the hospital, obstetricians and a highly interventionist model of care. The secondary culture is that of homebirth and the midwifery model of care. As a result of the two models being unequally represented, birth activism, the political and social movement motivated to increase women's choices for birth, has developed, challenging the dominant model by embracing select aspects of the secondary model. While the movement is national, it holds greater influence and power in cities such as Ithaca, NY. In Ithaca, a group called Birth First educates and advocates for a variety of choices for women in childbirth. Through the Birth First's perspective that mothering is the root of everything, the group works to bring individuality into the institution of medicine. The group embraces the idea that pain is fundamental to human life and personal growth and works to teach women and families about how to claim the transformative qualities of birth. (Oral presentation.)

## SUBUNIT TO INTERACTIONS WITH FACTOR IXA IN FACTOR XASE: OPTIMIZATION OF PROTEIN PURIFICATION.

Tricia Kruger, Indu Jagannathan, Sandeep Chadha, H. Travis Ichikawa, and Philip J. Fay, Department of Biochemistry and Biophysics, University of Rochester, Rochester, NY 14642.

Factor VIII (FVIII) plays a critical role in blood coagulation, where defects or deficiencies result in hemophilia A, the most common of the severe, inherited bleeding disorders. FVIII is synthesized as a metal ion-dependent heterodimer that is responsible for an increase in the catalytic efficiency of factor IXa (FIXa) in the surface-dependent conversion of factor X (FX) to FXa. The FVIII procofactor is proteolytically activated by thrombin to FVIIIa, a heterotrimer composed of A1 and A2 domains from the heavy chain and light chain-derived A3/C1/C2 domains. The expression of cofactor function relies on the conversion of the inactive procofactor to the active cofactor.

The objective of this research was to investigate the intrinsic factor Xase (FXase) complex that is formed, in part, by the protein interaction of residues in and around the 330-339 helix of FIXa, a serine protease, and the 558-565 loop of the FVIIIa A2 subunit assembling on an anionic phospholipid membrane. Scanning alanine site-directed mutagenesis was used to create point mutations using a pFastBac plasmid wild type A2 template. The A2 variants were expressed as isolated A2 domains in Sf9 cells using a Baculovirus construct and purified to greater than 80% using column chromatography.

Two reconstitution assays were used to measure the affinity parameters of the protein. In the first assay, FXase is reconstituted using varying concentrations of the A2 variant and fixed concentrations of A1/A3C1C2 dimer, FIXa and phospholipid vesicles, and the relative activity generated is used to determine an inter-molecular Kd value for A2. A FVIIIa reconstitution will be done using varying concentrations of the isolated A2 variant and fixed level of A1/A3C1C2 dimer to determine the Kd for the inter-FVIIIa subunit interactions. If the mutant has activity that varies from the known wild type values, then the mutant may play a critical role in the FVIIIa-FIXa interactions. (Poster presentation.)

## CHANGES IN THE CALLING PATTERN OF A RECENTLY TRANSPLANTED CAPTIVE KILLER WHALE.

Elizabeth Lange and Michael Noonan, Canisius College, Buffalo, NY 14208.

Killer whales (*Orcinus orca*) show convergent evolution with humans on a number of bio-behavioral traits. Both are species that are characterized by long lives, large brains, and complex, long-term social relationships. In the wild, pods of killer whales demonstrate both regional and family-specific dialects in the vocalizations that they produce. It has long been hypothesized that these vocal variations derive from social learning. This study sought evidence of vocal learning in the call patterns of a young male killer whale recently transferred from one vocally distinct social group (in Sea World, Orlando) to another (in Marineland, Ontario). Over time, the transplanted whale gradually increased the frequency with which it produced Marineland-specific calls, a pattern that strongly supports the social learning hypothesis. (Poster presentation.)

## EXPRESSION AND PURIFICATION OF THE MULTICOPPER OXIDASE FET5 FROM *S. CEREVISIAE.*

AnneMarie Laurri, Shella Dargout, and Christopher S. Stoj, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

A significant link has been established between the regulation of iron homeostasis and a class of metalloenzymes known as multicopper oxidases. This research seeks to develop a deeper understanding of metallobiochemistry through the expression and purification of the multicopper oxidase Fet5 from the baker's yeast *Saccharomyces cerevisiae*. Fet5 is directly involved in the oxidation of iron(II) and thereby the mobilization of iron stores from the yeast vacuole. *Pichia pastoris*, a strain of yeast which is notable for high protein expression as well as low gylcosylation, was used as a proxy host in an effort to improve the expression of Fet5. We have successfully cloned *FET5* and integrated it into the *Pichia* chromosome using Invitrogen's *Pichia pastoris* expression kit. Fet5 expression was confirmed by SDS-Page analysis. Currently, secretion and functionality of Fet5 are being evaluated. (Poster presentation.)

## DERIVATION OF THE HUBBLE CONSTANT.

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The Big Bang as the origin of the Universe is based on E. Hubble's observation that galaxies in all directions are moving away from our Galaxy, and that their rate of separation is proportional to their distance from our Galaxy. The slope of this correlation is known as the Hubble Constant. The cause and reason for this correlation was not known, but led to such esoteric suggestions as negative energy, which supposedly pulls the Universe apart, and dark matter, which supposedly will cause the Universe to collapse into a singularity.

It was shown in a new model of the Universe that the concepts of negative and dark matter are unnecessary to explain the expansion and collapse of the Universe (Leubner, RAS Fall Meetings, 2003, 2007). The new model suggests that the Universe expands because matter, with directed gravity, is converted to photons, with non-directed gravity. The loss of directed gravity causes the loss of cohesion of planetary systems, like the solar system (RASNY 2004/6), galaxies, and the Universe.

The new model leads to a reinterpretation of the Hubble constant. For this purpose, the model was extended to determine the rate of separation in closed systems, e.g., the Universe, as a function of the distance from the gravitational center. The modeling of separation rate as a function of distance leads to a linear correlation, in agreement with the experimental Hubble correlation.

This result suggests that the Hubble constant represents the mass loss ('decay') rate, or more accurately the gravity loss rate, of the Universe, $k_u$. The presently considered most accurate value of the Hubble constant is 71.0 (+/– 1.3) (km/s)/Mps (Mps = mega-parsec). From this value, the universal mass loss constant $k_u$ was calculated to 3.24+/-0.059)E-20 $s^{-1}$ or (0.0715+/-0.0013) $Byr^{-1}$ ($Ga^{-1}$).

The identification of the Hubble constant as the universal decay rate and its value are ground-breaking successes of the new model of the Universe. (Oral presentation.)

## STUDIES TOWARD THE TOTAL SYNTHESIS OF A CROSS-MEMBRANE FLUOROMETRIC PROBE.

Tim Liwosz, Ryan Walvoord, Christina Collison, and Andreas Langner, Chemistry Department, Rochester Institute of Technology, Rochester, NY 14623.

Synthesis of a cross-membrane probe that will show both nonpolar and polar spectrochromic sensitivity should help in determining the location of bound probe and its partitioning between a surfactant membrane and an aqueous core.

Our tethered fluorescence probe will be composed of coumarin and a dansylamide, separated by a hydrocarbon spacer. The spectrochromic sensitivity of secondary dansylamides in nonpolar environments is matched by the sensitivity of coumarin in polar and aqueous systems. By tethering these two probes with a hydrocarbon spacer, the resulting probe system can be anchored across a surfactant-based membrane. (Poster presentation.)

## MULTIPLE ANTIBIOTIC RESISTANCE FOUND IN BACTERIA FROM WILD GREEN FROGS.

Jillian Lund, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

An increase in the incidence of antibiotic resistant enteric bacteria has been observed in wild vertebrate species that have never had direct contact with humans. In the United States, livestock farms may be contributing to this problem through their use of antibiotics to promote growth and prevent infection. We tested this hypothesis by comparing the antibiotic resistance of enteric bacteria sampled from *Lithobates clamitans* at sites in central New York with different levels of exposure to livestock wastes. A chi-square analysis indicated that the isolates from the site with direct exposure to livestock wastes had significantly different levels of resistance to erythromycin and tetracycline, as compared to the isolates from the site that was protected from livestock wastes. (Oral presentation.)

## SURFACE COATINGS USING PVPh, PDMAC, AND PAH MULTILAYERS.

Ashley Mandrino, Paolo Grenga, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Every surface has a negative charge. Surface coating technologies have been tested and are now widely used. Phenol based polymers, such as poly (4-vinylphenol) (PVPh), are used in a layer-by-layer self-assembly technique to create a multilayered surface. The polyanions, PVPh has been used with two polycations to test cohesion between the two and the thickness of the multilayering. PVPh and poly dimethylammonium chloride (i.e. PDMAC), have been multilayered at five different pH values ranging from 10.5-12.5. The film growth was monitored using UV-Visible spectroscopy showing a clear difference in absorption between 10, 20, 30, 40, and 50 layers at each pH. Results have also been validated using AFM. (Poster presentation.)

## DELTA KNOCKDOWN STUDIES IN A PRIMITIVE SEA URCHIN *EUCIDARIS TRIBULOIDES.*

Jacqueline Mclatchy and Hyla Sweet, Ph.D., Rochester Institute of Technology, 102 Andrews Memorial Drive, Rochester, NY 14623.

Mesoderm, the middle tissue layer found during gastrulation, develops into many different cell types including skeletal cells, pigment cells, blastocoelar cells, muscle cells, and coelomic pouch cells in members of the Echinoderm phylum. There are several genes that control mesoderm development in sea urchins, including the genes involved in the Delta/Notch pathway. Delta/Notch signaling has been studied in *L.variegates* and shown to induce mesoderm development. In an effort to study the effect of Delta in a more primitive sea urchin, *Eucidaris tribuloides*, Delta morpholino injections were performed with the hypothesis that knocking down Delta would decrease the amount of mesoderm derivatives in the embryo. This preliminary study produced intriguing results: pigment cell and skeletogenic cell counts were higher in the morpholino experimentals than in the positive controls. Another unexpected qualitative result showed that the tripartite guts of the embryos appeared smaller in the knockdown experimental specimens when compared to the negative controls. Delta has, to date, not been shown to be involved in endoderm development as the previous results suggest. To further study this anomaly, an endoderm staining protocol was developed and applied to two to three day old, morpholino injected *E. tribuloides* embryos. Results are forthcoming. (Poster presentation.)

## FEEDBACKS AMONG BENTHIC INVERTEBRATES, SEDIMENT BIOGEOCHEMISTRY AND ALGAL PRODUCTION IN A SHALLOW EUTROPHIC ESTUARY.

Natalie McLenaghan, Christopher Scheiner, Megan Kozlowski, Charles Yarrington, Brittany Bourdon and Christy Tyler, 85 Lomb Memorial Drive, Program in Environmental Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Benthic invertebrates play an important role in biogeochemical cycling in estuarine sediments. These same organisms also tend to disappear with the onset of the persistent hypoxia associated with eutrophication. The aim of our research is to demonstrate that the burrowing, feeding and metabolic activities associated with a robust community of marine invertebrates have significant direct and indirect effects on nutrient cycling, organic matter decomposition and primary production during the early stages of eutrophication. In a series of laboratory experiments conducted using organisms and sediments from a shallow Cape Cod estuary currently undergoing rapid eutrophication, we investigated how common macrofauna (gastropods, bivalves, polychaetes and peanut worms) influence sediment anoxia and nutrient storage, oxygen consumption, decomposition, the return of nutrients to the water column, and benthic microalgal and macroalgal production. We found both direct and indirect effects. Direct effects included a decrease in algal production due to grazing activities of gastropods (on microalgae) and polychaetes (on macroalgae). Indirect effects included stimulation of macroalgal growth by gastropods through decreased competition for nutrients with microalgae, increased removal of organic matter through higher sediment decomposition rates within polychaete and peanut worm burrows, and increased return of nutrients to the water column by enhanced decomposition and excretion with most species. Our results show that the composition of the macrofaunal community significantly impacts sediment nutrient release, oxygen demand and primary production and is an important determinant of water column nutrient availability. This implies that these invertebrates

participate in important feedbacks that both facilitate and retard the progression of eutrophication in shallow estuaries. (Poster presentation.)

## SYNTHESIS AND EVALUATION OF TELLURIDE ANTIOXIDANTS FOR THE STUDY AND PREVENTION OF OXIDATIVE DAMAGE TO MITOCHONDRIAL DNA.

Trevor N. O'Leary, Margaret E. Logan, and Rey A. Sia, Departments of Chemistry and Biological Sciences, The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Mutations to mitochondrial DNA caused by reactive oxygen species have been associated with a wide range of diseases and disorders including cancer, heart disease, diabetes, Alzheimer's disease, Parkinson's disease, and even natural processes such as senescence. Organotellurides have been demonstrated to be powerful antioxidants, and could serve as probes to better understand oxidative damage to DNA. *Saccharomyces cerevisiae* (brewers' yeast) is an ideal experimental organism to evaluate the efficacy of a particular antioxidant because it is facultatively anaerobic. Therefore, when plated on selective media, yeast with impaired mitochondrial function can be identified. *Saccharomyces* assays have been used to establish a consistent frequency of spontaneous respiration loss, and will be used for the subsequent testing of the antioxidant's ability to prevent oxidative damage to DNA. Progress toward the synthesis of cationic, lipophilic, water-soluble organotelluride antioxidants designed to undergo transport into yeast mitochondria has been made. A series of telluride compounds has been analyzed for antioxidant capability using cyclic voltammetry. (Poster presentation.)

## THE EFFECT OF RIPARIAN ZONE HEALTH ON VERTEBRATE DIVERSITY.

Nicole Paris, Biology Department, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

The goal of this study was to determine if there is a relationship between stream/riparian zone health and the diversity and visitation of vertebrates in the riparian zone. Field research was done at Allen Creek at the east and west catchments in Pittsford and Henrietta, NY as well as at the Irondequoit Creek catchment in Mendon, NY. Observations of vertebrate activity were made from May 21, 2008 to June 18, 2008. A detailed log was kept of evidence of any bird, mammal, fish, or amphibian/reptile visitation within approximately fifty yards of the stream.

The evidence collected was placed into the categories of holes/nests, dead animal, scat, fur/feathers/eggs, sighting, hearing, and tracks. Utilizing this categorization, a diversity quantification was developed where a conservation value was given for each type of evidence based on the animal's conservation status as well as a visitation value for the type of evidence found based on an adjusted census. The data was organized by catchment and the frequency of invasive species, as well as the areas where least frequent species were found were compared in each catchment.

Due to the lack of riparian zone in Allen Creek West, it was hypothesized that the vertebrate richness and visitation would be less, and the data supported this strongly. Allen Creek East, however, showed much higher values than Irondequoit Creek. This did not support the hypothesis, as Irondequoit Creek is much more rural and Allen Creek East is more suburban. These results suggest that the maintenance of green space in Pittsford may be playing a part in preserving vertebrate species in stream riparian zones.

Additionally the results of the invasive species comparison showed that an overwhelmingly greater number of invasive species were observed in the Allen Creek East catchment, whereas Allen Creek West and Irondequoit Creek were about equal in terms of invasive species. (Poster presentation.)

## GUT CONTENTS OF A LOWER CRETACEOUS DROMAEOSAURID DINOSAUR: NEW DATA ON THE FEEDING BEHAVIOR OF *DEINONYCHUS ANTIRRHOPUS* (SAURISCHIA, THEROPODA).

William L. Parsons and Kristen M. Parsons, Department of Geology, Buffalo Museum of Science, Humboldt Parkway, Buffalo, NY, 14211.

Two partial specimens of *Deinonychus antirrhopus,* from the Lower Cretaceous Cloverly Formation of central Montana, discovered within a mono-specific site, were found to be closely associated with preserved gut contents. The gut contents consisted of several small nodules composed of densely packed bone fragments. Many of the bone fragments that appear upon the surface of these nodules exhibit erosion of the outer periosteal layers and acid etching, which are indications of the digestive process. The acid etching is similar to the result of the action of

digestive acids and enzymes found within the gut contents of modern amniotes. Although no gastroliths are present at this site, the highly fragmented nature of some of the bones in this gut material may indicate digestive processing by a muscular gizzard. Color differences between gut content material and associated bone have been noted in the descriptions of other fossil gut contents. Almost all of this gut content material is a deep shade of orange and can be easily distinguished from the pinkish-green/grey coloration of the associated *Deinonychus* bone material. Although some of the larger bone fragments within these conglomerates were of the size that would be expected from the remains of a medium-sized dinosaur, many fragments are from much smaller individuals. An avian-like manual phalanx found among these conglomerates indicates the original source of at least some of the smaller bones. The morphology of this phalanx indicates a forelimb/wing from a taxon that is very likely to have been capable of sustaining some form of flight. Although the discovery of this forelimb element is notable, it is also significant in that it indicates that *Deinonychus* not only fed upon the carcasses of larger dinosaurs, but that its predatory behavior included the acquisition of much smaller prey. *Deinonychus* was an opportunistic feeder, probably capable of catching prey species that possessed some form of flight. (Oral presentation.)

## ESTABLISHMENT OF THE ZEBRAFISH OVARIAN FOLLICLE AS A MODEL FOR ENDOCRINE DISRUPTOR RESEARCH IN AN UNDERGRADUATE SETTING.

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Meiosis, the process by which germ cells are generated, is highly conserved among species with very low error rates in most species studied. However, human females have extremely high meiotic error rates. The human oocyte is prone to errors during meiosis, in part due to a lack of stringent cell cycle checkpoints. Therefore, disturbances in the oocyte cell division process may go undetected, and delay of anaphase onset is unlikely to occur. Much time and effort has been devoted to determining what causes these errors. In humans, it has been established that meiotic competence decreases severely with age, starting at around age 35. Oocytes from ovaries of women $\geq 35$ years of age have an increased frequency of meiotic spindle defects, chromosome misalignment (congression failure; CF), meiotic non-disjunction (the failure of sister chromatids to separate), and aneuploidy (a deviation from the normal number of chromosomes). However, age is unlikely to be the only factor that is related to a reduction in meiotic competence, and the detailed mechanisms behind this phenomenon are actively being studied in various settings. Studies in wild-type mice have shown that exposure to endocrine disruptors (EDs; man-made chemicals that mimic or block normal hormone function thereby disrupting normal endocrine regulation of homeostasis) can influence chromosome behavior, and significantly increases the incidence of CF. CF may result in meiotic non-disjunction and is therefore likely to be causally related to aneuploidy. Also, it has been determined that CF does not cause a sustained delay in the onset of anaphase, indicating that abnormal oocytes have the potential to complete both meiotic divisions and to be fertilized. Research with various EDs such as bisphenol-A (BPA) in mice and pentachlorophenol in zebrafish has provided additional evidence that agents that disrupt the endocrine environment of the ovary do indeed alter oocyte meiosis. The phenotypes of oocytes exposed to specific EDs are very similar to the age associated effects in the human female, thus making EDs an excellent tool for studying the mechanisms behind alterations in oocyte meiosis in non-human research models. Zebrafish are an excellent model for investigating chemical toxicity because they are inexpensive to house and raise, are genetically complex vertebrates, and live in aquatic environments where EDs are often found. The focus of this research is to provide information on follicle maturation and mechanisms of ED action in the context of oocyte maturation within the zebrafish follicle. My research has dealt with laying the groundwork for studying the effects of EDs on follicle development in zebrafish. My research has consisted of validating and modifying existing protocols for zebrafish follicle isolation and incubation, follicle protein preparation, SDS-PAGE, and Western blotting. Future research will utilize these protocols to help elucidate the mechanism(s) of action of specific EDs in the disruption of zebrafish folliculogenesis, in an effort to model the phenomenon found in the human female. (Poster presentation.)

## MAPPING A MEXICAN NATIVE: PARAPHYLETIC RELATIONSHIPS WITHIN *CTENOSAURA PECTINATA.*

Bianca Peters, (RIT) 42 Rowley St. Apt. 5, Rochester, NY 14607, and Larry Buckley, (RIT), 1 Lomb Memorial Drive, Rochester, NY 14623.

The majority of Iguana species are either threatened or endangered and thus a better understanding of their genetic diversity may help save them from extinction. In this study we are examining the genetic variations within the species *Ctenosaura pectinata* (among others) found throughout Mexico. The focus of the laboratory work is to extract, amplify, and sequence the gene cytochrome b from several Iguana tissue samples. From our analysis of genes sequenced from theses species, we will then be able to build upon a phylogenetic tree already in progress. Phylogenetic trees are vital to the understanding of Iguana species' because they provide a foundation for the genetic diversity of these animals. Not only will this build a greater knowledge on the relationships within a species, it will also help answer questions on their behaviors, divergence, and concentrations within specific regions. (Poster presentation.)

## EXPERIMENTAL BLIND TEST FOR RELIABILITY OF TECHNIQUES FOR SIDING THE MANUAL PHALANGES.

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The purpose of this experiment was to assess if experience matters when applying a new method for determining the side of the manual phalanges. In a blind study, the primary author applied a recently established technique for siding phalanges to 50 phalanges of known side. The proximal phalanges were correctly sided 45% of the time while the middle and distal phalanges were correctly sided 67% of the time. These results suggest that the method is robust enough to be used by researchers of varying experience, but that ultimately experience will improve accuracy. (Oral presentation.)

## INHIBITION ASSAY OF BACTERIAL GROWTH ON ANTIMICROBIAL COATED SLIDES.

Matthew Pinto and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Multilayered phenol moieties have shown great promise in inhibition and prevention of bacterial growth because of their antibacterial character. Due to the antimicrobial nature of phenol; these multilayer films are currently under investigation as potential protective surface coatings. It is proposed that these surface coatings would aid in prevention of bacterial illnesses caused by bacteria, such as *Staphylococcus*, *E. coli*, and/or *Salmonella*. The adsorption of PVPh from an aqueous media has been successfully accomplished. Multilayered films of the phenol-based polymers have been prepared using the layer-by-layer assembly technique. The bacteria would essentially be trapped between the alternating poly-anion and poly-cation layers which would lead to the inhibition of bacterial growth and survival. Anti-bacterial surface coating on everyday objects such as medical instruments, doorknobs, or keyboards would prevent the spread of infection. (Poster presentation.)

## MELANIN-CONCENTRATING HORMONE SIGNALS ACTIN DEPOLYMERIZATION IN 3T3-L1 PRE-ADIPOCYTES.

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Melanin concentrating hormone (MCH) binds and activates two G protein-coupled receptors involved in the control of appetite and energy expenditure in mammals. MCH receptor 1 interacts with two cytoskeleton-binding proteins in vitro. One of these proteins, periplakin, has been shown to contribute to the desensitization of MCH signaling events by displacing the interacting G protein. While periplakin is an actin- and intermediate filament-binding protein, MCH is not known to signal cytoskeletal rearrangements. This study asks whether MCH receptors mediate actin cytoskeletal rearrangements in response to hormone binding. 3T3-L1 pre-adipocytes, endogenously expressing MCH receptors, were treated with MCH for varying times, fixed, and actin fibers were stained with Alexa Fluor phalloidin. Using fluorescence microscopy, cells were categorized as 1) having prominent actin stress

fibers, 2) being round with many plasma membrane extensions, or 3) being small and round in blinded experiments. Pharmacological agents were used to dissect the contributions of two downstream effectors of Gq, phospholipase C and ADP-ribosylation factor 6, on MCH-mediated actin rearrangements. A small, but statistically significant change in actin morphology was observed after exposure to MCH for a little as 2 minutes showing that MCH does indeed signal to the cytoskeleton in this cell line. Phospholipase C activators mimic this response on a similar time course suggesting it is a major participant in this signal transduction pathway. (Poster presentation.)

## PHENOL BASED POLYMERS: ANTIMICROBIAL AGENTS.

Danielle Raymond, Vincent Carroll, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Phenol based polymers have shown promising results as anti-microbial agents through an analysis of multi-layered quartz slides. A novel four step synthesis has been implicated to create unique phenol based polymers using free radical polymerization. The polymers are distinctive due to a number of different electron withdrawing substituents placed on the third position of the phenyl ring. We have begun to multilayer these polymers onto quartz slides with difference of binding affinities based on the electronegative substituents. (Poster presentation.)

## A COMPARISON OF BAITS FOR SAMPLING ISOPODS.

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Isopods are terrestrial crustaceans that play an important role in energy flow in forest and grassland ecosystems. The abundance and species diversity of isopods have been used to evaluate ecological succession and habitat quality. Some of these studies have used vegetables as baits to attract isopods. A variety of baits have been used, and differential responses to baits would complicate comparisons among studies.

We compared the response of isopods in a woodland on the RIT campus to four baits (potatoes, apples, carrots and turnips) in a total of 20 trapping sessions during a four-day period in July 2008. Each trial presented the four baits side by side, and we randomized the positions of the baits in each trial. We retrieved the baits after 48 hours and preserved the isopods from each bait in 70% isopropyl alcohol.

Chi square tests were based on the total surface area of each of the four baits. Analysis of the entire sample of 124 isopods (5 species) showed no preference ($\chi^2 = 4.4637$, $0.25 > p > 0.10$). However, analysis of bait choice by the two most abundant species revealed pronounced and offsetting preferences. *Trachelipus rathkei* (n = 63) was found substantially more often than expected on potatoes and less often on turnips, whereas *Philoscia muscorum* (n = 39) was found less often than expected on potatoes and more often on turnips. Although neither distribution reached statistical significance, these observations suggest that analyses should be based on individual species rather than on the entire community of isopods, and sampling protocols should incorporate interspecific variation in bait preference. (Poster presentation.)

## SCREENING OF A SOIL METAGENOMIC LIBRARY FOR CLONES THAT PRODUCE BACERIAL CELL-TO-CELL COMMUNICATION SIGNALS.

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The quorum sensing (QS) mechanism in bacteria regulates sets of genes in a coordinated fashion at the population level by the accumulation and response to signals called *N*-acyl-homoserine lactone (AHL). The goal of this study was to screen a soil metagenomic library for the synthesis of bacterial QS signal molecules. Our metagenomic library was constructed from isolated genetic material recovered directly from soil on a mountain site covered with a mixed deciduous and coniferous forest. In this technique, genetic clones of the metagenomic library should represent the genomes of the organisms present in the sample without the requirement of culturing. Since QS plays role in intraspecies communication in different species of bacteria, we expect that some of our soil metagenomic clones may represent new bacterial species not-yet-identified as using QS in communication. Our metagenomic library was transferred into *Escherichia coli* cells and this genomic library was screened for the production of AHLs. AHL signal screening was carried-out using the AHL-dependent *Agrobacterium tumefaciens*

KYC55 strain. This AHL biosensor employs the TraR receptor to activate the TraR-AHL dependent *traG::lacZ* fusion reporter gene. Library clones that produce AHL signals will be identified by a blue colony phenotype. We have identified seven colonies of *Escherichia coli* metagenomic library that produce a signal that specifically activates the KYC55 biosensor strain. This indicates that each clone potentially contains a gene from our metagenomic library that directs the production of an AHL signal. (Poster presentation.)

## THE ROLE OF THE VSV-M PROTEIN ON REGULATION OF NF-κB.

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As previously reported, NF-κB activation is delayed until later times post-infection in murine L929 cells infected with interferon (IFN)-inducing wild-type (wt) vesicular stomatitis virus (VSV). In contrast, NF-κB, a transcription factor, is activated at earlier times in cells infected with the interferon-inducing R1 strain that encodes a defective matrix (M) protein. An M-defective recombinant virus also activated NF-κB, although the timing varied slightly from activation by R1. Real-Time PCR analysis of RNA isolated from whole cells showed that very little IFN mRNA was produced in wt infected cells, while IFN mRNA was produced in cells infected with R1 and r1026M (an M-defective recombinant virus). The M protein has been shown to inhibit host transcription by blocking cytoplasmic export of mRNA, however IFN mRNA trapped in the nucleus should have been amplified from our whole cell RNA extracts. These findings suggest that the M protein blocks induction of the IFN gene by preventing NF-κB activation, or by blocking nuclear import of activated NF-κB protein. To determine if the M protein prevents NF-κB from entering the nucleus, we measured NF-κB activation in cytoplasmic extracts from wt infected cells using the TransAM assay (Active Motif). No significant NF-κB DNA binding was detected in these cytoplasmic extracts, suggesting that the M protein is not preventing nuclear import of activated NF-κB. To determine if there is another component involved in regulation of NF-κB we measured NF-κB activation in cells coinfected with R1 and r1026M. Our results suggest that the M protein alone regulates NF-κB activity. To determine, if the M protein alone is responsible for NF-κB regulation, we expressed the Wt or R1 M protein in cells through Nucleofector® Technologies (Amaxa). We found that the Wt-M protein was able to suppress R1 mediated-NF-κB activation. Other experiments were conducted by transfecting single viral proteins into L929 cells and infected with R1. Preliminary data alludes to Wt-M being the only component that suppresses the activation of NF-κB, however further studies are currently being conducted. These studies will help define the role of the M protein in regulation of NF-κB in VSV-infected cells. (Oral presentation.)

## AUTOCATALYSIS OF BENZYLIC DIALKOXY DISULFIDES UNDER PHOTOLYTIC CONDITIONS.

DiAndra M. Rudzinski and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Since the initial synthesis of dialkoxy disulfides in 1895, little has been done on this functionality very until recently. This structural moiety has been shown to thermolytically decompose to liberate trappable $S_2$ in a pseudo Diels-Alder reaction. In addition, this functionality has also been used to attach an alkoxy radical to fullerenes. We have examined a family of benzylic dialkoxy disulfides (X-Ph-$CH_2$–O-S-S-O-$CH_2$-Ph-X) under photolytic conditions to determine a substituent effect. We have been able to show that the decomposition is autocatalyzed and follows Swain and Lupton's field constant, $\mathcal{F}$. (Poster presentation.)

## DESIGN OF EXPERIMENTS FOR PROCESS OPTIMIZATION OF CAP-6.

Jeffrey Sattora, Stephen A. Godleski, Department of Chemistry, SUNY College at Brockport, NY 14420.

CAP-6 is a hexahydrophthalate derivative of a low molecular weight cellulose acetate (CTA) that is currently manufactured in the Synthetic Chemicals Division of the Eastman Kodak Company. The manufacturing process involves an acid catalyzed depolymerization to lower the molecular weight of the commercially purchased CTA, followed by a partial functionalization of available OH sites on the CTA by hexahydrophthalic anhydride. The process has proven to not be robust with respect to the CAP-6-CTA molecular weight, and the percent acetyl content. A Design of Experiments (DOE) was completed that optimized key analytical responses (% acetyl, % phthalate, MW) as a function of eleven process parameters in 20 experiments. Process parameters determined to be

significant in controlling MW were found to be depolymerization time, temperature and water content; acetyl content was found to depend on depolymerization time, temperature and acetic acid amount; phthalate content was found to be a function of acetic anhydride, acetic acid and water amounts. (Poster presentation.)

## A COMPARISON OF THE MACROINVERTEBRATE COMMUNITIES IN THREE CATCHMENTS WITH RURAL AND URBAN RIPARIAN VEGETATION.

Kate Schneeberger, Department of Biology, Nazareth College, 4245 East Avenue, Rochester, NY.

The goal of this research was to assess the water quality of three catchments based on biotic indices of their macroinvertebrate communities. Specifically, the potential benefits of the development of green space plans, restriction of building and protection of the riparian zone of specific watersheds in Pittsford, NY were studied in comparison to streams in the Henrietta/Brighton area and the Mendon/Irondequoit Creek watershed. The biotic indices used to evaluate stream quality were the Biotic Index (BI), Ephemeroptera + Plecoptera + Trichoptera (EPT) richness index and Percent Model Affinity (PMA). Based on these indices, the water quality of all three catchments is fair. To differentiate between the aquatic communities of the three catchments, a comparison of functional feeding groups is also presented. (Poster presentation.)

## IDENTIFICATION OF SINGLE NUCLEOTIDE POLYMORPHISMS FROM PATIENT SAMPLES WITH AUTOIMMUNE DISEASE OF THE LIVER PRIMARY SCLEROSING CHOLANGITIS (PSC).

E. Schreiner[1], C. Bowlus[2], L. Buckley[1], and A. L. Foreman[1]; [1]Department of Biological Science, Rochester Institute of Technology, Rochester, NY; and [2]UC Davis School of Medicine, Davis, CA.

Primary Sclerosing Cholangitis (PSC) is considered an autoimmune disorder involving chronic and progressive cholangitis within the walls of the bile ducts of the liver, leading to cholestasis. As a result, bile accumulates in the liver, leading to cirrhosis and liver damage. The etiology of PSC is unknown and is more prevalent in males than females. Previous studies narrow the cause to genetics and environment. In this project, genotypic risk of PSC susceptibility was examined within genotyping of Major Histocompatibility Complex (MHC) regions. The project involves identification of Single Nucleotide Polymorphisms (SNP) from patient samples with PSC. MHC class III snpDNA was investigated to see if the sample contained homozygous A/A, G/G, or heterozygous A/G. The snpDNA allele from patients with PSC were compared with healthy controls for measuring the risk allele as previously identified in another autoimmune disease. The results have shown no significant difference with the A/A, A/G, and G/G allele among PSC and healthy controls. (Poster presentation.)

## AMATEUR OBSERVATIONS OF LAYERS IN THE ARABIA REGION OF MARS.

J. Secosky, Finger Lakes Community College, Canandaigua, NY 14424.

Under the public target program, I discovered areas that contained layers on Mars. In August 2003, NASA began accepting suggestions from the public for possible targets for the Mars Orbiter Camera (MOC) narrow angle camera system on the Mars Global Surveyor (MGS). Up to that time over 120,000 images, representing about 3% of the surface, had been taken. I began receiving images from MOC in October 2004. Many of these images are on my website—PAWS.flcc.edu/~secoskjj

The MOC narrow angle images have resolutions of 1.4, 3.0, or 4.5 meters/pixel. Images are either 1.5 or 3.0–3.1 Km across (about 1 or 2 miles across). They are all taken with a local time of 2 p.m. when the spacecraft crosses the equator. In other words, the angle of the sun is consistent.

Arabia is about the size of Australia and has features of both the northern plains and the southern highlands. Although appearing very old due to a high density of impact craters, it is not near as high in elevation as the southern hemisphere.

In areas that I suggested that NASA image with MOC, I observed layers in widely separated parts of Arabia. Layers are found in many parts of Mars and can be caused by a variety of processes including volcanoes, wind, and deposition at the bottom of lakes and seas. The widespread distribution of layers suggest that the conditions for producing layers may have existed over a very large area. Perhaps, Arabia contained a large number of lakes. In September 2008 NASA released strong evidence for a lake in Xanthe Terra, which is located just to the west of Arabia.

I am grateful to Malin Space Science Systems for providing the images, the staff at FLCC's computer labs, and the staffs of Red Jacket Library, Wood Library, Clifton Springs Library, and Naples Library. Since I was not connected to the internet, I needed help where free access to computers was available. (Oral presentation.)

## ASSESSMENT OF CORALS AND CORAL SPECIES IN VILLA IGANG, PUERTO DEL MAR, GUIMARAS, PHILIPPINES.

Cornelio M. Selorio, Jr., College of Fisheries and Ocean Sciences, University of the Philippines in the Visayas, Miag-ao, Iloilo, Philippines; Rolando A. Alimen, Ph.D., John B. Lacson Foundation Maritime University – Molo; and M.H. del Pilar, Molo, Iloilo City, Philippines.

Coral reef is very important in the marine ecosystem because it houses the most diverse species of aquatic plants and animals. Marine reserve saves the coral reef ecosystem from destruction, through conservation and management. The assessment and baseline information of the reef status and corals species were made to address conservation and management. The Line Intercept Transect (LIT) was used to determine corals and coral species in Puerto del Mar, Guimaras, Philippines. Cryptic or unidentified corals were described and identified through FAO identification key. The assessment showed that live coral cover was "fair" to "good." In the assessment of abiotic component, coral rubbles dominated especially in the reef slope. Corals species revealed that thirty three (33) species were belonged to eleven (11) families for hard corals and three (3) species were belonged to two (2) families for soft corals. Despite the good condition of the corals and the coral reef, it was noted that few destructive fishing activities (like cyanide and dynamic fishing) were done in the area. (Poster presentation.)

## COMPOSITE SECTION FORMATION VIA SIMULATED ANNEALING OF HORIZON ORDINATION.

H. David Sheets, John Willis, Zachary Izard and Charles E. Mitchell, Dept. of Physics, Canisius College, 2001 Main St., Buffalo, NY 14208.

The process of composite section formation based on biostratigraphic information produces a temporal ordering of events and collections, critical for any high-temporal resolution study of geological events, particularly patterns of biodiversity change. Shaw's graphic correlation method has been widely used, as have more recent numerical methods such as RASC/CASC and CONOP. We present a new method, horizon annealing (HA), which like CONOP uses simulated annealing methods to produce an optimal ordination, minimizing the range extension implied by a proposed solution. Unlike CONOP, which produces ordinations of species FADS and LADS and other marker events, horizon annealing directly orders collection horizons. We present example calculations of composites based on the Riley formation problem as discussed by Shaw and Sadler and also on graptolite collections from the Yangtze platform. Results from HA are similar to those produced by CONOP or graphic correlation. However, the horizon annealing approach may offer advantages over other numerical approaches in dealing with large numbers of sections, integrating new collections into existing composites, or in merging multiple existing composite sections. HA readily produces detailed records of presence/absence information encompassing collections from many discrete sections, which are desirable for detailed study of biodiversity patterns. Additionally, the approach used may be readily adapted to other numerical search methods such as genetic algorithms. (Poster presentation.)

## RESPONSE OF ACTIN FILAMENTS TO LONG-TERM MCH TREATMENT IN 3T3-L1 CELLS.

L. Shum, S. Portwood, and L. B. Cook, The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Melanin-concentrating hormone (MCH) is an appetite-stimulating hormone, which binds two G protein-coupled receptors (GPCR) found in the brain, pancreas, fat cells and elsewhere. Melanin-concentrating hormone receptor-1 (MCHR1) is known to bind periplakin, an actin-binding protein. Actin can also influence GPCR trafficking, receptor desensitization, and membrane stability, which dictate a cell's response to extracellular stimuli. The interactions between the two are still relatively unknown and have great interest.

Previous research in our lab has shown actin remodeling in 3T3-L1 pre-adipocytes as a result of the addition of MCH for up to 10 minutes. The current study was performed to investigate the effect of MCH over a longer exposure time. Cells were treated with hormone for up to 24 hours, fixed and actin filaments were stained. The

slides were then blinded and the cells were classified into three categories: fibroblast-like, intermediate and small round cells.

At one hour of MCH exposure, the percent of fibroblast-like cells returned to near untreated levels, remaining at this level up to 24 hours. The percent of intermediate cells decreased from one hour to two hours and small round cells have a sharp decrease from ten minutes to one hour, then stay in the one to two percent range for the duration of the exposure: hence, MCH-mediated actin rearrangement is transient in nature. Since prolonged MCH exposure did not elicit a secondary response, this suggests that MCHR1 becomes quickly desensitized following MCH binding. On the contrary, MCH did not elicit actin rearrangements in differentiated 3T3-L1 adipocytes. This is the first evidence to suggest MCH participates in cytoskeletal remodeling, the degree of which might depend upon the differentiation state of the cell. (Poster presentation.)

## A COMPARISON OF VISUAL (GFP) SELECTION TO NO SELECTION IN THE EARLY STAGES OF *AGROBACTERIUM* TRANSFORMATION OF AMERICAN CHESTNUT SOMATIC EMBRYOS.

Kristia E. Smarzo, Linda D. McGuigan, William A. Powell, and Charles A. Maynard, SUNY College of Environmental Science & Forestry, Syracuse, NY 13210.

The American chestnut tree, *Castanea dentata,* has been plagued by a fungus called *Cryphonectria parasitica,* commonly referred to as chestnut blight. Currently, there is an American Chestnut Research and Restoration Project whose goal is to transform somatic embryos with a plant pathogen resistance gene in order to produce a blight-resistant American chestnut tree. In this experiment, two clones of American chestnut somatic embryos, Ellis #1 and WB 275-27, were co-transformed using pTACF-7, a plasmid that contains the *Oxo* and *ESF39* genes as well as pGFP, a plasmid containing the *mgfp5-ER* gene. This study focused on the time of normal selection (6 weeks after transformation) vs. late selection (10 weeks after transformation) in the two clones mentioned above. After completing chi-square tests, the results indicated that selection time did not change the number of embryos that got transformed. Also, it was found that the amount of embryos that did get transformed was associated with the clonal variety. (Poster presentation.)

## CONFIRMATION OF RSH FUNCTION: A BIFUNCTIONAL (P)PPGPP SYNTHASE AND HYDROLASE FROM A *NOVOSPHINGOBIUM* SP.

C. Smith, A. O. Hudson, and M. A. Savka, Department of Biological Science, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Bacteria use the stringent response as a mechanism to cope with stress, which can be both nutritional and environmental. This is done by the synthesis and hydrolysis of signals known as alarmones. ppGpp and pppGpp are examples of these compounds, which are synthesized by RelA and SpoT enzymes during the stringent response presented by bacteria. α–Proteobacteria and plants have been shown to contain the single bifunctional Rsh enzyme (named for RelA – SpoT homolog). We previously identified a Tn5 mutant, Hx699, from *Novosphingobium* sp. Rr 2-17, from a grapevine crown gall tumor, with a mutation in the *rsh* gene. Based on bioinformatical evidence, the *rsh* gene is predicted to encode two enzyme activities, RelA and SpoT. In order to confirm the bifunctionality of Rsh, the *rsh* gene will be cloned in the inducible plasmid expression vector, pBAD33. The expression of *rsh* can be induced by the addition of inducer molecule arabinose. The resulting plasmid pBAD33-*rsh* will be co-transformed into *Escherichia coli* along with a plasmid expressing the *relA* using a different inducer molecule (IPTG). By varying the concentrations of the two inducer molecules, expression of *rsh* and *relA* synthase, on selective media, we hope to demonstrate both synthase and hydrolase activity from the *Novosphingobium* sp. *rsh* gene. (Poster presentation.)

## MOLECULAR PHYLOGENY OF TERESTRIAL ISOPODS.

Janice K. N. Smith and Larry Buckley, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Terrestrial isopods (commonly referred to as pill bugs or woodlice) are inhabitants of both natural and human-altered landscapes. Additionally isopods contribute to the flow of energy and nutrients in ecosystems, and are a bio-indicator species that can reflect varying changes in habitat quality. Their social and reproductive behaviors are

responsive to natural and anthropogenic changes in environmental conditions. Terrestrial Isopods have been studied extensively in Europe, while in North America they have been studied only sparingly, also many of the species bear the names of European forms, even though it is uncorroborated if they are in fact the same species.

Data relating to the evolution of terrestrial Isopods has been mainly based on morphology alone, which can correlate unrelated groups in the same taxonomic group. Currently sequencing 12s and 16s genes of wild caught terrestrial Isopods is the focus of the project. The 16s and 12s rRNA genes are sections of DNA that code for rRNA, and this rRNA in makes up part of the ribosome. The nuclear rRNA loci 18s and 28s, are more conserved than 12s and 16s that can evolve up to ten times faster. Due to the higher substitution rates and lack of recombination, coalescent times are short, meaning species become apparently evolutionarily distinct more quickly than with nuclear genes. Also 12s and 16s are conserved because they are functionally constrained, this is due to the fact a stem must have compensatory changes on each side. Allowing the use primer of sites from other crustaceans to amplify all the isopods, and be sure we were amplifying 12s and 16s, and making 12s and 16s ideal choices for the construction of phylogeny. Currently the data generated reveals a very strong monophyletic relationship for the genera *Armadillidium*, *Oniscus*, and *Porcellio*. Additionally according the data complied using the 12s gene supports a strong monophyletic relationship for the genus *Trachelipus*, this is also supported by the 16s data however not as strongly. (Poster presentation.)

## PTHrP REGULATION OF CADHERIN-11 IN THE PRE OSTEOBLASTIC CELLLINE 3T3–E1.

M. E. Spears and J. R. Hens, Saint Bonaventure University, Biology Department, Saint Bonaventure, NY 14778.

The hematopoetic stem cell niche is the essential microenvironment where these stem cells reside, proliferate, and differentiate in bone and bone marrow. Although the niche has been difficult to define, osteoblasts expressing cadherins have been shown to be a crucial part of the environment. Cadherin-11 is involved in cell to cell communication, and it has been show to be up regulated in osteoblast differentiation. We hypothesize that PTHrP signaling will increase cadherin-11 concentration in osteoblasts and that an increase in cadherin-11 will result in a change in the stem cell niche. In this study, we examined whether PTHrP regulates cadherin-11 in the pre-osteoblastic cell line 3T3-E1, as the first step in understanding the possible role of cadherin-11 in maintaining the hematopoetic stem cell niche.

Using Western blot and Real-time PCR we found that PTHrP increases cadherin-11 protein in cells after 2 days of treatment. Additionally we saw an increase in transcription of cadherin-11 at day 2. We examined whether the 3T3-E1 cells had differentiated into mature osteoblasts by examining expression of CBFA1 and collagen alpha-1A. These osteoblast markers had decreased levels is PTHrP treated cells, indicating the cells were remaining pre-osteoblastic cells. (Oral presentation.)

## COMPARISON OF $NaCNBH_3$ VERSUS SILICA-GEL BOUND $^-CNBH_3$ AS REDUCTIVE AMINATION REAGENTS.

Brittany L. Sumbler and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Reductive amination is a powerful reaction for the coupling of a carbonyl and an amine to further substitute the amine. One of the most commonly used reagents for this methodology is $NaCNBH_3$. Generally, this reaction is performed in the presence of a mild acid, typically acetic acid. Although, in principle this reaction should proceed, in practice this does not always form in great yields and if an acid labile group is present, side reactions often occur. We have examined the use of silica-gel bound $^-CNBH_3$ (*Si*-CBH) in comparison to $NaCNBH_3$ and have shown that there is up to a 50% greater conversion to the desire product with the use of *Si*-CBH. (Poster presentation.)

## PTHrP REGULATION OF LEF1 EXPRESSION AND LOCALIZATION IN THE MESENCHYMAL C3H10T1/2 CELLS.

E. M. Tanski and J. R. Hens, St. Bonaventure University, Biology Department, St. Bonaventure, NY USA 14778.

PTHrP regulates mesenchymal cell fate choices during the development of the mammary gland. In mice that lack PTHrP or its receptor, the mammary mesenchyme fails to develop and morphogenesis of the mammary gland is

disrupted. In contrast, over-expression of PTHrP in keratinocytes in K14-PTHrP transgenic mice leads to the conversion of the ventral dermis to mammary mesenchyme. To further examine what signal transduction pathways PTHrP may regulate during mammary gland development, we have used the C3H10T1/2 cells as a model for the mammary mesenchyme. In PTHrP knock-out mice, it has been previously shown that there is a decrease in LEF1 expression. LEF1 is a transcription factor that belongs to the TCF transcription factor family, which WNT signaling utilizes. Therefore we examined how PTHrP may affect LEF1 expression and location in the mesenchymal cell line, C3H10T1/2. We treated C3H10T1/2 cells in culture with PTHrP, and examined LEF1 expression and localization in the cells. We saw by Western blot that LEF1 had an increase in nuclear localization. By real-time PCR, LEF1 mRNA increased after PTHrP treatment. We also examined the levels of β-catenin mRNA, which works together with TCFs to promote WNT signaling. There was a striking increase of β-catenin mRNA after PTHrP treatment that coincided with the LEF1 mRNA increase. We can conclude that PTHrP may regulate canonical WNT signaling the mesenchymal cell line, C3H10T1/2, and this may also be occurring in the mammary mesenchyme. (Oral presentation.)

## MICROHABITAT ANALYSIS AND HABITAT PREFERENCES OF EPHEMEROPTERA, PLECOPTERA, AND TRICHOPTERA POPULATIONS IN ROCHESTER AREA STREAMS.

Jacques Tardie, Biology Department, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

A survey of the various orders of Ephemeroptera, Plecoptera, and Trichoptera populations was undertaken in the summer of 2008 in order to draw correlations pertaining to their respective populations and the microenvironments each preferred. Microhabitat features that were measured were velocity, oxygen concentration, temperature and substrate. This research will help ecologists determine why these sensitive species are missing from some local streams. (Poster presentation.)

## THE EFFECT OF THE VSV MATRIX PROTEIN ON INTERFERON MRNA PRODUCTION IN INFECTED MOUSE CELLS.

Arthur H. Totten, Christopher Reid, Matthew Woodruff, and Maureen C. Ferran, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Wild type (Wt) Vesicular Stomatitis Virus (VSV), a negative sense ssRNA virus, has been shown to be a strong regulator of the Interferon (IFN) response. IFN is a cytokine produced by cells in response to viral infection, which is able to inhibit the replication of VSV. Previous work indicates that Wt VSV is able to block NF-κB activation, a cellular transcription factor which is activated upon viral infection and is necessary for IFN gene induction. We propose that by blocking NF-κB activation, Wt VSV prevents IFN gene expression, thereby allowing the virus to evade the antiviral response. In contrast, we have shown that NF-κB activation occurs at earlier times post-infection with T1026R1 (R1), which has been shown to be a potent inducer of the IFN response. This induction is proposed to be a result of the virus encoding for a defective Matrix (M) protein. Coinfections were carried out with these viruses, as well as an M-defective recombinant virus, and the results then analyzed. Real-time PCR analysis of RNA isolated from the infected cells show little mRNA produced in Wt-infected cells, while the amounts of IFN mRNA induced by the R1 and recombinant viruses were significantly higher. These results suggest that the Wt M protein plays a role in the suppression of the innate host response. While our data suggests that the M protein alone is enough to inhibit IFN mRNA expression, it has been proposed that other viral components are involved. To establish whether the M protein, separate from other viral factors, is responsible for IFN regulation we are examining the ability of transfected Wt or R1 M proteins to suppress IFN mRNA expression. These studies may lead us to a greater functional understanding of the interplay between the viral evasion mechanism and the cell's innate antiviral response during VSV infection. (Oral presentation.)

## RIPARIAN ZONE ASSESSMENT IN THREE WATER CATCHMENTS.

Stephen Tychostup, Biology Department, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

The aim of this study was to analyze the riparian zone habitats in three Rochester water catchments. The catchment running through Pittsford is protected by a "Greenprint" plan, which protects riparian vegetation, while one running through Henrietta is not protected, and the one in Fishers is primarily wooded and undeveloped riparian vegetation. A species inventory was carried out on field trips during the summer at multiple sites for each

catchment. In the fall, GIS maps were used to measure the percentage of housing, impervious surfaces, and natural vegetation in the area of each catchment. The analysis will compare the quality of the riparian zones in each area. The study also includes data from other research done at the same time, to test how vegetation in each catchment effects suspended solids, phosphates, and nitrates in their respected water samples. (Poster presentation.)

## LEWIS ACID/IODIDE SALT-CATALYZED REARRANGEMENT OF VINYL EPOXIDES TO DIHYDROFURANS.

Ashley R. Versaggi and Stephen A. Godleski, Department of Chemistry, SUNY College at Brockport, NY 14420.

A series of monoepoxides were synthesized from the conjugated dienes, 1,3-cyclooctadiene, *trans, trans*-1,4-diphenyl-1,3-butadiene, and 1,3-cyclohexadiene. Rearrangement of these epoxides to the corresponding dihydrofurans utilizing a catalyst mixture consisting of a phosphonium iodide and tributyltin iodide was investigated. The phosphonium salts prepared and utilized as co-catalysts included decyl, octyl, hexyl and butyl-triphenylphosphonium iodide. The phosphonium salts were designed so as to be capable of performing as ionic liquid solvents as well as co-catalysts, thereby obviating the need for volatile organic solvents in the reaction. (Poster presentation.)

## NITRATE, AMMONIA AND TROPHIC DYNAMICS OF STAR LAKE IN THE NORTHWESTERN ADIRONDACK PARK.

James Wolfe, Steven Crance, Katelyn Lippert, Caitlin Loftus, Donald McDonnell, Sarah Proulx, Jeffrey Russell, and Kendal Stoltzfus, Biology Department, Houghton College, Houghton, NY 14744.

Nutrient addition and eutrophication of Star Lake are important to the hamlet of Star Lake which depends on the lake as a source for the municipal water supply. The private ownership to the shoreline (7.40 km) requires lakeside owners around this kettle lake to exert strict control of nutrient addition. Historically Star Lake has had good water clarity (Secchi depths of 4-77 m) and low amounts of phytoplankton. As a typical dimictic lake, the lake has shown stratification during each summer since 2001 with a metalimnetic oxygen maximum at 9 m and an anoxic hypolimnion. Alkalinity (as 10mg/L calcium carbonate) during summers 2007 and 2008 reflected the contribution of groundwater through adjacent calcareous sands. Total phosphorus levels measured in winter 2003 and 2005 and summers 2007 and 2008 showed extremely low levels (<5 ppb) in the epilimnion and higher amounts (up to 30 ppb) in the hypolimnion, especially during July 2007. Amounts of nitrate as measured during summer 2007 and 2008 are in the moderate range for ALSC lakes, with a peak noted in the lower metalimnion. At several times during summer 2008 nitrate levels were undetectable in the metalimnion. Ammonia peaked in the metalimnion in summer 2008. Chlorophyll levels peaked in the metalimnion during summers 2007 and 20088 with levels at 3 micrograms per liter. A variety of zooplankton (including Daphnia, Bosmina) was noted during summers 2007 and 2008. The development of an anoxic hypolimnion each summer indicates the sensitivity of Star Lake to change is in nutrient status. Studies are continuing with the imminent deployment of YSI 6800 sonde with continuous sampling. (Poster presentation.)

## TRANSCRIPTIONAL PROFILING STUDIES OF PRION POSITIVE AND CONTROL ISOGENIC YEAST STRAINS.

Seth Zimmerman, Khairunnisa Ghazali, Salahuddin Khairuddin, Noorsalfarin Mustapha, and Irene Evans, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The objective of this study is to determine whether the presence of the Sup35 gene product in its "prion" conformation in the yeast strain [PSI+] causes changes in gene transcription. In the model organism *Saccharomyces cerevisiae* (yeast), the gene SUP35 codes for a translational release factor protein eRF3. This protein has been the subject of intense study as a model for prion proteins in eukaryotic organisms. A prion protein is a protein that is capable of assuming an alternate conformation distinct from that of its known functional conformation and in this altered "prion" conformation, the protein can have a different functional activity. Sup35p, in its prion conformation, has the ability to induce "normal" sup35p to convert to a prion conformation. In mammals this can cause neurodegenerative diseases called transmissible spongiform encephalopathies. However, in yeast this prion system

causes no known pathology and may even give an evolutionary advantage. This is because the prion conformation of eRF3 (the gene product of Sup35) is inefficient at translational release causing stop codon read through and alternate protein production. The variability in proteins produced may have a positive effect allowing the yeast to survive in diverse environments. We have previously done transcriptional profiling of the [*PSI+*] and [*psi-*] yeast strains. These results suggested there were over a hundred gene expression changes in the [*PSI+*] prion containing strain. In order to ensure that our *[PSI+]* and [*psi-*] strains are isogenic, our lab has cured or reverted the [PSI+] strain back to [psi-] by growing the strain on YPD plates containing guanidine hydrochloride. Further microarray studies on these isogenic strains have been done to confirm our earlier findings. The changes in gene expression that were found may have important implications for explaining the widely varied phenotypes for growth, viability, and survival in different environments found when [*PSI+*] and [*psi-*] strains of yeast are compared. (Poster presentation.)

# THIRTY-SIXTH ANNUAL SCIENTIFIC PAPER SESSION

## ROBERTS WESLEYAN COLLEGE
## ROCHESTER, NY
## October 31, 2009

## LARRY J. KING MEMORIAL LECTURE

### The Astronomy of the Lord Rosse's Nebulae
**Sue French**
**Contributing Editor for *Sky and Telescope*, Former Columnist for *Night Sky*, and Author of the Book, *Celestial Sampler*.**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### THE USE OF ISOPODS TO EVALUATE RESTORATION SUCCESS AT RUSH OAK OPENINGS.

Cole Adams, Erin Pence, F. Harvey Pough and Elizabeth Hane, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Though once widespread across the eastern United States, oak openings or oak savannas are now an endangered ecosystem. Rush Oak Openings (ROO) in Rush, NY is one of a very few examples of this ecosystem remaining in the eastern United States. Much of ROO had been lost due to lack of annual fire and the spread of invasive species. Today, ROO has begun to recover thanks to restoration techniques such as controlled burning, mowing, brush hogging, reseeding, and herbicide use. In an attempt to evaluate restoration success, we collected, counted, and identified isopods located in various sites within ROO that had been treated with some combination of these restoration techniques. We found that areas that had been mowed, seeded, and treated with herbicides in addition to burning had a fewer isopods ($2.2 \pm 0.43$ per bait station; $p=0.0087$) compared to sites which only had been burned ($3.7 \pm 0.33$ per bait station). Because more than one restoration technique was used at each site, we could not determine which technique was having the greatest impact on the isopods, and factors such as soil type and percent invasive plant species still need to be examined as possible causes for the variation in isopod abundance. (Poster presentation.)

### COMMUNICATION SIGNALS IN SUGARCANE AND GRAPE ASSOCIATED BACTERIAL ENDOPHYTES.

N. H. Ahmad, A. O. Hudson, M. A. Savka, Department of Biological Science, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Many bacteria communicate using chemical signals in a process known as quorum sensing (QS). QS is a bacterial gene regulatory mechanism that measures diffusible signal molecules called *N*-acyl-homoserinelactone (AHL). At threshold concentrations of AHLs, activation or repression of genes as a function of the cell population density can coordinate disease progression or symbiosis in eukaryotic bacterial pathogens. In this work, we investigated the production of QS AHL signals from sugar cane and grape bacteria internal to the host i.e. bacterial endophytes. Samples were collected from stem vascular tissue of sugar cane and from xylem fluids of grapevine. Bacterial isolates were purified by repeated subculture and molecular genetic analysis using sequence analysis of the v3 (variable region of the 16S rDNA gene) identified six unique isolates from sugar cane and seventeen isolates from grape xylem sap. The production of QS signals by the sugarcane and grape endophytes were tested using six different AHL-dependent bacterial biosensors strains. Among the endophytic strains identified, five of sugar cane

and fifteen of grape elicited a significant response in at least one biosensor. Production of AHL QS signals may contribute to the communication and coordination of sugarcane- and grape-associated bacteria in fostering disease, or in protection, of the host plant. Future work will investigate if AHL-signal deficient endophytes produce compounds that inhibit the AHL QS communication mechanism. (Oral presentation.)

## INVESTIGATING THE DIFFUSION OF TRIHALOMETHANES THROUGH POLYDIMETHYLSILOXANE USING MEMBRANE INTRODUCTION FLAME IONIZATION DETECTION.

Ian Anderson and Michael Brown, Department of Chemistry, The College at Brockport, SUNY, Brockport, NY 14420.

Chlorination, the most widely used method for disinfecting drinking water, is known to form undesirable halogenated byproducts. Some of the most common are trihalomethanes (THMs). Typical methods used for analysis of drinking water for THMs, such as liquid-liquid extraction into hexanes, are expensive and time consuming, and often require organic solvents. Previous research resulted in the development and implementation of a membrane-based method for on-line monitoring of THMs in drinking water. While this approach was successful for performing on-line monitoring, it suffered from a low sampling rate. This research aims to improve on the previous work by further optimizing the membrane sampling device and experimental method to provide faster quantitative extraction. The membrane device was coupled directly to a flame ionization detector to investigate the effects of experimental parameters on diffusion. Membrane temperature, sample flow rate, carrier gas flow rate, sample ionic strength, and sample organic carbon content were investigated. Sorption studies will also be presented. The experimental data was then correlated to a computational model to approximate diffusion rates. The experimental data closely matched the simulated model. Results indicate that increasing membrane temperature and carrier gas flow rate can significantly decrease response time. (Poster presentation.)

## SYNTHESIS OF ANTIBIOTIC SIGNALING MOLECULES.

Lisa Andrews, Michael Cagney, DiAndra Rudzinski, Mark Gallo, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Bacteria have been present on the earth for billions of years. Some are harmful to humans, while others can be very beneficial. Bacteria within colonies have the ability to communicate to one another. *Streptomyces*, for example, use a process called quorum sensing. This involves secretion of a molecule by the bacteria which is then received by other bacteria through a receptor. This signal informs the bacteria to release antibiotics. One such messenger was recently isolated. Thus, the addition of this signaling molecule to a colony of *Streptomyces* should signal the bacteria to produce an antibiotic. This research focuses on the organic synthesis of this recently isolated messenger molecule. This synthesis involves: a base hydrolysis to yield a carboxylic acid, a borane reduction to convert the acid into an alcohol, another base hydrolysis to yield a second carboxylic acid, and ultimately an ortho-lithiation/alkylation to add the carbon chain. (Poster presentation.)

## SYNTHESIS OF A RESIN BOUND IRON LEWIS ACID CATALYST FOR FATTY ACID ESTERIFICATION.

Victoria A. Assimon, Richard W. Hartmann, and Timm A. Knoerzer, Department of Chemistry, Nazareth College of Rochester, 4245 East Avenue, Rochester, NY 14618.

Many low quality samples of used vegetable oil contain high percentages of free fatty acids. In order to use such sources of oil for biodiesel production, the free acids must first be esterified to prevent the formation of salts (soap) during the base-catalyzed transesterification process. Methanol solutions of iron chloride are known to catalyze the esterification of fatty acids to their methyl esters. However, purification involves reduced-pressure distillation which is impractical for large scale biodiesel synthesis. In order to make the iron Lewis acid catalyst easier to recover/remove, "click" chemistry was employed to link a phenanthroline molecule to a polystyrene resin system which allows the iron (III) ion to be available for catalysis, but easily removed by filtration. (Poster presentation.)

## COMPARISON OF SOIL RESPIRATION, FINE ROOT BIOMASS, AND LITTERFALL IN YOUNG AND MATURE FORESTS IN THE WHITE MOUNTAINS OF NEW HAMPSHIRE.

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Soil respiration is a major pathway of flux in the terrestrial ecosystem carbon cycle and has received a great deal of attention recently. This is largely because even a small change in soil respiration can exacerbate the annual input of $CO_2$ into the atmosphere. Soil respiration represents the combined respiration of roots and soil micro- and macro-organisms, and a number of studies on soil respiration have been undertaken in a variety of ecosystems. In spite of these, our understanding on the mechanisms of soil respiration is not fully achieved largely due to the many complex reactions involved in soil ecosystems. This study aimed to measure a seasonal soil $CO_2$ efflux and compare their values in three old-growth and recently regenerating forests in the White Mountains of New Hampshire during growing season in 2008–2009. Seasonal patterns of soil $CO_2$ efflux at both sites showed a high correlation with soil temperature at 10 cm depth. We would expect big different rates of soil $CO_2$ efflux at the old sites due to deeper soil layer and greater biological activity, but some sites were not significantly higher ($p < 0.05$). Fine roots biomass ( > 5 mm) were higher in old forests but litterfall biomass were no difference between young and old forests. Therefore, further studies about more factors and continuous measurements that are affected to soil respiration including climate, vegetation, substrate quality, net ecosystem productivity and others are needed. (Poster presentation.)

## SEWER SYSTEM AND SURFACE CHARACTERISTICS OF THE RATTANAKOSIN VILLAGE, RANGSIT, THAILAND.

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Rapid urbanization and economic growth in urban areas are causing population densities to increase. The infrastructure cannot always keep up with the increases in population; this is especially evident in developing countries. The Rattanakosin Village in Rangsit, Thailand (just north of Bangkok) is an example of these urban pressures. The sewer system here does not successfully sustain flow with the current population and flooding frequently occurs, especially during the rainy season. To help manage the flooding in the village, storm water, along with raw sewage is pumped into a nearby canal causing problems for other areas as far as quality and quantity of water.

Survey data revealed that the slopes of the streets vary greatly, not only in degree of slope but also the direction of the slope. Rainfall data were collected and showed that peak intensity can reach up to 70.4 mm/hr. Sewer flow was monitored during dry weather and rainfall events. Changes in velocity and depth of flow depended on rainfall conditions and pumping duration.

Because Southeast Asian urban infrastructure and climatic conditions are much different from the western world, the main objective of this study was to understand the existing sewer system and how it drains a local urban area. Development of a model, PCSWMM.net, is underway. PCSWMM.net is a computer model that simulates flow; information such as rainfall, flow and survey data are needed to construct this model. Completion of the model will help to identify the locations of the most problematic pipes with respect to efficient drainage. In the future, with these results, we hope to help the officials of the Rangsit municipality develop a new sewer system or improve their existing one. (Oral presentation.)

## SUBCELLULAR LOCALIZATION OF DBC1 TUMOR SUPRESSOR PROTEIN.

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DBC1 (Deleted in Bladder Cancer Chromosome Region 1) is a tumor suppressor gene that is hypothesized to have an important role in the process of human bladder tumorigenesis. Published studies have reported a cytosolic subcellular location of the DBC1 protein, but these DBC1 constructs had included an amino terminal epitope tag. Recent bioinformatics analyses have revealed the DBC1 amino acid sequence contains a putative ER signal sequence (amino acids 1 to 19) that may be masked by the presence of an amino epitope tag. We hypothesized that DBC1 protein possesses an ER signal sequence which is necessary and sufficient to cause localization to the secretory pathway, which may be masked by an amino terminal epitope tag. We tested this hypothesis by

engineering constructs of DBC1with Enhanced Green Fluorescent Protein (EGFP), and made a separate construct with the putative 19 amino acid DBC1 signal sequence and EGFP (SER-EGFP). Both constructs were separately transfected into the mammalian 293T cell-line. Localization was observed over a time course using fluorescence microscopy. Cells expressing the DBC1-EGFP construct revealed similar localization patterns to 293T cells expressing 6HIS- HA -DBC1-EGFP. Cells expressing SER-EGFP showed a similar pattern of EGFP fluorescence compared to control, but SER-EGFP expressing cells had altered EGFP intensity and slight morphological differences. Taken together our results suggest there is no conclusive evidence that amino acids 1-19 of DBC1 function as a *bona fide* ER signal sequence. (Poster presentation.)

## DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN WEST FALMOUTH HARBOR, MA: RELATIONSHIP TO PRIMARY PRODUCER ABUNDANCE AND SEDIMENT OXYGEN CONSUMPTION.

Jeff Barnette, Natalie McLenaghan, Megan Kozlowski, Charles Yarrington, Brittany Bourdon, Chris Scheiner, and Christy Tyler, Program in Environmental Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

West Falmouth Harbor (WFH) is a shallow estuary in Cape Cod, MA, USA, subject to increasing nitrogen (N) loads as a result of sewage contamination. We performed multi-annual field surveys in three WFH sub-embayments to characterize the benthic macroinvertebrate communities in relation to a spatial gradient of degradation. From 2007 through 2009, samples were collected from the silty, inner basin (IB) and sandy, outer basin (OB) within seagrass-vegetated and non-vegetated patches, with additional samples in 2008 and 2009 from the sandy, southern basin (SB) that is devoid of macrophytes. During the summers of 2008 and 2009, macroalgal biomass, seagrass % cover, benthic microalgal chlorophyll *a* (chl *a*) and benthic oxygen consumption (BOC; dark only) were assessed monthly. Following the results in 2008, seagrass % cover was highest in OB (mean = 64% OB, 40% IB, 0% SB) while chl *a* was 2-fold greater in SB than elsewhere. We observed temporal shifts in relative macroalgal biomass across basins, with dominance of *Ulva* sp. (Chlorophyta) and *Gracilaria* sp. (Rhodophyta) in the inner reaches of WFH and a more diverse suite of taxa in the well-flushed OB. The following sequence for BOC was determined: IB >> SB > OB. Common invertebrates included the gammarid amphipod *Microdeutopus gryllotalpa* (OB dominant), the bivalve *Gemma gemma* (IB and SB dominant), and nereidid, orbiniid, and capitellid polychaetes. In spite of substantial spatial and inter-annual variability in species composition in OB, species richness and evenness were highest here, corresponding with low SOC and high seagrass cover. Opportunistic taxa and low richness characterized IB and SB communities, where chl *a* was high, but both macroalgae and seagrasses were lower. The community composition in SB was more similar to IB than OB, in spite of differences in sediment grain structure and SOC, suggesting substantial impairment. Continued assessment of WFH field data will enable evaluation of the severity of N-loading impacts in an estuary undergoing eutrophication. (Poster presentation.)

## DE-IODINATION OF CUBANE DERIVATIVES VIA ELECTROCHEMISTRY.

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Cubane was initially synthesized by Phillip Eaton in 1964, and since then numerous traditional organic chemistry reactions have been performed upon this cage structure. One exceptionally difficult reaction is the conversion of diiodocubane to mono-iodocubane. It has however been demonstrated that mono-iodocubane can be converted to cubane via electrochemistry. This has enticed us to further examine this approach as a means of removing iodine from other cubane derivatives. Initial observations have shown that diiodocubane is initially converted to mono-iodocubane at a lower voltage than the subsequent second de-iodination. Thus, by maintain the voltage at this lower energy complete conversion of diiodocubane to mono-iodocubane should be possible. In addition, it may be able to remove iodine from other iodinate cubane derivatives, or use this technique to perform substitution reactions. (Poster presentation.)

## THE EFFECTS OF BULKINESS ON ASYMMETRIC CATALYSIS: UTILIZATION OF CUBANE AS A CONTRIBUTOR IN ENANTIOSELECTIVITY.

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A novel cubane Schiff's base ligand has been synthesized in five steps starting with dimethyl-1,4-cubane carboxylate. Its utilization in asymmetric catalysis in copper and palladium catalyzed reactions including cyclopropanation of styrene as well as the Henry reaction has been screened. This ligand demonstrates the significance of bulkiness on enantioselectivity in asymmetric catalysis. (Poster presentation.)

## EFFICIENT SYNTHESIS OF DAIDZEIN AND ITS DERIVATIVES.

Kyle Biegasiewicz and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

The isoflavonoids are a class of plant secondary metabolites composed of a three ring backbone and two heterocyclic moieties. Their use as antioxidants and in some cases, activity against the spread of cancer, has been considered as a potential pharmaceutical target in recent years. One of the most common soy isoflavonoids, Daidzein, has become of specific interest not only for the previously mentioned reasons, but for its biological use as an important precursor of phytoalexins medicarpin and glycoellins, which are found in alfalfa and soybeans.

Our project focuses on a novel synthetic pathway for the synthesis of Daidzein and its derivatives Isoformononetin and Dimethyldaidzein. This synthesis involves an enamine addition and O-methylation of 2,4-dihydroxyacetophenone, a ring closure and iodination, followed by a Suzuki coupling to yield isoformononetin or dimethyldaidzein; either of which can be demethylated to give Daidzein as their product. (Oral presentation.)

## EXPERIMENTAL STUDY OF MICROSCOPIC TRAP LOADING AND AN INVESTIGATION OF ATOM DYNAMICS IN CONFIGURABLE MICROSCOPIC DOUBLE-WELLS.

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We present our progress towards an experiment to investigate microscopic optical dipole traps, trap loading and atom dynamics in microscopic optical traps. Loading mechanics of large dipole traps from a laser cooled atomic molasses or magneto-optically trapped atoms have been extensively investigated, and the loading dynamics are relatively well understood. While microscopic traps are finding increasing number of uses, little is known of the loading dynamics or of the optimal loading conditions. Several recent experiments of sub-micron traps have found size dependent differences in the loading dynamics. We propose to investigate loading dynamics as well as the lifetime and the temperature of dipole traps of waist 8 $\mu$m to$\approx$2.5 $\mu$m. Also microscopic dipole traps that we propose to study are well suited for investigating the dynamics of atoms of two adjacent microscopic traps. We also propose to investigate atoms in two adjacent dynamically configurable traps to study the effect of the presence of one trap on the other separated by a variable barrier height. Finally a collection of atoms localized to a very small volume in space lends to studying an untested cooling scheme particularly suited for deep microscopic traps. We also propose to investigate this cooling scheme. These studies will contribute to further our understanding of microscopic traps. (Poster presentation.)

## HOST PLANT IDENTIFICATION OF ARGENTINIAN WALKING STICKS (*AGATHEMERA* spp.) USING MOLECULAR METHODS.

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Insects of the genus *Agathemera* utilize a noxious chemical compound as a defense mechanism when disturbed. Little is known about these chemicals, and diet may play a role in its production. Futhermore, nothing is known about walking stick diets in their natural habitat, yet there is evidence that dietary constraints can influence population structure and morphological diversity. In this experiment, gut samples were extracted and nucleotides sequenced at the trnL-F chloroplast region, ITS nuclear region, and ribosomal rpL region from *Agathemera* samples. These sequences were then entered into the BLAST nucleotide database to positively identify several plant species presumably eaten by the insects and compared to plant samples from the same geographic region. Analysis yielded plants from genera *Citrus*, *Larrea*, *Rhus*, *Hoffmannseggia*, *Acaena*, and *Lecointea*. (Poster presentation.)

## DOES MERCENARIA MERCENARIA INFLUENCE BENTHIC DENITRIFICATION? EFFECTS OF SEDIMENT MANIPULATION AND BIVALVES IN MICROCOSMS.

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The effect of benthic macroinvertebrates on nutrient cycling in estuaries can be substantial. In order to experimentally assess these effects in laboratory microcosms, it is crucial to understand how the method of sediment manipulation during preparation of animal-free microcosms impacts sediment chemistry and the return to steady-state conditions. We looked at four strategies for removing organisms from sediments. Prior to microcosm construction sediments were: 1) homogenized (0-12 cm depth), sieved (1 mm) and placed in 9.5 cm (I.D.) polycarbonate core tubes; 2) sectioned and sieved (1 mm) in separate layers (0-2, 2-5, 5-12 cm depths) and reconstructed in core tubes while maintaining the strata; 3) frozen intact in core tubes (5 days); or 4) driven anoxic intact in core tubes (12 days). Unmanipulated sediment cores were used as a control. All sediments were collected from West Falmouth Harbor, Cape Cod, MA, USA. These cores were sampled at five successive time points spanning ~45 d post-treatment for sediment pore water sulfide and ammonium, and fluxes of dissolved oxygen and ammonium. After 45 d sediment porosity, organic matter and benthic chlorophyll a (chl a) were also measured. We found that porewater ammonium and soluble sulfides were always greater than in unmanipulated cores but that the variability was significantly lower and a return to constant conditions was more rapid in the sectioned and sieved treatment. Chl a was highest in the anoxic treatment at the end of the experiment, but there were no differences in any of the other measured parameters.

We used the sectioned and sieved method to prepare microcosms for a series of experiments examining the effects of *M. mercenaria* on dissolved nitrogen fluxes and denitrification. Our results suggest that *M. mercenaria* may have a significant effect on denitrification rates in West Falmouth Harbor, but that the magnitude of the effect varies depending on the organic matter content of the sediment. (Poster presentation.)

## IDENTIFICATION OF SINGLE NUCLEOTIDE POLYMORPHISMS THAT BETTER DEFINE EUROPEAN HAPLOGROUPS.

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Mitochondrial (mt) haplogroups serve as useful tools to relate individuals to one another through maternal ancestry. The mtDNA of haplogroups allows the path of human migration to be traced. The phenotypic differences a haplogroup may have compared to others may also be analyzed. Mt haplogroups are clusters of individuals related by maternal descent, determined by mt sequences that share similar single nucleotide polymorphisms (SNPs). More favorable SNPs have been identified to categorize individuals into major European mt haplogroups through the use of www.mitomap.org. These SNPs were found to be more suitable because new information led to the improvement of the mitochondrial haplogroup trees. The previous SNPs used were not optimal, leaving many individuals excluded from these haplogroups, while others could have been categorized into more than one. The new genetic markers that better define certain haplogroups were used to genotype the sample population of 640 individuals. Genotyping has been completed for four of the six new genetic markers via the use of TaqMan® Custom Genotyping Assays and Restriction Fragment Length Polymorphisms (RFLPs). Out of 224 samples that were previously excluded from the haplogroups, 105 samples were placed into the appropriate haplogroup using the new SNPs. The only haplogroup change was from Haplogroup I to W. Of the nine major European haplogroups, the identifying SNP remains the same for only haplogroups H and V. A SNP has also been found that better distinguishes haplogroup U and K from one another. Haplogroups I, J, and T will also be improved once the genotyping of the remaining two defining SNPs is completed. The redefined haplogroups will allow us to reanalyze previous data to yield more accurate statistics with regards to another project relating mt haplogroup K men to better hearing. (Poster presentation.)

## TOWARD THE CONSTRUCTION OF TETRAPODAL ARTIFICIAL TRANCRIPTION FACTORS.

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Artificial transcription factors (ATFs) designed for multifunctional use must be capable of interacting with DNA binding domains in high specificity. The synthesis of such a system in which we exert complete control could serve to expand our knowledge of biological mechanisms and potentially find use as a preventative measure in the field of medicine. Herein, we describe a novel tetrapodal molecular architecture that can be developed into the next generation of artificial transcriptions factors. To achieve the target molecule, a bis-Michael addition reaction introduces the critical molecular theme. Subsequent hydrogenation followed by several peptide-coupling strategies and key deprotection reactions lead to a structure capable of incorporating mini-proteins. Finally, 1,3-dipolar cycloaddition chemistry leads us to the desired tetrapodal structure. Complete synthetic strategies and spectral characterization of proposed target molecule are described. (Poster presentation.)

## PROPOLIS, A PRODUCT FROM THE HONEYBEE, INHIBITS QUORUM SENSING COMMUNICATION IN BACTERIA.

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Propolis or 'bee hive glue', chemically complex, is collected by bees from local flora and is used to secure their hive. It has been used by humans to protect against viruses, bacteria, inflammation and ulcers. The purpose of our study was to examine the effect of propolis on a bacterial gene regulatory mechanism called quorum sensing (QS). QS regulatory activity of six different samples of propolis tincture was examined using four *N*-acyl-homoserine lactone (AHL)-dependent bacterial biosensors: *E. coli* strains JM109(pSB401), JM109(pSB1075), JM109(pSB536), and *Agrobacterium tumefaciens* A136. These biosensors report bioluminescence with activation by specific exogenous AHLs. Two distinct RP-TLC profiles of our six samples were visualized and imaged under UV-fluorescence. Propolis was exposed to the biosensors in the absence of AHLs to determine if compounds in propolis can act as signal mimics and activate QS, although none were able to. However, when propolis and the cognate AHL were together exposed to the biosensors, the ability of the propolis to antagonize the quorum sensing activity was observed. The levels of inhibition for the six propolis samples with origins in North America and Europe using JM109(pSB1075) ranged from 45%–83%. 'Propolis A' was able to inhibit quorum sensing most effectively in short-chain AHL biosensors, JM109(pSB401) and JM109(pSB536), reducing reporter activity to 36% and 59% respectively. In long-chain AHL-dependent biosensor A136, 'Propolis C' reduced AHL QS activity by 48%. Together this work shows that although complex, propolis does not contain compounds that can function as QS signal mimics but does contain compounds that exert an antagonistic affect on the QS gene regulatory mechanism in bacteria. (Poster presentation.)

## INVESTIGATION OF THE ROLE OF GJB2 AND GJB3 IN PRESBYCUSIS.

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Presbycusis, or age-related hearing loss, is a growing health issue in the United States. It has been found to be partially genetic and partially environmentally caused. Dr. Newman's research lab has been studying connexin genes that are thought to be related to deafness and could therefore be implicated in presbycusis. GJB2, GJB6, GJA1 and GJB3 are connexin genes which code for gap junction proteins in the inner ear, involved in maintaining potassium levels, which is important in cell signaling. Previously we screened all four genes for single nucleotide polymorphisms (SNPs) in our population of elderly subjects from Rochester, NY. In 2007 we presented data at the RIT Summer Undergraduate Research Program meeting showing that GJA1 could be excluded as a presbycusis susceptibility locus. The connexin 26 gene (GJB2), located at 13q11-12, is the gene most commonly mutated in nonsyndromic hearing loss. We found 12 SNP sites within this gene and genotyped 9 of them. However, we found no association between genotype and hearing phenotypes within our population of ~600 human subjects, and can now conclude that connexin 26 does not play a significant role in the development of presbycusis. The connexin 31 gene (GJB3), located at 1p34, has 22 SNP sites, of which 9 were chosen to be genotyped using RFLP and analyzed based on frequency of the alleles. This summer we have genotyped our population at four of these SNP sites, and begun analyzing the allele frequencies to see if there is any association with hearing. (Poster presentation.)

## SCREENING OF A LIBRARY TO TEST INHIBITION OF THE PTP1B ENZYME: POSSIBLE ADVANCEMENTS IN TYPE II DIABETES TREATMENT.

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Increased rates in sedentary lifestyles, obesity, and the aging of the American population have caused near epidemic proportions of Americans having Type II diabetes. Recent statistics indicate that ~20 million Americans have this disease. At the molecular level. the cause of Type II diabetes is the over activity of the protein tyrosine phosphatase 1B enzyme (PTP1B). This enzyme dephosphorylates tyrosine residues on insulin receptors, preventing insulin from binding, and ultimately increasing blood glucose levels. Current treatments for Type II diabetes involve decreasing blood glucose levels, but do not attempt to inhibit the PTP1B enzyme. The focus of this research was to test a library of chemical compounds for their inhibitory affects on this enzyme. Over 200 small molecules were tested with 9 full $EC_{50}$ values being obtained. (Poster presentation.)

## THE SILURIAN WILLIAMSPORT SANDSTONE OF WEST VIRGINIA: EURYPTERIDS/TRACE FOSSILS.

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Eurypterids have been known from the rocks of West Virginia at least since 1927. Several faunas and localities were detailed in *Silurian Eurypterids from West Virginia* (Leutze, 1960) including a brief discussion of the Williamsport Sandstone. Few eurypterid remains have been reported from the Williamsport Sandstone—most being reported from the overlying beds of the Wills Creek Formation.

We report here the occurrence of countless pieces of eurypterid integument and rare complete structures within a lithology that is a fine greenish mudrock, thick beds of which are sandwiched between hard white sandstones having abundant trace fossils that are very nicely preserved and presumably *Cruziana*. Much of the mudstone is thoroughly bioturbated (*Chondrites* sp.) but, nevertheless, is replete with molted eurypterid remains. While remains are mostly fragmentary to very fragmentary, preservation is often exceptional with regard to fine ornamentation. Out of over 150 specimens examined, only a few show complete structures (e.g., metastomas, etc.).

The extremely abundant eurypterid remains are tergites and other structures that have been torn apart, presumably during storms, and transported to the site. They are usually affected by the bioturbation of the sediment, leaving behind impressions/expressions of the burrowing organisms that primarily caused the thorough bioturbation of the fine sediment. Indeed, integument was observed that was penetrated by the organism (*Chondrites* sp.). It appears that a stable environment of bioturbating organisms existed with repeated influxes of eurypterid cuticle during storm events, followed by occasional replacement with bars of sand.

In the classic eurypterid-bearing Silurian occurrences in New York, *Chondrites* is rarely encountered, but examples are known. A very thin interval within the *Hughmilleria/Eurypterus* beds of the Pittsford Shale bears *Chondrites*. These beds resulted from extensive mudflats and the thin interval represents very shallow water that was probably well-oxygenated while much of the Pittsford Shale is dark and certainly was not as well oxygenated and most likely hypersaline.

This West Virginia example of an 'eurypterid deposit' within the Williamsport Sandstone is rather unusual, relative to the many examples from the New York sequence that occur in an evaporite/carbonate sequence, in being associated with a sandy shoreline. There is no general alignment (due to current) of fragments as is typical of the New York horizons. Integument and eurypterid parts were probably transported, tossed to and fro, fragmented and deposited in the mudstones that we find them in today. Some scavenging may also have occurred, but this is not addressed here.

From all of the eurypterid scraps examined, it would appear that three distinct species might be present in the fauna. The metastomas preserved are hughmilleriid, but quite unlike the *Hughmilleria socialis* of New York. Scraps with well preserved scales show the presence of a pterygotid, and finely pustulate ornamentation on some specimens may even indicate the presence of a carcinosomatid. Only one specimen shows the presence of a lingulid brachiopod, this type of brachiopod being often characteristic of several of the New York faunas.

Notes: The locality at Moyers Gap, near Moatstown, West Virginia was discovered by a team from the West Virginia Geological Survey who noted the occurrence of fossils and shared this information with SJC during an

NYSGA meeting in Oswego, New York in 2005. The reported thickness of the Williamsport Sandstone in the region is around 40 feet: (http://www.wvgs.wvnet.edu/www/statemap/statemap04.htm) (Poster presentation.)

## DETERMINING THE LETHAL STAGE OF THE INTERACTION BETWEEN THE GENES NOTCH, DELTEX, AND ENHANCER OF RUDIMENTARY IN *DROSOPHILA MELANOGASTER*.

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The *enhancer of rudimentary* gene, *e(r)*, encodes a transcription co-activator that has been shown to activate the *Notch*-signaling pathway and the pyrimidine biosynthetic pathway. The interaction with *Notch* (*N*) has been identified through a lethal interaction between null alleles of *e(r)* and viable hypomorphic alleles of *N*. In addition an interaction between *e(r)* and the *Notch*-signaling pathway was indicated by a lethal interaction between null alleles of *e(r)* and a mutation of *deltex* (*dx*), a gene downstream of *Notch* in the signaling pathway. We hypothesize that loss of *e(r)* activity results in a reduction in *N* expression, which results in lethality. *N*, *dx*, and *e(r)* genes are on the X chromosome, so lethal interactions were originally shown by the absence of double-mutant, hemizygous adult males, however the developmental stage of the lethal interactions were not determined. The stage at which the lethality occurs should indicate the stage at which *Notch* activation by *e(r)* is crucial. In order to access the presence of *N e(r)*, and *dx e(r)* double-mutant larvae, we utilized a wild-type X chromosome carrying the green fluorescent protein gene (GFP). This allowed us to distinguish wild-type from double-mutant larvae. In the viability assays, heterozygous female larvae and wild-type male larvae will be $GFP^+$, while *N e(r)* and *dx e(r)* double-mutant larvae will be $GFP^-$. Using this approach, we determined that *N e(r)* and *dx e(r)* mutant flies are fully viable as larvae, but that they die during the pupal stage. These data suggest that *e(r)* is activating *N* during the pupal stage, and that this activation is necessary for the normal development of the fly during metamorphosis. (Oral presentation.)

## A FIELD EAVALUATION OF LARVAL BLACK FLY (*SIMULIUM VITTATUM* s. s.) RESPONSES TO DAMAGE-RELEASED CUES FROM CONSPECIFICS.

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Chemical cues released from injured prey are thought to indicate the proximity of a predator or predation event, and therefore, an area of elevated predation risk. Prey organisms often respond to chemical cues released from injured conspecifics in a laboratory setting, but there are relatively few field trials of chemically mediated responses. The purpose of this study was to investigate the behavioral responses of larval black flies (*Simulium vittatum* s. s.) from two populations to damage-released cues from conspecifics in a natural setting. In our first study, we evaluated the responses of individual *S. vittatum* to cues from damaged members of their own population and in the second study we examined population-specific responses. We found that individuals from each population were more likely to engage in a defensive posture when exposed to damage-released cues versus a control (water). In addition, members of each population engaged in the defensive posture for a significantly longer period of time when exposed to damage-released cues. In the second trial we found that individual larvae were more likely to engage in the defensive posture when exposed to damage-released cues as compared to a control regardless of the population of the stimulus donors. We again found that the duration of the defensive posture was significantly longer when exposed to the damage-released cue versus the control with no significant difference in the amount of time in defensive behavior between the two populations. These results offer compelling evidence to suggest that individual *S. vittatum* do respond to chemical cues associated with predation in a natural setting and that there does not appear to be population differences with regard to the nature of the response or the cue itself. (Poster presentation.)

## MOLECULAR RELATIONSHIPS BETWEEN ARGENTINIAN WALKING STICKS (INSECTA: PHASMATIDAE) AND THEIR ECTOPARASITIC MITES (ACARI: ERYTHRAEOIDEA).

Emily DiBlasi and Katharina Dittmar, Department of Biological Science, EEB Graduate Program, University at Buffalo, NY.

Mites of the family Smardidae are known to be parasites of insect hosts in their larval stages. To explore the extent of host-parasite relationships, associations of larval erythraeoidea mites (Smaridídae) and their walking stick hosts (Agathemera) are being examined. Congruent phylogenies between these mites and their hosts may indicate cospeciation due to the specificity of the host parasite association. Preliminary data suggests that mites of the family Smaridídae are host specific and can be found as ectoparasites of Agathemera throughout Argentina. The population structure of these ectoparasitic mites throughout Argentina is being analyzed using molecular markers from nuclear and mitochondrial genes. Additional genomes in these mites include endosymbiotic bacteria which is also being examined at a population level. The scope of this research is intended to shed light on host-parasite associations as well as add to the resolution of acarine evolutionary relationships with a phylogeny of Erythraeoidea mites. (Oral presentation.)

## THE EFFECT OF WELLBUTRIN ON DOPAMINE REUPTAKE TRANSPORTERS IN RODENT STRIATAL TISSUE.

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Neurotransmitter reuptake is an important process involved in keeping the body functioning properly, and disruption of reuptake can affect the body and brain in many different ways. Dopamine, a neurotransmitter associated with sensations such as reward/punishment, sleep, and mood, can generate feelings of euphoria or depression depending on the heightened or lowered concentrations present respectively. Drugs such as cocaine or bupropion (commonly known as Wellbutrin) will produce an excess of dopamine between the pre-synapse and post-synapse by blocking reuptake transporters in the neuron therein boosting neuron firing and increasing sensation. Wellbutrin, often used as an anti-depressant, supposedly boosts the concentration of dopamine to an average level in the synaptic gap by inhibiting the reuptake transporters. An *in vivo* study comparing reuptake velocities, using electrochemical analysis, was performed in order to better understand the effects of bupropion on this transporter. A rotating disk electrode was used to measure electrochemical changes in rodent striatal tissue as a series of dopamine injections were added following an initial Wellbutrin shot. The changes in electrochemical signal were then converted to reuptake velocities through a sequence of data manipulations. Results showed inhibitory effects at Wellbutrin concentrations of 0.25 and 1.0 μM, but catalytic effects at a concentration of 0.50 μM. In order to better understand and characterize this transporter, further experimentation must be done, such as investigating other bupropion concentrations in the tissue and possibly the metabolites of the drug that are known to provide their own inhibitory effect on reuptake. (Poster presentation.)

## MOLYBDATE-FUNCTIONALIZED GOLD NANOPARTICLES.

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The purpose of this project is to create gold nanoparticles (AuNPs) coated in a molybdate shell, which is illustrated in Figure 1. The applications for this type of research expand into the biomedical, catalysis, and electronics fields. This research can also be used for drug delivery; once a shell is created around the nanoparticle, the metal core can be dissolved with aqua regia and the shell can be loaded with a drug. The rate of release of this drug can be controlled based on the thickness and porosity of the shell, and it can be designed to specifically target different areas of the body.

A coupling agent must be employed to act as a glue between the AuNP and the molybdate. Although the compound 3-aminopropyltrimethoxysilane (APTMS) has been widely used as a coupling agent, we have studied 3-aminopropylphosphonic acid (APPA) because of the known interactions between phosphorus and molybdate.[1] The amine group has great affinity for the AuNP, and the phosphonate group binds to the molybdate through a condensation reaction. Various concentrations of the coupling agent and molybdate were tested to determine the best combination to functionalize the AuNPs. Using standard methods, 11.2 nm AuNPs were synthesized and used

throughout the studies. After addition of the APPA and molybdate ($Na_2MoO_4$), the pH level was lowered using concentrated HCl. Acidification of the $MoO_4^{2-}$ anion causes oligomerization and the formation of polyoxomolybdates.[1] This quality, along with its capability to self-assemble onto metal nanoparticles, makes molybdate an ideal compound to functionalize AuNPs.[2]

The methods used for characterization include UV-visible and FT-IR spectroscopy, and transmission electron microscopy (TEM). APPA is stable in solution with AuNPs, and it shows promise as a coupling agent for functionalizing AuNPs. A shift in absorbance peak was observed as the AuNPs were functionalized with APPA and molybdate. This shift in peak position could indicate either molybdate deposition on the particle surface or aggregation. Further TEM imaging will be conducted to determine if a molybdate shell has been created on the surface of the gold nanoparticles.


Figure 1: Diagram showing the coating process of AuNPs.

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References:

(1) Pope, M. T., *Heteropoly and isopoly oxometalates*. Springer-Verlag: Berlin: NY, 1983; p 180.

(2) Flynn, N. T.; Gewirth, A. A., Synthesis and characterization of molybdate-modified platinum nanoparticles. *Physical Chemistry Chemical Physics* **2004,** 6, 1310–1315. (Poster presentation.)

## COMPARISON OF GROWTH CHARACERISTICS OF AMERICAN CHESTNUT, CHINESE CHESTNUT AND AMERICAN x CHINESE CHESTNUT HYBRID SAPLINGS.

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American chestnut (*Castanea dentata* Marsh) genotypes surviving chestnut blight caused by the fungal pathogen *Cryphonectria parasitica* (Murr) have been hybridized with disease-resistant Chinese chestnut (*Castanea mollissima* Blume) in an attempt to produce sixth-generation seed that is 94% American chestnut and resistant to the chestnut blight (Burnham 1988). Morphological studies indicate that the third backcross generation most closely resembles American chestnut (Diskin and Steiner 2005). This experiment compares the growth characteristics of year-old saplings of one American chestnut genotype, two Chinese chestnut genotypes and two intercrosses produced from F1s backcrossed to American chestnut grown under different planting distances.

Seeds were planted in May 2008 on the campus of Alfred State College in Alfred, NY in a randomized block design. Replicate blocks (4 for each spacing) consisted of five seeds from each genotype, planted either one, two or three feet apart in rows that were spaced nine feet apart. Not all of the seeds either grew or survived the winter; therefore growth parameters were measured on four to six trees per spacing distance per genotype from July to October 2009. Effects of genotype, spacing and genotype by spacing interactions were determined using the univariate GLM procedure of SPSS.

Due to a great deal of natural variation, no significant effects of genotype, spacing or genotype-by-spacing interactions were found for photosynthetic rate, dark respiration rate, number of stems, height of tallest stem, or total stem length. Chinese chestnut genotype 1 had a significantly higher survival rate (70%) than all other genotypes (37-45%). The difference in survival is most probably due to the depth of planting, as re-planting in May 2009 resulted in nearly equal germination. Survival was not affected by spacing or genotype-by-spacing interactions. As with morphology, the growth parameters measured in this experiment do not differ significantly between American chestnut and American x Chinese chestnut hybrid intercrosses. (Poster presentation.)

## A TWIN MULTIWALLED CARBON NANOTUBE-NAFION COMPOSITE MICRO SENSOR AS AN INDICATOR FOR KETOSIS.

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A twin multiwalled carbon nanotube-nafion composite microsensor is constructed on Si wafer for analyzing one of the ketosis products arising from the ketogenic diets in adults. Ketosis produces several products such as acetone, acetoacetate and β-hydroxybutarate. Recently, it has been proposed that acetone measurement in adults consuming ketogenic diets could be determined by breath analysis. Breath acetone is a good index of the ketosis. This was determined by gas chromatography equipped with a flame ionization detector. As an alternative, we propose here a twin carbon nanotube composite sensor that could be used to determine the amount of acetone in concentrations of nano moles/liter. The sensor's performance was also successfully examined for acetone content in urine. The advantage of this method is cost competitive and rapid as compared to the existing methods. The details of the construction of a twin carbon nanotube composite sensor and the measurement details will be presented. The mechanism of the sensor response is analyzed through Fourier transform, infra red spectroscopy, and UV-VIS spectroscopy. The twin sensor provides a greater sensitivity over a single sensor due to larger nanodimensional surface areas. A parallel combination in the twin sensor, as opposed to a series combination, generates a lower starting resistance and superior stability in the sensing of acetone, permitting the measurement of a larger concentration range. (Poster presentation.)

## A HYBRID SEMINAR COURSE CENTERED ON INCREASING STUDENT AWARENESS OF CAREER OPTIONS IN THE SCIENCES.

Edward Freeman, Ph.D., St. John Fisher College Department of Biology, 3690 East Ave. Rochester, NY 14618.

Over the past four years I have taught a student centered course (Junior Seminar, BIOL 349) focused on increasing student awareness of potential careers from the Biology major. In addition, this course aims to increase student awareness of the requirements for admission to the advanced educational programs often necessary to pursue careers of interest. Due to increased enrollments in the major I have recently been forced to rethink the delivery methods utilized in this course. To reach a greater number of students and manage the workload appropriately I have chosen to use a hybrid course design with students completing most of their work either over the summer or during the early part of the fall semester. Throughout the latter half of the semester students then complete the face to face sessions with the instructor and professionals from their field of interest. Data from the hybrid course suggests that student learning occurs at comparable levels to that in the face-to-face course and that students enjoy the flexibility inherent in a hybrid course. This talk will provide an overview of how the hybrid version of this course is managed using our campus BlackBoard tool. (Poster presentation.)

## REGULATION OF CXCR3 EXPRESSION ON TH1 CELLS IN *LEISCHMANIA MAJOR*.

Kayla Garrett, Michael Overstreet, Ph.D., and Deborah Fowell, Ph.D., Rochester Institute of Technology, Rochester, NY.

Chemokine receptors are surface proteins found on many cells. Interaction with their corresponding chemokines results in migration of cells to a desired location within the organism. In this project, expression of chemokine receptors was analyzed on CD4+ helper T cells. CD4 cells are involved in activating and directing immune cells for pathogen clearance so their traffic to infection sites is imperative. T helper 1 (Th1) responses to the *Leishmania major* parasite results in pathogen clearance in an IFN-g-dependent manner, whereas susceptible BALB/c mice develop a T helper 2 (Th2)-skewed response leading to chronic infection. Recent data from Dr. Fowell's laboratory has demonstrated that prior to systemic skewing of the T helper immune response, both Th1 and Th2 cells can be found in the lymph nodes draining the site of infection but only Th2 cells accumulate at the infection site. This skewed response is hypothesized to be caused by a functional silencing or down-regulation of chemokine receptors on Th1 cells which prevents either cell trafficking or functionality at the infection site.

Both in vitro and in vivo generated Th1 and Th2 cells were stained for chemokine receptors and analyzed through flow cytometry. CXCR3 stood out as the most highly expressed on Th1 cells. Th1 cells were cultured in

conditions containing Th2 cells or their chemical product IL-4 and it was found to cause CXCR3 expression to be down regulated on Th1's. When compared to a *L. major* resistant strain of mice, C57BL/6, BALB/c mice were found to possess fewer CXCR3 on their Th1 cells. It is hypothesized that genetic factors as well as the influence of Th2 cells at the site may lead to reduced functionality of Th1 cells. Further experiments must be performed to confirm this as well as elucidate any effects the parasite itself may have on Th1 cells. (Poster presentation.)

## ANALYSIS OF IRON RESPONSIVE PROTEINS IN PATIENTS WITH RISK FACTORS FOR CORONARY ARTERY DISEASE.

James Gordon IV, AnneMarie Laurri, and Christopher S. Stoj, Department of Chemistry, Biochemistry and Physics, Niagara University, NY, 14109.

According to the National Institutes of Health, coronary artery disease (CAD) is the most common form of cardiovascular disease and currently the leading cause of death for both men and women in the United States. The underlying cause of CAD is the buildup of plaques on the inner walls of the arteries supplying the heart with blood. The narrowing of these vessels results in a decreased blood flow facilitating plaque formation ultimately leading to angina, or even heart attacks. It has been shown, the severity of plaques correlate well with indicators of oxidative stress including lipid peroxidaton, oxidized sterols, and reactive oxygen species. Oxidative stress can be the result of iron accumulation leading to cell damage through radical-mediated lipid peroxidation. The purpose of this study is to evaluate relationships between plasma concentrations of iron mediating proteins in a population of patients suffering from CAD. (Poster presentation.)

## COMPARISION OF $Na(CN)BH_3$ AND *Si*-CBH IN REDUCTIVE AMINATION REACTIONS.

Paolo Grenga, Brittany Sumbler, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Reductive amination is a chemical reaction commonly employed by organic chemists in academics and the pharmaceutical industry. In this reaction a carbonyl group is converted to an amine via an imine intermediate, the formation of which is rate-limiting. A major reagent necessary for the completion of this reaction is a hydride source, commonly sodium cyanoborohydride ($Na(CN)BH_3$). The objective of this research was to compare the efficacy of $Na(CN)BH_3$ with silica-bound cyanoborohydride (*Si*-CBH) as hydride sources in reductive amination reactions. Work has shown that reactions employing *Si*-CBH as a hydride source showed significant improvement, exhibiting an average percent conversion 25% greater than reactions using $Na(CN)BH_3$. (Oral presentation.)

## THERMAL BEHAVIOR OF IODINATED CUBANE DERIVATIVES.

Justin Griffiths and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Since the initial synthesis of cubane, numerous derivatives have been made with a diverse range of physical, chemical, and biological properties. Some iodinated cubane derivatives have been reported to be thermolytically unstable and/or rearrange *in situ*. An iodinated cubane-containing, norbornene-based polymer showed rapid thermodecomposition during TGA studies. Bis-(4-iodocubylmethyl)-dialkoxy disulfide undergoes fragmentation more easily than its non-iodinated counterpart. The synthesis and thermal behavior of a library of iodinated cubane compounds are herein reported. Most of the iodinated cubane derivatives showed melting/decomposition with no exotherm upon cooling. 4-Iodo-1-vinylcubane was observed to rearrange to 4-vinyltrans-iodostyrene and its cyclooctatetraene intermediate during DSC analysis. TGA studies on 1-iodo-4-(hydroxymethyl)-cubane suggest that this particular iodinated cubane scaffold is most prone to rapid thermo-decomposition. (Poster presentation.)

## SYNTHESIS OF CUBANE-CONTAINING SURFACTANTS.

Patrick Heaphy and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Cubane is a molecule that was once seen impossible to make due to the strain on the structure and the intense angles that are beyond that for a tetrahedral carbon. Once synthesized in 1964 by Philip E. Eaton, it has flourished into many possibilities, including polymers, pharmaceutical, and explosives. One untapped area is surfactant

chemistry. Surfactant molecules are structured with hydrophilic (head) and lipophilic (tail) structures and are mainly used in detergents to break the surface tension. We have researched the synthesis of cube-based surfactants. This approach is a five-step synthesis involving acid hydrolysis of dimethyl-1, 4-cubane dicarboxylate, a Moriarty reaction, reduction, William ether synthesis, and reaction on a sulfone. (Poster presentation.)

## SPECIES DIFFERENCES BY COLLECTION METHOD OF TERRESTRIAL ISOPODS IN WESTERN NEW YORK.

Jennifer Hunt, Xue Zhou Hou, Roxanne Ost, Michael Goers, Elizabeth Shaw, Cole Adams, Joshua Jording, Renee Cook, Adanna Okpala, F. Harvey Pough and Elizabeth Hane, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Terrestrial isopods are decomposers in forest ecosystems and aid in biogeochemical cycling. Despite their important role in ecosystem function, little is known about the microhabitat distribution of various species or how collection methods may be biased to under- or over-represent certain species. We tested four commonly used methods of collecting terrestrial isopods: baits (carrots and potatoes), drop cans, coverboards and leaf litter searching. We collected isopods in two deciduous forest stands on the RIT campus (Henrietta, NY). In four trials over two weeks, we obtained 512 individuals, of which 394 were identified to species (the others were juveniles too young to identify). In all, five species were found. The number of isopods was non-randomly distributed among the collection methods ($X^2 = 185.3$; $p < 0.001$), with 46% found on the baits, and only 9% found in the drop cans. Additionally, while most species were found most commonly on the baits, *Philoscia muscorum* was found most often under the coverboard ($X^2 = 41.1$; $p < 0.001$). This variation by collection method probably results from behavioral and/or ecological differences among species. Our results suggest that the method of collecting terrestrial isopods should be matched to the research question, because the collection method can influence the proportion of different species collected. (Poster presentation.)

## TRANSCRIPTIONAL CHANGES FOUND IN [PSI+] STRAINS OF YEAST.

Ahmad Suhail Khazali, Carolina Alexander Rodriguez, Hamel Amin, and Irene M. Evans, Department of Biological Sciences, College of Science, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Proteins in their prion form are thought to be involved in spongiform neurodegenerative diseases. Yeast provides a valuable model system to study prion proteins and their effects on cells. We asked the question whether there are common transcriptional changes in yeast strains containing the prion conformer of the Sup35 gene protein which codes for a translational release factor protein (eRF3). The presence in a cell of the prion conformation of this protein will result in altered translation termination. The yeast strain containing the Sup35 product in its prion form is designated as [PSI+]. In order to understand the effect of prions on a yeast cell, we conducted transcriptional profiling using DNA microarrays on isogenic [PSI+] and [psi-] yeast strains (L1763 and 74D). The results were that there are a lot of small, but statistically reproducible, changes in retrotransposon genes expression in [PSI+] when compared to [psi-]. Changes in retrotransposon RNA have been shown to be involved in genomic changes which can give rise to genomic variation. Previous work done by others has suggested that [PSI+] generates different phenotypes in yeast with different genetic backgrounds. We asked the question whether the same changes in levels of retrotransposon and other RNAs would be found when we compared gene transcription in these different strains. When strains 74D and L17623 were compared, we found that about 3-4% of the genes are altered in their expression in both strains. Of these genes, about a quarter (25%) are underexpressed or overexpressed in both the 74D and L1763 yeast strains. The remaining genes change in both strains, but the changes are in different directions. The data reveal that the presence of Sup35 protein in its prion conformation causes many subtle, but statistically significant changes in the levels of mRNAs in cells. The genetic background of the strain is important as some changes are found regardless of the genetic background while other changes vary depending on the genetic background. For example, in both genetic backgrounds we found changes in the mRNA levels of retrotransposon genes. Our studies may help to explain the prior finding that [PSI+] generates different phenotypes in different genetic backgrounds. This may be because there is differential gene expression in these [PSI+] yeast strains. (Poster presentation.)

## THE EXPRESSION AND PURIFICATION OF FBPA IN *H. INFLUENZA.*

Jessica Kidd and Christopher S. Stoj, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

All organisms require metal ions in order to perform vital biological processes such as respiration, transcription, and translation. However, the processes of uptake, distribution, and mobilization of metal ions, including iron and copper, are tightly regulated within the organism. Specifically, bacteria have adopted several different strategies to acquire, store, transfer, and employ iron for various cellular functions. Delocalization of iron could cause the formation of reactive oxygen species, including superoxides and hydroxyl radicals, leading to cellular dysfunction and ultimately cell death. The ferric ion binding protein (FbpA) is one such protein that lies within the bacterial periplasmic space and is involved with the internalization of iron. In this study, a histidine tagged version of FbpA was cloned from *Haemophilus influenza* into *E. coli* and over-expressed *via* IPTG induction. FpbA was then purified using metal ion affinity chromatography and assessed for purity by SDS-PAGE. Current studies involve analyzing iron binding and evaluating metal ion specificity. (Poster presentation.)

## SYNTHESIS OF NOVEL MOFs FOR IMPROVED HYDROGEN STORAGE.

Josh Kolev and Christina Collison, Department of Chemistry, Rochester Institute of Technology, 85 Lomb Memorial Dr. Rochester, NY 14623.

It has become apparent in the modern world that fossil fuels cannot be relied upon indefinitely. Renewable energies, such as wind energy, solar energy, and hydrogen fuel cells, have shown promise as replacements for fossil fuels. One problem confronting hydrogen fuel cell usage is the need for a safe and efficient method of storing hydrogen gas. Of the many materials that are studied for hydrogen storage, metal organic frameworks (MOFs) stand out. MOFs are porous, crystalline materials made with metal centers and organic ligands. The ligands have functional groups that coordinate to metals and also have symmetry that allows for a repeating pattern creating a three-dimensional structure. Our research focuses on the synthesis of novel MOFs for hydrogen adsorption. New ligands are synthesized via organic chemical reactions and applied to various metals to create new MOFs. These MOFs are then tested for hydrogen gas adsorption. By custom tailoring both the ligand and the metal center the hydrogen uptake can be maximized to better store the gas. (Poster presentation.)

## THE ROLE OF CADHERIN-11 DURING LUNG DEVELOPMENT.

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In this study, we examined the role of cadherin-11 (Cdh11) and Wnt signaling during lung development using Cdh11 and Parathyroid hormone related protein (PTHrP) knock-out mice. RNA from lungs of wild-type and Chd11 knock-out mice were examined at 1 day after birth during development for molecules that are possibly involved in branching morphogenesis. Our hypothesis is that Cdh11 is involved with lung development through non-canonical Wnt signaling. A total of 4 litters of mice were examined which included a total of 11 wild types and 22 Cdh11 knock-outs. We first examined whether other cadherins would compensate for the loss of Cdh11. We saw no difference between wild type and Cdh11 knock-outs for E-cadherin and N-cadherin. To examine molecules that may be involved with branching morphogenesis, we measured RNA levels for Lef1, a Wnt transcription factor, and Wnt11, a non-canonical Wnt, both of which may be involved in branching morphogenesis in other organs. An increase in Wnt11, but no change in Lef1 expression in knock-out vs. wild-type lungs was observed. We further examined the possible molecular mechanisms of Cdh11 in mesenchyme cells from E15 mice that were from either wild-type or PTHrP knock-out mice. The mesenchyme was cultured in vitro and then treated with $10^{-7}$ M PTH1-34 for 24 hours. Cdh11, Wnt11 and Lef1 expression was measured by qRT-PCR. Cdh11, Wnt-11, and Lef1expression increased by 60%, 73%, and 60%, respectively. In PTHrP knock-out mice, which has no PTHrP signaling, there was no increase in Cdh11, Wnt11, or Lef1 expression. To understand the role of PTHrP and Cdh11 regulation, we used Chromatin Immunoprecipitation (ChIP), to examine whether PTHrP regulates Cdh11 by inducing Lef1 to bind to the Cdh11 promoter. Using a mesenchyme cell line (C3H10T1/2), cells were treated with $10^{-7}$ M PTH1-34 and then analyzed by ChIP with antibodies against Lef-1. Results showed that Lef-1 bound to the Cdh11 promoter and increased by 50% in PTHrP treated cells. Therefore PTHrP regulates Cdh11 by increasing Lef-1 binding to the Cdh-11 promoter which increases its expression and may alter Wnt-11 expression. In further work we will examine

changes in lung architecture in Cdh11 knock-out mice. These studies will further our understanding of the molecular mechanism in of non-canonical Wnt signaling in lung development. (Poster presentation.)

## SIZE-SPECIFIC BEHAVIORAL RESPONSES BY ALLEGHENY DUSKY SALAMANDERS (*DESMOGNATHUS OCHROPHAEUS*) TO CHEMICAL CUES FROM PREDATORS.

Stewart LaPan, Nathanael Smith, and Aaron M. Sullivan, Department of Biology, Houghton College, Houghton, NY 14744.

Many species use chemical cues associated with predation to evaluate risk. We evaluated chemically mediated predator assessment in the Allegheny dusky salamander (*Desmognathus ochrophaeus*) to cues from one aquatic predator (*Gyrinophilus porphyriticus*) and one terrestrial predator (*Diadophis punctatus*). We hypothesized that smaller salamanders would be more responsive to chemical cues from *G. porphyriticus* and larger salamanders would be more responsive to cues from *D. punctatus*. Our data show that the activity of individual dusky salamanders is not correlated with body size when exposed to chemical cues collected from *G. porphyriticus*, but activity is significantly positively correlated with body size when exposed to chemical cues collected from *D. punctatus*. Additionally, when we compared the mean levels of activity of individual dusky salamanders sorted into two size classes, we found that activity is significantly higher when individuals are exposed to the chemical traces from *D. punctatus* regardless of the body size of the test subject. Our hypothesis was supported by the data regarding salamander activity when exposed to cues from terrestrial *D. punctatus*, but not the data regarding salamander activity when exposed to cues from aquatic *G. porphyriticus*. A future study that examines the responses of aquatic larvae as well as adults may reveal ontogenetic changes in the defensive behavior of dusky salamanders. (Poster presentation.)

## EXPRESSION AND PURIFICATION OF THE MULTICOPPER OXIDASE FET5 FROM *S. CEREVISIAE*.

AnneMarie Laurri, Shella Dargout, and Christopher S. Stoj, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

A significant link has been established between the regulation of iron homeostasis and a class of metalloenzymes known as multicopper oxidases. This research seeks to develop a deeper understanding of metallobiochemistry through the purification and characterization of the multicopper oxidase Fet5p from the baker's yeast *Saccharomyces cerevisiae*. Fet5p is directly involved in the oxidation of iron(II) and thereby the mobilization of iron stores from the yeast vacuole. *Pichia pastoris*, a strain of yeast which is notable for high protein expression as well as low glycosylation, was used as a proxy host in an effort to improve the expression of Fet5p. *FET5* was successfully cloned and integrated into the *Pichia* chromosome; however, attempts at isolation and purification of a functional Fet5p were unsuccessful. A new strategy has been implemented incorporating the plasma membrane ferroxidase Fet3p, a paralog to Fet5p, which has been truncated to secrete from the yeast cell. An expression vector containing an inactive form of *FET3* fused to *FET5* allowed for the successful secretion of functional Fet5p. Several separation techniques have been employed to purify the Fet5p including gel filtration and metal ion affinity chromatography. Additionally, further kinetic characterization of the intact chimera is underway. (Poster presentation.)

## PLANKTON IN THE MIDDLE: SMALL ENVIRONMENTAL CHANGES COULD SPELL BIG TROUBLE FOR LAKE ECOLOGY.

Felicia Lenzo, Dominique Derminio, Aimee Vilardo and Tim Sellers, Center for Aquatic Research, Keuka College, Keuka Park, NY 14478.

Our group used field observations, lab experiments and mathematical models to investigate the effects from a confluence of environmental changes on the predominate primary producers in the Finger Lakes. Many of these lakes showed high phytoplankton concentrations (as measured by depth-specific phytoplankton fluorescence) at middle depths (metalimnion) as compared to surface depths (epilimnion); this middle layer of high concentration is termed a deep chlorophyll layer (DCL). Our research has also shown individual phytoplankton residing in the DCL are generally larger than those in the epilimnion. This larger size is functionally important: large phytoplankton (> 35 um) are generally too big to be consumed by most zooplankton. Hence, most of the phytoplankton biomass (i.e.,

energy) in these lakes cannot be transferred to upper trophic levels but instead remains in the detrital food web. Our lab experiments investigated potential factors promoting this size shift, including light and nutrient availability, and demonstrated that low light availability produces the observed shift, while nutrient concentration (nitrogen and phosphorus) variation does not. Phytoplankton collected from the epilimnion but lab-incubated in low light conditions produced both bigger phytoplankton populations and larger individuals. Measured underwater light levels and modeled light attenuation rates suggest these DCL phytoplankton reside just above the depth where carbon gains by phytoplankton photosynthesis equal carbon consumption from respiration. Coincidentally, field studies have shown an increase in surface bloom events of the cyanobacteria *Microcystis* (due to watershed or climate changes) which temporarily reduce the light available to DCL phytoplankton. Because the majority of DCL phytoplankton reside at the "just break even" depth any prolonged reduction in light availability could eliminate these primary producers or further alter their size structure. Thus, small environmental changes could produce large, negative ecosystem changes. (Poster presentation.)

## NEW TECHNIQUES IN SOIL SAMPLING: METHODS FOR LONG-TERM ECOLOGICAL RESEARCH.

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Imprecise, inaccurate, and inconsistent soil sampling techniques are a major source of uncertainty in the calculation of nutrient budgets. Traditional methods of soil sampling include soil coring and excavation of quantitative soil pits. The major problem with soil coring is that rocky soils limit the location and depth of sampling, and therefore the soil volume is not accurately measured. Quantitative soil pits resolve the rock volume bias, but they are notoriously laborious and destructive, making repeated measurements difficult in spatially variable sites. At the Hubbard Brook Experimental Forest and other sites in the in the White Mountain National Forest, New Hampshire, we are testing novel methods of soil collection and analysis. A gas-powered, diamond-bit drill can core through large roots and rocks to a depth of 90 cm or more, thereby eliminating the depth and density biases of manual coring. The samples we collected with this technique will be compared to soils collected from quantitative soil pits to determine if total carbon, nitrogen, and exchangeable cations are consistent between power-cored soils and soils from pits. Analyses of different segments of the cored samples revealed significantly higher concentrations of exchangeable cations at the edge of the core, presumably due to contamination by ground rock. This grinding action may bias exchangeable cation concentrations, but will probably not affect total carbon and nitrogen concentrations. We also tested an inelastic neutron scattering approach, which non-destructively measures belowground carbon and nitrogen concentrations through *in-situ* spectroscopy of gamma rays. This approach could be highly beneficial to long-term ecological research as it allows for repeated measurements. It does not, however, allow for depth profiling. No method is perfect, but each of these methods offers important improvements in speed and reproducibility over traditional methods of soil sampling. These new methods are applicable to a wide variety of ecosystems, and may improve understanding of carbon and nutrient stocks in soils at other LTER sites. (Poster presentation.)

## RAIDING ACTIVITY OF TWO SPECIES OF SLAVEMAKING *FORMICA* ANTS.

Sara L. Lewandowski and Jennifer L. Apple, Department of Biology, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

Slavemaking ants are social parasites that conduct periodic raids on neighboring colonies of a related ant species to steal the developing brood. The slavemakers return to the slavemaker colony with the captured brood, which is raised as a workforce to forage, maintain the nest, and care for slavemaker offspring. The Roemer Arboretum of SUNY Geneseo has two species of slavemaking ants, *Formica subintegra* and *F. pergandei*, which parasitize colonies of *F. glacialis*. We identified eight *F. subintegra* colonies and three *F. pergandei* colonies in a 155 m by 310 m area of the Arboretum that contained over 220 colonies of the host species. Raid activities of eight *F. subintegra* colonies and three *F. pergandei* colonies were monitored from July 7th through August 6th, 2009. Over

50 raids were observed during this period and target host mounds were identified for 37 of these raids. We measured raid distances for these tracked raids using ArcGIS and found intercolony variation in median raid distance (ranging from 4.1 to 26.9 m) and raid frequency. In addition, there was a marginally significant difference in raid frequency between the two slavemaker species. These raid characteristics are useful in describing the dynamics of this host-parasite interaction and its impact on our local ant populations. (Poster presentation.)

## DETERMINATION OF LEAD LEVELS IN SOIL AND PLANT UPTAKE STUDIES.

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Contamination of soils with lead is of local concern near old houses with lead-based paint or busy roads due to remnants of leaded gasoline. Lead is one of the most common toxic substances and is known to cause learning disabilities and behavioral problems in children. Lead poisoning in children can occur from exposure to lead paint, soil lead, and vegetables grown in lead-contaminated soil.

Since lead is immobilized in the soil many homeowners are looking for ways to practice safe gardening and to remove the lead from their contaminated soil. In this work, lead levels in soil around homes in a local neighborhood were evaluated using atomic absorption spectrophotometry (AAS) and plant uptake studies were initiated so as to identify vegetables that are safe for gardeners to plant, as well as which are hyperaccumulators. (Oral presentation.)

## IMPORTANCE OF SOIL MINERALOGY TO CALCIUM AVAILABILITY IN FORESTS.

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Calcium depletion is a widespread problem in northern hardwoods and has been implicated in sugar maple decline. Apatite, a trace mineral, has recently been recognized as an important source of Ca, by studying Ca/Sr ratios in leaves and soil. To describe the importance of Ca sources in a variety of soil types in the northeastern US, we collected soil samples from multiple depth intervals down to the C horizon from 29 forested sites on contrasting parent materials. We used a 3-step sequential extraction that distinguished exchangeable cations, readily weathered minerals (apatite and calcite), and less readily weathered minerals. We also analyzed leaf litter from the dominant tree species at each site. We found that aspen, birch, pine and red maple showed the most response to soil variation in Ca. We also observed that the exchangeable extract was the best predictor of foliar Ca/Sr in aspen, beech and birch, but surprisingly the mineral extract was the best predictor of leaf Ca/Sr for oaks, red maple and "other hardwoods", such as striped maple, pin cherry and ash. The depth which best predicted foliar Ca/Sr ratios differed among all the species; the best predictor for aspen was the C horizon, 30-50 cm for beech, 10-20 cm for birch, organic horizon (Oa) for "other hardwoods", C horizon for oaks, and the organic horizon for red maple. We also found evidence that birch and "other hardwoods" are accessing Ca from a similar pool as sugar maple. Additional research is needed to determine the source of Ca for aspen, beech and oak. (Poster presentation.)

## SYNTHESIS OF NOVEL PHOTODYNAMIC THERAPY ANTI-CANCER AGENTS.

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$BF_2$-chelated azadipyrromethene dyes have many potential applications in photodynamic therapy. When irradiated with near infrared light, in the presence of oxygen, these aza-BODIPY dyes react to form singlet oxygen species, which can lead to cellular damage and ultimately to cell death. A small library of boron containing aza-BODIPY compounds has been synthesized via a four-step process, with varying substituents on the aromatic ring of the starting acetophenone and benzaldehyde. An *in vitro* study is also being conducted to test the degree of cell death in HeLa cells when irradiated, to evaluate their therapeutic effectiveness. Also, new agents that contain palladium or other metals are being developed to see how they may possibly increase the effectiveness of these photodynamic therapy agents. (Poster presentation.)

## CULTURAL TRAUMA AND GENETICS: THE "NEW" AFRICAN AMERICAN IN OUR MIDST.

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In recent years there has been a growing trend among members of the African American community to seek genetic ancestry testing, as demonstrated by the success of the African Ancestry Project in 2003 and Dr. Henry Louis Gates, Jr.'s PBS documentaries *African American Lives* (2006) and *African American Lives 2* (2008). This test offers participants information about their genetic "past." What cannot be ignored, however, is the unique historical past of African Americans who, as a result of slavery, were severed from their African past. Using sociologist Jeffrey C. Alexander's framework of cultural trauma, this paper will argue that African Americans are seeking the genetic test as a means of gaining insight into an unknown and, until recently, unattainable ethnic/racial identity. Although the results of this test cannot resolve the trauma, knowledge is attainable. Yet such knowledge is a product of imposing cultural ideas of race/ethnicity upon the genome. Thus, by examining this trend, this project will address the relationship between genetics and culture and the implications of this relationship on establishing ethnic/racial identities. (Oral presentation.)

## SIPHONAPTERA AS A VECTOR OF *BARTONELLA* spp.

Kayla Maxwell and Katharina Dittmar, Department of Biological Science, University at Buffalo, NY.

*Bartonella* spp. are pathogenic bacteria of which eight species are known to infect humans. Fleas have been shown to be vectors (transmitters of disease) of this pathogen, and may cause diseases such as Trench fever, Cat Scratch Disease, Bacillary Angiomatosis, Oroya fever, Verruga Peruana and Carrion's Disease. The majority of fleas that have been tested so far for the occurrence and transmission of *Bartonella* are associated with humans and domestic and peridomestic animals. However, the diversity of fleas is much larger, infecting many different species of wild animals. Thus, there is potentially a much larger reservoir for *Bartonella* available, which may pose a threat to humans.

This project is designed to examine fleas of the family Pulicidae for strains of *Bartonella*. Pulicidae contain several species associated with humans or domestic animals (e.g., *Pulex irritans* or *Xenopsis cheopis*), but also encompass fleas of wild animals. To accomplish this I will (1) pursue the detection of *Bartonella* in 16 species of Pulicidae, which are being tested for the first time for such purposes; (2) possibly identify new species of *Bartonella;* and (3) analyze *Bartonella* within Pulicidae in an evolutionary context, to assess vector potential of the wild reservoir. These goals will be accomplished by a combination of fieldwork, molecular techniques, and evolutionary analyses. (Poster presentation.)

## $^{1}$H NMR-BASED METABOLOMIC PROFILING OF PATIENTS WITH RISK FACTORS OF CORONARY ARTERY DISEASE.

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The prevalence of Coronary Artery Disease (CAD) in current well-developed countries has caused an increase in the amount and type of technology used to diagnose and treat this sometimes-debilitating disease. These techniques, which usually consist of invasive and sometimes painful procedures, have led us to consider metabonomics as a way of determining CAD. Metabonomics is the study of the different metabolites and their concentrations in the body and is specific to the cellular processes that are carried out throughout the body.

In recent years there has been an increased desire to understand the usefulness of metabonomics using bio-fluids to determine various different processes that occur in the human body. Due to the wide variety and numbers of metabolites or biomarkers found in the metabolome, the study of metabonomics had proved to be complex but effective. By using blood plasma from patients at risk for CAD and using proton NMR we are determining the metabolites associated with CAD. (Poster presentation.)

## EFFECT OF POLYMER COATED GLASS SLIDES ON BACTERIAL GROWTH.

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The use of multilayered antimicrobial surfaces provides a means to create an inhibitory effect on bacterial growth. These multilayer films are currently under investigation as potential surface coatings that would aid in the prevention of bacterial illnesses. The adsorption of PVPh from an aqueous media has been successfully accomplished, and multilayering to form films of this phenol-based polymer was accomplished using the layer-by-layer assembly technique. These surfaces were examined for their inhibitory growth on *Staphylococcus epidermidis* and *Escherichia coli* and have shown promising results. With anti-bacterial surface coating on everyday objects such as doorknobs, table surfaces, or even medical instruments, the spread of infection may be prevented. (Poster presentation.)

## THE EROSION OF BUSH BEDROCK, OR A MERE WEATHERING? THE INTERSTATE 390 EFFECT ON VOTING TRENDS IN LIVINGSTON COUNTY, NEW YORK.

Jaime McKay, Box 3386, 10 MacVittie Circle, Geneseo, NY 14454.

With the 2008 Presidential elections now in recent memory, data has become readily available showing just how and when people voted. While Democrats were victorious this past year, there are still many Republican strongholds in the country. In the not so distant past, Livingston County, NY boasted a very strong Republican vote in the last two Presidential elections, 2008 and 2004 respectively. With districts showing over 70% of the population choosing Bush in 2004, Livingston County was certainly 'red'. However, with the coming of the 2008 elections, the small communities were rocked with drastic changes in voting tendencies. Over 10% of voters in the small communities jumped parties.

Livingston County represents a more homegrown form of "Bush Bedrock"—a pattern of staunch Republican voting, often represented in economically challenged, rural areas. Save for the 'Athens' of Livingston County, the quite liberal Geneseo and its four-year university, the county was overwhelmingly Republican. With the 2008 elections, however, many of these former Republicans voted for Obama and the pattern changed dramatically. However, the overall net change in total voters did not noticeably increase. So, what had happened to cause the striking new pattern?

The communities with the most significant increases in Democratic votes lie where Interstate 390 passes through. The concept that commuters may use I-390 to travel to work in Rochester and bring back not only income but a more democratic political culture may in fact explain this. This is reinforced by data representing the 390 Ridge as it travels from Democratic Rochester to the southern Livingston Co. Geography, when coupled with political data, makes for quite a pair in explaining electoral outcomes. (Oral presentation.)

## PROTEIN EXPRESSION ANALYSIS OF THE [*PSI+*] and [*psi-*] YEAST STRAINS USING 2-D GEL ELECTROPHORESIS.

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In previous work, we have studied the differences in gene expression between a prion containing [PSI+] and non-prion containing [psi-] yeast strain using the technique of microarray analysis. More than 50 genes were found to be under and overexpressed using the microarray technique. The central dogma of molecular biology states that DNA → RNA→ PROTEIN. We hypothesized that if there are differences in the gene expression between these [PSI+] and [psi- ] strains, there should also be differences in the proteins produced by these strains. Previous work done by other members of the lab suggested there were differences in proteins present when strains of [PSI+] and [psi–] were compared, but identification of the protein changes were not accomplished. In order to detect protein differences, 2-dimensional gel electrophoresis is used to analyze the protein harvested from both strains. In the first dimension or isoelectric focusing (IEF), the proteins are separated according to their isoelectric points (PI). After being separated according to their PI, the proteins are then separated according to their molecular weight in the second dimension. Protein differences have been found between the [PSI+] and [psi–] yeast strains. We are

identifying these protein changes in order to determine whether the yeast mRNA changes found previously translate into similar protein expression changes. (Poster presentation.)

## PROGRESS TOWARD THE TOTAL SYNTHESIS OF A NOVEL CROSS-MEMBRANE FLUOROMETRIC PROBE.

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What?: Surfactants are molecules containing both hydrophilic and hydrophobic components, usually a hydrophilic head and a hydrophobic hydrocarbon tail. When added to oil/water mixtures, surfactants straddle the phase partition. At a certain concentration, the surfactants begin to align themselves forming micelles.

Why?: It is very difficult to determine the location of a probe and its interaction with the aqueous core when monitoring aggregation dynamics of reverse micelles.

How?: Our research focuses on the synthesis of a novel fluorescent cross-membrane probe with both hydrophilic and hydrophobic fluorescent activity. The probe will span the surfactant-based membrane and will monitor subtle physiochemical changes on either side by ratioing the signals.

So What?: Future applications include cross-membrane probe syntheses for biological membranes. (Poster presentation.)

## IDENTIFICATION AND LOCALIZATION OF BACTERIAL ENDOSYMBIONTS IN NEW WORLD BAT FLIES (DIPTERA: STREBBLIDAE).

Solon Morse and Katharina Dittmar, Department of Biological Science, EEB Graduate Program, University at Buffalo, NY.

My objective is to identify candidate obligate endosymbionts within two genera of streblid bat flies, *Strebla* and *Trichobius*. Bat flies are highly modified Diptera, and obligate ectoparasitic blood feeders on bats. Preliminary data suggests that adult streblid bat flies host a diversity of bacteria, including *Arsenophenous, Spiroplasma, Bartonella,* and *Wolbachia*. Because bat flies cannot be cultured in the lab, obligate relationships (fitness effects) between flies and bacteria cannot be directly assessed. To establish the primary status of candidate endosymbionts, I am employing three strategies. (1) Primary endosymbionts are typically transmitted vertically from mother to offspring. To establish mode of transmission, I use PCR techniques to examine batfly larvae and pupae for evidence of bacteria. Presence of the same bacteria within batfly larvae and pupae would imply vertical transmission, as larvae would most likely be infected within the female, and would constitute evidence of an obligatory relationship. (2) Obligate endosymbionts are typically housed within specialized structures within the host, and are endocellular. Using whole-mount *in situ* hybridization techniques, I am looking for evidence of the localization of bacteria, specifically to identify specialized structures that may act as bacteriocytes. *In situ*s performed on female batflies containing larvae may illuminate mode of transmission as well. Preliminary *in situ* hybridizations suggest that, indeed, bacteria are localized within adults. (3) I would expect congruence between phylogenies of hosts and endosymbionts if speciation of one partner is accompanied by speciation of the other—strict congruence implies ancient infection and continuous association between lineages, while incongruence implies horizontal transmission. The evolutionary relationships between a number of *Strebla* and *Trichobius* species have already been established: using these phylogenies, I will test for congruence between the phylogenies of batflies and their bacterial mutualists. While facultative endosymbionts may also inhabit (and even co-inhabit) bacteriocytes, taken together, vertical transmission, co-speciation, and localization would provide strong evidence of obligatory symbiont status. (Oral presentation.)

## SHORT INTERFERING RNA (siRNA) SCREENING FOR ALLELE SPECIFIC GENE SILENCING IN AUTOSOMAL-DOMINANT MYOPATHIES.

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Single amino acid substitutions in the skeletal muscle $Ca^{2+}$ release channel, the type 1 ryanodine receptor (RyR1), result in Malignant Hyperthermia (MH) and Central Core Disease (CCD). Both diseases are related

autosomal dominantly inherited (AD) skeletal muscle disorders. We focus on two RyR1 mutations: Y522S (YS), which causes MH, and I4898T (IT), which results in a severely penetrant form of CCD. Because these diseases are AD and knock out of one RyR1 allele in mice is well tolerated, we propose that allele specific gene silencing (ASGS) of the mutant allele will rescue functional defects observed in skeletal muscle of knock-in mouse models for these disorders. Here we screen potential short interfering RNAs (siRNAs) for their ability to efficiently and selectively silence the mutated allele at the mRNA level. Silencing either the YS or IT mutant allele would result in an increased proportion of wild type (WT) protein expression, and thus, normalization of RyR1 function.

Human Embryonic Kidney (HEK-293) cells, which lack RyR1, were transfected with plasmids that encode a selection of exons flanking and including either the I4989T mutation or the Y522S mutation. To ascertain selectivity, screening was also carried out using cells transfected with the same selection of exons, but containing the WT sequence. Along with the plasmids, cells were transfected with either scrambled or mutation-specific siRNA. After total RNA isolation, semi-quantitative reverse transcriptional polymerase chain reaction (RT-PCR) was used to determine the efficacy and specificity of knockdown of each allele separately. This was accomplished using a set of primers created to amplify a 550 base-pair product for each allele, which was then quantified using densitometry. After normalization to the product resulting from a primer pair created to amplify GAPDH, the amount of transcript for each allele was determined and compared to that observed following transfection of a scrambled siRNA. This approach provides a rapid first-pass screen of multiple potential siRNAs that can then be used for future functional rescue experiments in mice. (Poster presentation.)

## CHARACTERIZATION OF THE DBC1-INDUCED CELL DEATH PATHWAY.

Jordan Myers[1, 2] and Kate Wright, Ph.D.[2], The McNair Scholars Program (Academic Affairs)[1], Rochester Institute of Technology[2], Rochester, NY 14623.

The Deleted in Bladder Cancer Chromosome Region 1 (DBC1) tumor suppressor gene has been shown to induce non-classical apoptosis in cultured human bladder tumor cells. Cultured human bladder tumor cell lines that transiently expressed DBC1 fused to enhanced green fluorescent protein (EGFP) demonstrated a programmed death phenotype of cell rounding and detaching, with apoptotic-appearing nuclei, but showed neither DNA fragmentation nor caspase-3 activity; two hallmarks of classical apoptosis. The purpose of this study was to determine if the 293T human embryonic kidney cell line would be a suitable model for DBC1-incuded cell death and for further analysis of the programmed cell death pathway. 293T cells expressing DBC1-EGFP fusion constructs demonstrated the programmed death phenotype while 293T cells expressing EGFP, only, did not. Time course analysis and viability assays also demonstrated the field effect of DBC1-EGFP expression on 293T cells. Activated PARP, a downstream product of active caspase 3, was not detectable in DBC1-EGFP expressing cells. Taken together, the 293T cell line is a suitable model system for investigation of DBC1-induced programmed cell death. (Poster presentation.)

## CONTEXTUALIZING AFRICA: WHAT WE KNOW AND WHY.

Skye Naslund, Department of Geography, SUNY College at Geneseo, Geneseo, NY 14454.

Despite globalization, there is cause for concern about Americans' place awareness, especially of overseas settings. Although education and Internet access today has expanded to encompass information about all corners of the globe, students' geographic literacy leaves much to be desired. This paper seeks to identify and partially explain variations in awareness of African countries based on a sample of one hundred SUNY Geneseo students in spring 2009. Levels of country awareness range from as low as one percent, in the case of many of the island nations, to as high as seventy percent, in the case of Ghana. The median country awareness is a mere eight percent. Factors contributing to country awareness include colonial background and related language, level of development, population, and geographic area. The relative importance of these and other factors is assessed through multiple regression analysis. A key implication of this study is a striking lack of contextual reference in the framing of localized political and other crises on the African continent. Knowledge of how different factors affect public awareness can arm educators with the tools needed to combat the persistent problem of geographic illiteracy. (Oral presentation.)

## DEVELOPMENT OF pH AND STRUCTURAL REPORTER MOLECULES FOR PHOTOACOUSTIC IMAGING.

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The photoacoustic effect is currently used by biomedical researchers to image living tissues and organs as well as by photo-chemists as a way to study photo-physical properties of molecules. In this research we begin to identify molecules with photo-physical properties that may be useful to image biological features selectively and to measure chemical properties (e.g. pH) in humans. Nitrazine yellow, a well-known acid-base indicator, has been shown to localize in the lymphatic system and may allow for the use of the photoacoustic effect to image lymph nodes both selectively and noninvasively. In this research we have investigated the photo-physical properties of nitrazine yellow and found that it is highly efficient in the conversion of light into acoustic waves in both its acidic and basic forms. Our preliminary research shows that nitrazine yellow should be well-suited to image the lymphatic system selectively while simultaneously measuring the pH. (Poster presentation.)

## SOCIAL NETWORKING ON THE LONGEST ROAD: MY SPACE.COM PARTICIPATION IN THE U.S. HIGHWAY 20 PLAINS COMMUNITIES.

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For the lightly settled expanses of the United States, three generations of population decline have bequeathed thousands of ghost and near-ghost towns, unable to sustain schools, churches, doctors, small businesses, and even hope. In their infancy, such places enjoyed rail and good road access, but tracks and blacktops gave way to Interstates and civil aviation, and the rewards of time-cost compression were denied to most Heartland communities. Somewhere reverted to nowhere. For more than a decade, near-universal Internet access has, once more, promised to overthrow the tyranny of distance in isolated American settings, most tellingly perhaps through the rapid diffusion of social networking. My paper documents adoption differentials and usage of myspace.com in communities along U.S. Highway 20 in Iowa, Nebraska, and Wyoming. Adoption lags perceptibly in the smallest places, is predictably age-sensitive, and appears to be leveling off. The geographical reach of individuals' friends networks tends to reinforce rather than overcome Heartland isolation from America's more urban and urbane settings. Social networking and likely Internet access in general are no remedy for geographic isolation and community decline. (Oral presentation.)

## CADHERIN-11 REGULATION DURING MAMMARY GLAND DEVELOPMENT.

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The first sign of mouse mammary gland development is thickening of epithelial tissue between the limb buds to form mammary lines on the left and right sides of the ventral surface at embryonic day (E) 10.5. Signals from underlying mesenchyme cause these epithelial cells to remodel forming five lens-shaped placodes on each side. Mesenchymal cells condense and differentiate around the placodes which grow deep into the dense mesenchyme becoming buds between E12.5 and E13.5. A sprout grows out of the bud between E15.5 and E16.5 and branches to form a rudimentary ductal tree with 10-15 branches by birth.

Canonical Wnt signaling is broadly expressed within the flank epidermis at E10.5 and becomes prominently expressed in the epithelium and dense mesenchyme during mammary development. Inhibition of Wnt signaling prevents the formation of placodes while pharmaceutical activation of Wnt signaling accelerates placode development and causes ectopic placode formation. Parathyroid hormone-related peptide (PTHrP) and bone morphogenetic protein (BMP) are secreted signals molecules involved in outgrowth from the mammary buds. PTHrP is necessary for mammary bud outgrowth, and it has been demonstrated that BMP4 can rescue outgrowth in mice lacking PTHrP signaling.

Cadherin11 (CDH11) is an integral membrane cell adhesion protein involved in the formation of adherens junctions. CDH11 may be involved in mesenchymal cell adhesion during condensation, differentiation, and remodeling. Catenins including β-catenin associate with the cytoplasmic tails of cadherins. This suggests a potential

interaction between adherens junctions and canonical Wnt signaling through β-catenin. Canonical Wnt signaling is necessary for initial bud formation, but the role of Wnt signaling during bud outgrowth remains unclear.

In this study we characterized the role and regulation of CDH11 during mouse mammary gland development. While treatment of C3H10T1/2 mouse mesenchymal cells with BMP4 did not appear to affect CDH11 protein expression, PTHrP treatment increased CDH11 expression in mesenchymal cells. PTHrP knock-out mice at E15.5 had lower levels of CDH11 expression in the mammary mesenchyme. Pharmaceutical activation of Wnt signaling with LiCl caused a transcriptional and translational decrease in CDH11 expression in mesenchymal cells. LiCl also prevented outgrowth when epithelial buds and the mammary mesenchyme in E13.5 embryonic mammary bud cultures. While PTHrP signaling is necessary for ductal outgrowth and normal levels of CDH11 in the dense mesenchyme may be part of this regulation. These results suggest that canonical Wnt may have an opposite affect in mammary bud outgrowth by decreasing CDH11 expression in the dense mesenchyme and preventing ductal outgrowth. (Oral presentation.)

## AN UNUSUAL, NEW, RELATIVELY LARGE MAMMAL FROM THE LOWER CRETACEOUS CLOVERLY FORMATION OF CENTRAL MONTANA.

William Parsons and Kristen Parsons, Buffalo Museum of Science, Buffalo, NY.

The remains of at least two individuals from a new mammalian taxon were discovered within the basal portion of Unit VII of the Cloverly Formation of Montana. Preliminary phylogenetic analysis indicates that it occupies a basal position among Mammaliaformes, The material represents a mammal that is approximately 20 to 30 percent larger than the extant Short-beaked Echidna (*Tachyglossus aculeatus*). Both cranial and postcranial materials have been recovered. The skull is represented by much of the roof of the braincase, maxilla, incomplete jugal, fragmentary basicranium, and complete mandible. The skull possesses a postorbital process on the jugal, a feature that, within the Mesozoic mammals, is unique to this taxon. The teeth exhibit polyphyodont replacement, with new teeth erupting behind the older teeth in both the dentary and maxilla. The tooth enamel is composed of a transitional form of synapsid columnar enamel and is non-prismatic. There is no canine, but there appears to be a large caniniform incisor. The molariform teeth have unusual crown configuration with vertical enamel-covered walls surrounding deep basins. These walls comprise a number of both large and small cuspules. The postcranial material includes the ilia, several centra and isolated neural arches, partial humerus, proximal end of the radius, several manual elements, rib fragments, fragments of the femur, complete tibia, possible fibula, articulated calcaneum and astragulus (collected as a block), an isolated astragulus and numerous pedal bones. The manual unguals are dorsoventrally flattened, and all the manual elements closely resemble those of the echidna, suggesting similar fossorial behavior. The manual elements are at least twice the size of the pedal elements. The transverse processes of the sacral vertebrae are not fused to the ilia, but contact them in a "ball and socket" articulation. A latex mold has been created from within the inner surface of the dorsally reconstructed portion of the braincase. The variety of primitive characters possessed by this new taxon give either a more informative indication as to the ancestral origin of mammals or create some cause to re-examine the monophyletic hypothesis regarding the origin of mammals. (Oral presentation.)

## DRINKING WATER QUALITY VIA WATER CLEANING TECHNOLOGIES AND RAINWATER HARVESTING SYSTEMS IN CAMBODIA.

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Only a total of 30% and 34% of people between urban and rural areas had access to clean drinking water in the years 2000 and 2002, respectively (Global Water Supply, 2006). The difficulty in obtaining clean water lies in the emphasis on urban development over the last decade in Cambodia, lack of revenue put forth by the government to support water sanitation programs and lack of revenue of the people to meet the cost of living, thus the investment in

water cleaning technologies or sanitation precautions are not of immediate concern. In addition there are some provinces throughout the country which do not have knowledge of the benefits of clean drinking water.

The Department of Environmental Studies at the Royal University of Phnom Penh oversees a multidisciplinary course which includes Water Quality Management. It is part of a pilot project in the Greater Municipality of Phnom Penh called Human Values Based on Water and Hygiene Education. This project included evaluations of five different water cleaning technologies and one rainwater harvesting system. Ultimately contribution to "a manual on rainwater harvesting will be developed for use in schools based on available literature and the primary data collected during the study period; presented in the Khmer language (Eliyan, 2009)." These efforts are enabled by a joint effort between Buffalo State College, Buffalo, NY and Eastern Mennonite University, Harrisburg VA, in the form of an Undergraduate Research Experience to Assess Sustainable Sanitation and Drinking Water Quality in Developing Countries.

The effectiveness in treatment of parameters *Escherichia coli*, pH, turbidity and were monitored for the harvesting systems and the additional parameter of nitrogen was monitored for the five technologies. A comparison of portable technologies in respect to nitrogen was also conducted to see if the convenience they provide in the field can be relied upon for precision of results. It was found that boiling was always efficient while other technologies fluctuated in *E. coli* and total coliform. In the comparison of portable detectors, HANNA instruments multi-parameter photometer always detected significantly higher values for nitrogen than those found in the colorimetric CHEMetric kits for nitrate and nitrite. (Oral presentation.)

## COMPARISON OF ISOPOD ABUNDANCE AND DIVERSITY IN DECIDUOUS FORESTS AND UNCULTIVATED APPLE ORCHARDS.

Erin Pence, Cole Adams, F. Harvey Pough and Elizabeth Hane, Department of Biological Sciences, Rochester institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

During the colonial period, nearly all of the forests in the northeastern United States were cleared and converted to agriculture. Since the decline of agriculture in the mid-1900s, much of that land has been reverting to forest ecosystems. Forests reinvading abandoned apple orchards may differ from other post-agricultural systems because apple orchards were treated with lead arsenate to control pests in the first half of the 20th century. The pesticide breaks down into lead and arsenic, both potentially dangerous contaminants that can remain in the soil for long periods of time. Terrestrial isopods play an important role in the mineralization process of leaf litter on the forest floor and are also sensitive to soil pollutants. In order to determine whether the distribution and abundance of isopods varies between the second growth forests and the abandoned orchards, isopods were sampled from sites in mixed forests and in abandoned apple orchards in Henrietta, Rush, and Sodus NY. We placed organic potatoes and carrots on the soil within wire bait stations. Over the course of six weeks, 389 isopods of four different species were collected. No significant differences in total number of isopods or in species composition were found between forest and orchard sites. These results may be a result of the species of isopods attracted to the baits not regularly interacting in the portions of the soil possibly contaminated by legacy pesticides. Isopod numbers did vary significantly among the three locations (One-way ANOVA: F Ratio: 7.290; $p = 0.0010$). The differences may be due to the variation in the ground cover between the three different locations. (Poster presentation.)

## ASSESSING THE CONDITION OF SUGAR MAPLE STANDS IN THE NORTHEAST FOLLOWING DEFOLIATION BY FOREST TENT CATERPILLAR.

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Sugar maple (*Acer saccharum* Marsh) is a keystone species of the northern hardwood forest type. A common stressor of sugar maple in the Northeast is forest tent caterpillar (*Malacosoma disstria* Hübner, FTC), an indigenous defoliator. The recent outbreak of FTC (2002–2007) affected millions of acres of forest in the northeastern U.S. and Canada. Defoliated trees can exhibit crown dieback and loss in vigor, which can lead to mortality. This research involved assessing the condition of sugar maple trees in 48 new or previously monitored NAMP stands in New York, Vermont, and Massachusetts, in 2007 and 2008, following the collapse of the FTC outbreak. Crown damage was assessed two ways: tree crown dieback (%) and mortality (%). Objectives were: (1) to see if crown dieback in 2007 affected the amount of crown dieback in 2008 (2) to see if mortality within stands in 2008 could be predicted

using the crown dieback percentage from 2007 and (3) to determine if sugar maple stands in the Northeast appeared to be recovering or declining following the latest outbreak of FTC.

Results showed that all but two stands had less crown dieback and appeared to be recovering. Recent mortality in 2008 was highest in the two stands that exhibited the highest amount of crown dieback in 2007. Trees dead in 2008 had significantly higher ($p = <0.001$) crown dieback in 2007 than trees still alive. Although results do show some relationships, further investigation and statistical analyses are needed. The overall goal of this research is to determine why some sugar maple stands appear to recover, while others decline following defoliation and investigate the factors involved. We are currently investigating soil chemistry factors and working on statistical analyses. (Oral presentation.)

## INVASIVE SPECIES: SHRUB HONEYSUCKLES.

Frank C. Pombert, Department of Environmental Sciences, SUNY Brockport, Lennon Hall, Brockport NY 14420; Maureen A. Leupold, Biology Department, Genesee Community College, 1 College Road, Batavia, NY 14202; Dr. James Zollweg, Department of Environmental Sciences, SUNY Brockport, Lennon Hall, Brockport 14420; Judy Spring, Genesee County Soil and Water Conservation District, USDA Center, Liberty Street, Batavia, NY, 14020; and Paul Osborne, Parks, Recreation and Forestry, 153 Cedar Street, Batavia, NY 14020.

Research was conducted on invasive shrub honeysuckles in Bethany, NY, at Genesee County Park and Forest. The non-native shrubs are the main focus due to their large population throughout the park. This study is a first of its kind at the park and employed G.P.S. technology to plot the specific location of individual and groups of shrub *Lonicera* spp. This data was changed into G.I.S. format and plotted spatially using ArcMap, under the guidance of Dr. Zollweg, SUNY Brockport. Biomass data was also gathered. These data, along with observation and analysis, will lead to a better understanding of invasive species impact upon native ecosystems. Next steps will gather a similar data set for native dogwood species, *Cornus* spp., so as to compare and contrast the two data sets. This study was conducted as part of BIO290, Field Experience in Environmental Studies at Genesee Community College under the guidance of Professor Leupold. (Poster presentation.)

## IDENTIFICATION AND CHARACTERIZATION OF A PUTATIVE TYROSINE AMINOTRANSFERASE FROM *ARABIDOPSIS THALIANA*.

P. R. Prabhu, and A. O. Hudson, Department of Biological Science, Rochester Institute of Technology, 85 Lomb Memorial Dr. Rochester, NY 14623.

Aminotransferases are ubiquitous enzymes that catalyze the inter-conversion of amino acids and oxoacids by the transfer of amine group from a donor (amino acid) to an acceptor (oxo-acid). In *Arabidopsis thaliana*, there are 44 annotated aminotransferases; of the 44 genes, only 26 have been characterized through experimentation. The remaining 18 have not been characterized and are deemed putative. One such aminotransferase is the gene annotated by the locus tag At5g36160. This gene is predicted to encode a tyrosine aminotransferase (TAT). The gene was cloned and the purified recombinant enzyme was characterized through *in vivo* and *in vitro* experiments. *In vitro* analysis showed that the enzyme is capable of inter-converting tyrosine to 4-hydroxyphenylpyruvate and phenylalanine to phenylpyruvate. Through functional complementation, the gene was able to complement the *E. coli tyrB* mutant which is auxotrophic for both tyrosine and phenylalanine even though the plant enzyme is 7.6% identical to the orthologous TyrB from *E. coli*. Results from these analyses show that the gene annotated by the locus tag At5g36160 encodes TAT. (Oral presentation.)

## NOVEL SYNTHESIS OF A CUBYL STYRENE DERIVATIVE FOR POLYMERIZATION.

Danielle Raymond and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Based on previous studies of cubane, and its ultimate successful incorporation into polymers, it was found that vinylcubane has a tendency to undergo cage opening/rearrangement. It was in this finding that a cubyl styrene derivative is proposed in order to deter the cage opening of the cubane and thus perform polymerization from a vinylcubane-based monomer. The goal of this research is to perform a novel synthesis of this cubyl styrene

derivative and attempt polymerization of the molecule in order to study the cage opening/rearrangement due to the initial α radical formation. (Poster presentation.)

## SYNTHESIS AND MULTILAYERING OF A CUBANE-BASED WEAK POLYELECTROLYTE.

Rachael Roberts and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Cubane is unique in the respect that it has the structure of a three-dimensional cube with a carbon atom on each of its eight corners. This structure causes ring strain from that fact that the carbons are held in a strict conformation of ninety-degree angles from each other. When a molecule of cubane is opened it forms a ring cycle that reduces this strain, ultimately yielding cyclooctatetraene. In this study, we are attempting to synthesize and multilayer polymers containing cubane and effectively open their cage structure. In doing so, it may be able to strengthen the intermolecular forces that are holding the layers together, by introducing pi-stacking, as well as possibly converting cubane to an electron conductor. (Poster presentation.)

## ALIENS DISRUPT COMMUNITY DYNAMICS AT COBB'S HILL PARK IN ROCHESTER, NY.

Justin Rogers and Mark Norris, Department of Environmental Science and Biology, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Invasive species have the potential to establish themselves as an ecosystem dominant. In this study, we characterized the current forest composition of the Washington Grove, a part of Cobb's Hill Park in Rochester, NY. This park is heavily used by many members of the community who may be contributing to an unnatural form of disturbance. Past research has demonstrated that disturbed habitat is more prone to exotic species invasion. Here, the nonnative but commonly planted landscape tree Norway maple (*Acer platanoides*) is present, and other previous research has found that this species can have a significant impact on the areas it inhabits. The Norway maple has been described as a prolific seed producer, shade tolerant, and a strong competitor for limiting resources. Hypothesized was that the forest trajectory is shifting to a Norway maple dominated forest. In order to test this expectation, the forest was surveyed at random points along four parallel transects. At each point we systematically measured canopy and subcanopy trees, seedlings and saplings, herbaceous cover, and shrub cover. Discovered upon analysis of the collected data was that the canopy trees were dominated by native species including Red Oak (*Quercus rubra*), Black Cherry (*Prunus serotina*), White Oak (*Quercus alba*), Black Oak (*Quercus velutina*), and Sugar Maple (*Acer saccharum*). However, the Norway maple was the most dense and dominant in the subcanopy of the forest. Also found was that of the seedlings and saplings, this species was also the most dense. These findings provide an understanding of what we can expect of the forest composition in future generations. If this current trajectory continues one of our local forests will be dominated by a non-native, invasive species, which may have additional ecological consequences than just lost species diversity. (Oral presentation.)

## EVOLUTION OF ODORANT RECEPTOR 83B IN HIPPOBOSCOIDEA.

Barbara Rolls and Katharina Dittmar, Department of Biological Sciences, University at Buffalo, Buffalo, NY 14260.

Hippoboscoidea is a Dipteran superfamily of bloodsucking flies that evolved from free-living predators into true ectoparasitism. It contains four families: Streblidae and Nycteribiidae, which are winged and wingless bat flies respectively; Hippoboscidae, which are louse flies that feed on birds and mammals; and Glossinidae, which are free-living tsetse flies. It is theorized that the spatial association of the bat flies and the louse flies with their hosts has resulted in reduced visual sensitivity and overcompensation of olfactory senses. The actual nature of the olfactory system modification during the evolution from a free-living predator to an ectoparasite is unknown and is the focus of our research. To that effect, we are studying OR83b, an odorant receptor gene, which is highly conserved among insects. It is our goal to characterize this gene on a molecular level from multiple species. Furthermore, we will localize OR83b expression in representative flies and comparatively assess functional differences throughout the evolutionary history of the hippoboscoid olfactory system. (Poster presentation.)

## CONSTRUCTION OF A MITOCHONDRIAL DNA HAPLOGROUP DATABASE.

Syafrul Azfar Rosly, Eric L. Stevens, Kyle Dewey, Michael V. Osier, and Dina L. Newman, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Within the human mitochondrial DNA phylogeny, certain variants (SNPs) have been used to classify people into specific mtDNA haplogroups. There are three ethnically distinct lineages or macrohaplogroups (N, M and L) representing European, Asian and African populations, respectively. Within each lineage are numerous clades, known as haplogroups. Haplogroups have been used to study human anthropology and disease etiology. They are also popular for personal genealogy tracing and forensics. Although many publications have associated SNPs with one or more haplogroup, public databases do not provide this association in a searchable format (e.g. mitomap.org). We have constructed a searchable database that provides the SNP-haplogroup associations and the location/functional consequences of each variant. This information was gathered from online databases, literature and our own research to create a user-friendly, publicly accessible database. The database has been populated with European haplogroups (H, V, J, T, W, I, X, U and K) and eventually, we plan to include SNPs within Asian and African haplogroups. This searchable database allows researchers to find causative or associative alleles that cause certain haplogroups to be susceptible or protected against a disease. We found that Ala↔Thr substitution is the most frequent amino acid change although they are not the most abundant amino acids in the coding region. Also, tRNA-Thr has a high mutation rate relative to its size. These analyses can help researchers to further understand the processes of mtDNA evolution. This user-friendly database is publicly accessible at http://momtong.rit.edu/cgi-bin/haplogroups/haplogroups.cgi. (Poster presentation.)

## NOVEL SOLID-SUPPORTED SYNTHESIS OF BEXAROTENE.

DiAndra Rudzinski and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

Bexarotene is commonly prescribed as a retinoid x-receptor agonist for the treatment of cutaneous T-cell lymphoma, and has also been under examination for breast, lung, and colon cancers. The five-step synthesis of bexarotene involves the dichloro formation of 2,5-dimethyl-2,5-hexanediol with concentrated hydrochloric acid. Subsequent Friedel-Crafts alkylation and acylation produces a ketone. Wittig reaction of the ketone followed by a base hydrolysis yields the final product, bexarotene.

We propose a novel solid support methodology to aid in the advancement of green chemistry. Aluminum chloride is generally the primary Lewis acid used in alkylation and acylation processes. However, silica-bound aluminum chloride is used as an alternative to this traditional reagent, namely for its more efficient workup. This procedure results in an environmental advantage over the accepted methodology for the synthesis of bexarotene. (Poster presentation.)

## KNOCKDOWN ANALYSIS OF *KITLA* IN ZEBRAFISH GASTROINTESTINAL MOTILITY.

Jeff Sattora and Dr. Adam Rich Department of Biological Sciences, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Gastrointestinal (GI) motility is necessary for survival and functional motility is essential for quality of life. Four out of every ten medical visits result from GI discomfort. These symptoms may result from GI dysmotility. Treatment options are limited and ineffective which may reflect an incomplete understanding of the mechanisms that regulate GI motility. Three main components regulate coordinated motility patterns; smooth muscle cells, enteric neurons, and the interstitial cell of Cajal. Smooth muscle cells are autorythmic and receive input (excitatory or inhibitory) from enteric neurons, and also from ICC which set the frequency of GI muscular contraction and are therefore pacemaker cells. Coordinated GI motility results in segmentation, which mixes luminal contents, and peristalsis, which propels luminal contents in an oral to anal direction. The zebrafish is widely used as a model system for human biology. The intestinal triad is present within the zebrafish GI tract and therefore the zebrafish is a suitable model for human GI motility. Zebrafish are transparent in the early stages of life enabling direct observation of GI development and function using conventional microscopy methods.

It is known that the *kit* gene codes for tyrosine-kinase receptors on the plasma membranes of ICC and is partially responsible for ICC density in humans and mice. This gene is activated by a ligand called stem cell factor, a growth promoting factor. In the zebrafish the *kit* gene exists as 2 separate genes: *kita* and *kitb*. The growth factors that activate these 2 genes are *kit ligand a* (*kitla*) and *kit ligand b* (*kitlb*). It is not fully understood what role of these

genes play in GI development. The focus of this research is to determine the role of *kitla* on the development of coordinated motility patterns, and ICC.

We have adopted a technique called a morpholino oligomer (MO) knockdown to examine the role of *kitla* on development of coordinated motility patterns and ICC. MO is an mRNA analog which uses the same nitrogenous bases (AGTC, U) but has them tethered to a morpholine ring instead of a ribose sugar. This difference in ring structure does not allow the ribosomal subunits to form on the pseudo-mRNA and translation does not occur; the gene is not expressed. The MO can be made specifically for the gene of interest by selecting the appropriate primers that anneal only to that gene's sequence when the DNA is being transcribed into mRNA. Embryos are injected using a pulled pipet that is held in a micromanipulator and attached to a nitrogen gas tank via a pressure injector for controlled calculated injection amounts. When injected into fresh embryos the MO is used, just like RNA, for the many subsequent cell divisions that a new embryo experiences. *kit* genes are also important in melanocyte migration, thus, making it relatively easy to visually confirm the success of a knockdown. The effect is not permanent. The MO becomes more diffuse with each cell division and becomes virtually absent. This means that a wild type fish can be made a mutant for a period of time and then later functions as a wild type.

Injection of the chordin MO resulted in the curling phenotype, and served as a positive control. Injection of *kitla* MO resulted in reduced pigmentation, as expected. Characterization of the potential GI phenotype is underway. It is anticipated that *kitla* knockdown will result in an ICC deficit and dysmotility. The anticipated phenotype is a distended GI tract and reduction in coordinated motility patterns. (Poster presentation.)

## HOW DO NON-POLAR D-LIMONENE AGGREGATE IN AQUEOUS SOLUTIONS OF SURFACTANTS?

Carl T. Schrader, Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Surfactants are molecules with regions of opposite polarity. While one end of the molecule is hydrophilic and easily dissolves in water, the other end is usually highly hydrophobic. How then do surfactants behave in aqueous solutions? These molecules are known to organize themselves into micelles. This arrangement places the hydrophobic regions of the surfactant molecules together in the center of a globular aggregate, with the hydrophilic regions pointing outward into the aqueous solution, thereby protecting the hydrophobic tails. We were using NMR spectroscopy to investigate whether or not limonene, a typical fragrance molecule, incorporates itself into the micellar structure of surfactants. Specifically, Diffusion-Ordered-Spectroscopy (DOSY) was used to determine the concentration and temperature dependent diffusion coefficients of all components of two types of aqueous surfactant/limonene solutions. One surfactant was a quaternary ammonium salt as an ionic surfactant and the other was an amine oxide compound as a zwitter-ionic surfactant. These diffusion coefficients were then coupled with viscosity data to determine the aggregate radii of each component in the mixtures. Surprisingly, the limonene molecules were found to be aggregating independently of the surfactant micelles, with radii that are highly temperature dependent. Additional $T_1$ and $T_2$ relaxation studies were also performed in which the restriction to motion of the hydrophobic surfactant tails was found to increase with temperature. The combined results suggest the presence of an equilibrium between two types of aggregates, one rich in surfactant, one rich in limonene. In the case of the zwitter-ionic surfactant, an increase in temperature appears to cause a gradual break up of the two aggregates into the formation of one single, smaller-sized aggregate. (Poster presentation.)

## A GENETIC POLYMORPHISM IN HAPTOGLOBIN: A GENETIC MARKER FOR CORONARY ARTERY DISEASE.

Juliet Schulz, Deborah Leonard, and Michael Merhige, Biology Dept., Niagara University, NY 14109 and Heart Center of Niagara, Memorial Medical Center, Niagara Falls, NY.

Coronary artery disease (CAD) is caused by atherosclerosis. This is the progressive accumulation of cholesterol in the inner walls of arteries forming fatty plaques. Advanced plaques are susceptible to rupturing leading to clot formation and myocardial infarction. Neovascularization and microhemorrhage occur in advanced lesions resulting in the release of free hemoglobin. Following a minor hemorrhage event, haptoglobin (Hp) removes excess hemoglobin. Free hemoglobin correlates with an accumulation of iron, oxidative stress, and inflammation at the site of injury. As a result, the haptoglobin genotype is a key marker of iron accumulation in atherosclerotic plaque and may contribute to plaque progression. We hypothesized that patients carrying the

Hp 2 allele are at greater risk for coronary artery disease than those with the Hp1,1 genotype. Patients undergoing clinically indicated positron emission tomography myocardial perfusion imaging were genotyped using a high throughput real-time PCR assay. Genotype was then correlated with disease status. The patient population sampled in this experiment is in Hardy Weinberg equilibrium for the haptoglobin polymorphism (p=0.4751). The proportion of allele 2 carriers is greater in patients who have obstructive CAD (p=0.0155). Our data support the hypothesis that the Hp 2 allele is a risk factor for CAD, and this correlation will be investigated further using quantitative PET analysis to study patients with mild diffuse disease. (Poster presentation.)

## FATE OF DIPICOLINIC ACID RELEASED FROM *BACILLUS SUBTILIS* DURING SPORE GERMINATION.

Michelle K. Scotland and Alicia M. Carroll, Department of Chemistry, Nazareth College of Rochester 4245 East Ave Rochester, NY 14618.

*Bacillus subtilis* (*B. subtilis*) is a gram positive soil bacterium that forms metabolically dormant spores under starvation conditions. Spores undergo germination and outgrowth and become vegetatively growing cells once nutrients become available. *B. subtilis* is a nonpathogenic bacterium and serves as a model organism for other spore-forming bacteria that cause disease such as anthrax, gangrene, botulism, and food poisoning. Dipicolinic Acid (DPA) is a small, soluble molecule that can be found within the core of *B. subtilis* spores usually chelated to a divalent metal cation, often calcium. DPA makes up approximately 10% of the spore's dry weight and is present in the spore's core well above its solubility. The large concentration of DPA in the core plays a pivotal role in the spore's resistance to wet heat and UV radiation. Upon germination DPA is released from the spore's core and activates a cortex lytic enzyme (CwlJ), which degrades the peptidoglycan cortex and allows for water to enter the spore's core. Although it has been shown that DPA exits the spore's core during germination, the fate of DPA after release from the core is unknown. In the current work, the concentration of DPA released from *B. subtilis* spores over a one week germination period was determined. The results indicate that DPA is a stable molecule and is not taken up by the germinated spores. In addition, we attempt to determine whether *B. subtilis* cells or other soil microorganisms use DPA as a nutrient source. Completion of these investigations will allow us to understand the fate of DPA once it is released from *B. subtilis* spores. (Poster presentation.)

## MODELING UNDERWATER LIGHT DYNAMICS AND THEIR ECOLOGICAL RELATIONSHIPS TO DEEP CHLOROPHYLL LAYERS IN THE FINGER LAKES.

Tim Sellers, Center for Aquatic Research, Keuka College, Keuka Park, NY 14478.

In many of the Finger Lakes, phytoplankton primarily resides in a distinct layer well below the surface of the lakes. These deep chlorophyll layers (DCL) hold the majority of organic carbon that can drive the rest of the grazing food web. Our underwater light data show that the DCL is very close to the 1% surface light level, the light level where photosynthetic gains are just matched against losses due to respiration. In Keuka Lake (and some other Finger Lakes), the DCL is usually located just below the thermocline meaning the phytoplankton live in a low light and low temperature environment that is very close to a high light and warmer water area. Small changes in environmental conditions can push these phytoplankton communities to very different conditions, and the population and community effects of these changes can cascade through the food web. Environmental changes can cause changes in both light quantity (available photons) and quality (available wavelengths). Reductions in light quantity can occur from surface blooming cyanobacteria (e.g., *Microcystis*), while zebra mussel filtration may result in greater light intensity at depth. DCL depths range between 8 and 20 meters in depth. This means wave-length specific absorption by water, organics, and phytoplankton make the suite of available wavelengths for photosynthesis very different than in the warmer, surface waters. The presence or absence of accessory pigments (i.e., light harvesting pigments other than chlorophyll *a*) may drive species composition for DCL phytoplankton. This modeling study describes how environmentally driven changes in light dynamics (e.g., surface phytoplankton, path length (depth), wave length-specific and integrated light attenuation coefficients, etc.) can potentially affect food webs and water quality in lakes with prominent DCLs. (Oral presentation.)

## MELANIN-CONCENTRATING HORMONE FACILITIES 3T3-L1 PRE-ADIPOCYTE MIGRATION.

L. Shum and L. B. Cook, Department of Biological Sciences, The College at Brockport, SUNY, Brockport, NY 14420.

Melanin-concentrating hormone (MCH) is an appetite-stimulating hormone, which binds G protein-coupled receptors (GPCRs) found in the brain, pancreas and fat (adipose) tissues. The broad distribution range of its receptors suggests that MCH might help regulate the whole-body response to food. We recently discovered that in addition to eliciting a MAPK signal in 3T3-L1 pre-adipocytes, MCH also mediates rearrangements of the actin cytoskeleton, leading to a reversible change in cell morphology; however the physiological significance of this change is as yet unknown. The aim of this study was to determine whether MCH-mediated actin rearrangements result in altered migration. 3T3-L1 pre-adipocytes, endogenously expressing MCH receptors, were grown to confluency, wounded, and then treated with MCH. At hour-long time points, the wound was measured and compared to the size of the initial wound. The percent of closure was measured in both the presence and absence of MCH. When cell migration experiments were performed in the absence of serum, there was little difference between MCH treated and control cells for as long as 12 hours. However, in the presence of serum, MCH caused cells to migrate into the wound progressively faster. After six hours, the hormone-treated wounds had closed to $39.3 \pm 6.7\%$ of the initial wound size versus the untreated wounds which had only closed to $49.5 \pm 8.7\%$ of the initial size (significant to the $98^{th}$ percentile). This novel finding suggests that while MCH does not influence pre-adipocyte differentiation, it could impact the overall development of adipose tissue *in vivo.* (Oral presentation.)

## MICROWAVE SYNTHESIS OF METHYLATED PHENOLS.

Allison W. Smith, Pavel Belov, and Ronny Priefer, Department of Chemistry and Biochemistry, DePaul Hall 206, Niagara University, NY 14109.

The methylation of phenol compounds is commonly performed in order to preserve the alcohol group(s) from interfering with subsequent reactions. This protection can be done in numerous manners, one of which is the use of *N,N*-dimethylformamide dimethylacetal (DMF-DMA). This however typically requires lengthy reflux (i.e. 24hrs). This project examines the use of microwave to accelerate the rate of reaction. This new process methylates in thirty minutes to one hour using a laboratory microwave and is dependent upon the electron donating and withdrawing substituents attached to the ring. (Poster presentation.)

## THE SYNTHETIC DEVELOPMENT AND STRUCTURAL CHARACTERIZATION OF CHOLESTOSOMES™.

Charles Smith, Haley McClory, Dr. Lawrence Mielnicki, and Dr. Mary McCourt, Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109.

Cholestosomes™ are novel nanoscale drug delivery vesicles synthesized from neutral lipids based on their co-solubility as determined from DSC measurements. Initial synthesis using cholesteryl myristate and cholesteryl laurate in a 1:1 molar ratio resulted in a vesicle, which incorporated a flurochrome (FITC) and was shown to be capable of drug delivery into cells. This study reports on a new synthetic procedure that increases productivity as well as extractive productivity. Electron microscopy gives evidence of the nanoscale size as well as indication of the shape of the vesicles. Dynamic light scattering was also used to determine the size range of the vesicles. The most recent work includes successful incorporation of different chromophores as well as using different esters in different molar combinations in addition to the incorporation of oxysterols as a method for changing surface electrostatics. Surface properties are critical for the targeted delivery and survival in the body. Recent work also includes the development of an effective long-term storage procedure. (Poster presentation.)

## GLOBAL PROTEIN PROFILES IN HUMAN MONOCYTES UNDER CONDITIONS OF OXIDATIVE STRESS.

Elizabeth Smith, Robert Greene, and Deborah Leonard, Biology Department, Niagara University, NY 14109.

Oxidative stress plays a critical role in the initiation and progression of atherosclerosis. Both oxysterols and free iron have been identified in advanced atherosclerotic lesions and may contribute to the oxidative stress response in resident macrophages. One approach to identifying novel biomarkers for atherosclerosis is to look at changes in global protein expression patterns. Using a cell culture model system, human monocytic cells were treated with either 7-ketocholesterol or iron ascorbate and proteins were analyzed by two dimensional chromatographic protein separation using the Beckman PF2D proteomics system. A comparison of monocytes treated with or without 7-ketocholesterol showed minor difference in the protein profile. Mass spectrometry and pathway analysis will be used to identify specific proteins and a protein biomarker network that is diagnostic of oxidative stress in human macrophages. (Poster presentation.)

## ANO-1 SELECTIVLY IDENTIFIES INTERSTITAL CELLS OF CAJAL IN ZEBRAFISH.

Jennifer Strouse, Jessica Ouderkirk, and Adam Rich, Department of Biological Sciences, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

**Introduction:** Anoctamin 1 (Ano1) is a transmembrane protein that functions as a calcium-activated chloride channel. Ano1 was recently shown to be expressed on ICC in both mouse and human. This channel contributes to pacemaker function by Interstitial Cells of Cajal (ICC). ICC express the Kit receptor tyrosine kinase and are typically identified using anti-Kit antibodies, but this marker also identifies mast cells which are present in gastrointestinal (GI) tissues. Anti Ano1 antibodies have been shown to specifically identify ICC in human and mouse.

**Objective:** To determine if anti-Ano1 antibodies selectively identify ICC in the zebrafish GI tract.

**Methods:** Wild type adult zebrafish were anesthetized and sacrificed, and the GI tract was carefully dissected and fixed in 4% paraformaldehyde (PF) or an acetic acid/ethanol (aa/EtOH)mix. A panel of anti-Ano1 antibodies was tested for immunoreactivity. Parallel experiments were performed using anti-Kit, anti-tubulin, or anti-SM22 antibodies as positive controls. Several experimental protocols were examined to reduce background staining, such as type of blocking solution (normal donkey serum versus bovine serum albumin), and buffers (phosphate buffered saline versus Tris buffered saline). Finally, immunoreactivity of tubulin, SM-22, and anti-Kit antibodies using aa/EtOH was determined because dual labeling experiments are necessary to determine smooth muscle (SM-22), enteric neuron (tubulin) and ICC (anti-Kit) reactivity with anti-ano1 antibody. Appropriate secondary antibodies were applied and fluorescence microscopy was used to detect specific staining. Digital imaging was used to collect data.

**Results:** Anti-Ano1 antibody in aa/EtOH fixed zebrafish GI tissues stained a network of cells that was similar in appearance to the ICC network identified using anti-Kit antibody in PF fixed tissue. The Ano1 positive cellular network showed a higher signal-to-noise staining, and therefore was more easily resolved when compared to the Kit-positive network. Anti-Ano1 antibodies were ineffective in PF fixed tissues. Anti-Kit, anti-SM22, and anti-tubulin antibodies were not effective in aa/EtOH fixed tissues. Dual labeling was possible when aa/EtOH fixation was followed by anti-Ano1 staining, followed by PF fixation and anti-tubulin staining.

**Summary:** Zebrafish ICC appear to be selectively identified with anti-Ano1 antibodies in aa/EtOH fixed tissues. Further experiments will include dual labeling with anti-Ano1 and anti-Kit antibody to verify co-localization on ICC. Dual labeling with a nuclear stain (DAPI) and Ano-1 or Kit antibody followed by cell counting will also be performed. (Poster presentation.)

## DEVELOPMENT OF AN EARLY DETECTION METHOD FOR ALZHEIMER'S DISEASE.

Brittany L. Sumbler, Haley McClory, Dr. Lawrence Mielnicki, and Dr. Mary McCourt. Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109.

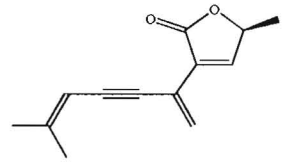
Alzheimer's disease is a degenerative condition that affects over 5 million Americans with direct and indirect costs amounting to $150 billion each year. It is the most common form of dementia resulting from the development of plaques and tangles in the brain that may block neuronal communication and lead to cell death and deterioration.

This causes severe memory loss, confusion, difficulty with everyday tasks, and personality changes. There is currently no cure for Alzheimer's disease, so early detection is the key to saving lives. This research project aims to develop an early detection method for Alzheimer's disease by examining human urine samples using $H^1$-NMR spectroscopy. The concentration of various metabolites found in the urine that are related to Alzheimer's disease will be quantified using the Chenomx-NMR Suite Version 6.0, and then the data will be analyzed using Umetrics SIMCA-P+ multivariate analysis software. The results of the data analysis will be correlated with the results of memory tests performed on the urine donors. The ultimate goal of this project is to develop a simple, noninvasive test that will be able to place individuals into groups depending on the level of development of the disease. Currently, Alzheimer's disease is diagnosed in its later stages when treatment options are limited; however, this project's ultimate benefit will be its ability to detect the disease in its earliest stages when the usual memory symptoms aren't yet noticeable. (Poster presentation.)

## STUDIES TOWARD THE TOTAL SYNTHESIS OF TROCHELIOPHOROLIDE A.

J. Swartzenberg, S. Dorn, W. Spencer, III, J. Smith, O. Agusto, and C. Collison, Department of Chemistry, Rochester Institute of Technology 85 Lomb Memorial Dr. Rochester, NY 14623.

Soft sea corals have been of particular interest to synthetic organic chemists due to their ability to yield many natural products including steroids and metabolites. In recent years the soft corals *Sarcophyton trocheliophorum* and *Lithophyton arboretum*, isolated from the Gulf of Aqaba in the Red Sea, exhibited the presence of six butenolide lipids and butenolides with atypical substitution and saturation patterns. A butenolide consists of a γ-lactone with a single unit of unsaturation and are commonly called 2-furanones due to the fact that they are derived from oxidized furans. Several natural products and natural aroma constituents contain these butenolide elements.[2,3] The purpose of this research project is to achieve the total synthesis of Trocheliophorolide A (**1**), a γ-lactone which is one of the six butenolide natural products. Biological assays confirm that Trocheliophorolide A shows evidence of considerable inhibition of bacterial cell growth in *S. aureus* (11.5mm) and *B. subtilis* (13.0mm) and toxicity toward the brine shrimp *Artemia salina.*



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(Poster presentation.)

## GENETIC EXPRESSION CHANGES IN NIH3T3 FIBROBLAST CELLS DURING NOTCH MEDIATED CELLULAR TRANSFORMATION.

J. Travers, J. Dankert, and B. Hara-Kaonga, Department of Biological Sciences, Rochester Institute of Technology, Rochester, NY 14623.

The Notch signaling pathway is required throughout development of vertebrate and invertebrate species to regulate normal cell functions, including cell fate decisions. Recent studies on this pathway in the mesoderm-derived mouse fibroblast cell-line NIH3T3 have demonstrated the formation of multicellular spheroids as a result of the transduction of these cells with genes that encode Notch inhibitory proteins. This project focused on three Notch-inhibitor proteins encoded by dnRBP-jk, soluble Jagged 1 (sJag1), and γ-secretase inhibitor IX (γ-SI), which were each designed to interfere with a specific segment of the Notch pathway. The transduced cells were treated with dimethyl sulfoxide (DMSO) or MEK inhibitor (MEKin) with or without the presence of fibroblast growth factor (FGF) in multiple assays. Observations of the cells were made at 6 hr intervals to examine the formation of spheroids, which began to form before the first observation at 18 hrs. After 36 hrs of growth, total RNA was extracted from each cell assay and converted into complementary deoxyribonucleic acid (cDNA). The cDNA samples were then each run through polymerase chain reaction (PCR) to amplify several genes known to be involved in the mesenchymal-epithelial transition (MET). This revealed positive detection of E-cadherin in all three transductions and positive detection of N-cadherin in γ-SI/FGF/DMSO only. Quantitative real time PCR (qRT-PCR) E-cadherin revealed an over expression of the gene in the γ-SI/FGF/DMSO and dnRBP-jk/FGF/DMSO treatments

with SyBr Green™ fluorescence at 1.82 and 1.75, respectively. This gene was slightly underexpressed in the sJag1/FGF/DMSO treatment at 0.922 fluorescence. Since wild-type NIH3T3 cells do not express E-cadherin, these results suggest that the spheroidal NIH3T3 cells have gone through a phenotypic transformation that activates the E-cadherin gene, based on the changes in gene expression. In the future, additional qRT-PCR analyses will be performed to compare the expression rates of additional MET genes in spheroidal NIH3T3 cells to the wild-type. (Poster presentation.)

## A NEW PROFESSIONAL SCIENCE MASTER'S IN BIOLOGICAL SCIENCES AT THE COLLEGE OF BROCKPORT.

Stuart Tsubota, Dept. of Biological Sciences, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

I would like to take this opportunity to describe an exciting new Master's program in the Dept. of Biological Sciences at The College of Brockport. The program is a Professional Science Master's Program (PSM). This program has recently been approved by NYSED, and we will be enrolling our first class in Fall 2010. Students completing this program will receive a Master's of Science in Biological Sciences with a PSM designation. The PSM is an innovative, non-thesis master's program designed for those interested in working in biotechnology—in particular in positions that interface between the research scientist and company management. These individuals will need expertise in cellular and molecular biology, business, and management. As an interdisciplinary degree program, the PSM will provide these skills. Students in the program will take a number of graduate courses focusing on cell and molecular biology, but what sets this program apart from traditional biology master's programs is the inclusion of courses in management and business (Plus Courses) and an internship in a science-based business, or government or non-profit organization. The Plus Courses were arrived upon and designed after consultation with members of local life-science companies and through comparisons with other PSM programs. Through the internship, students will receive hands-on experience with processes such as drug discovery, product testing, and project design and implementation.

As part of the American Recovery and Reinvestment Act of 2009, 15 million dollars have been allocated for the funding of new PSM programs such as ours. We are applying for a three-year grant through this program. If we are successful, the first two classes of PSM students will receive a stipend and a full tuition waiver. (Poster presentation.)

## STEWART'S WILT DISEASE PROGRESSION IN BIOENGINEERED CORN.

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Stewart's wilt disease is a disease of sweet and dent corn caused by the bacterium *Pantoea stewartii subsp. Stewartii*. The bacterial pathogen is vectored to corn via the corn flea beetle, *Chaetochema pulicaria*. *P. stewartii* use the quorum-sensing signal 3-oxo-C6-HSL to communicate and produce a biofilm that blocks the movement of water and nutrients in the corns vascular tissue, causing leaf blight and necrosis, and in young corn, death. A bioengineered corn variety was created that endogenously produces the same 3-oxo-C6-HSL signal that *P. stewartii* uses to communicate. In theory, this tricks the bacteria into prematurely producing an ineffective biofilm, which fails to adhere to the vascular tissue, giving the corn ample time to mount a defense. To test this hypothesis, a strain of *P. stewartii* was tagged with green fluorescent protein (GFP) to track bacterial movement, and infection assays were conducted to determine disease susceptibility. Bioengineered plants were screened using NTL4 and bioluminescent assays, PCR amplification, and southern blot analysis to measure 3-oxo-C6-signal production and screen plants for gene inserts. A randomized infection assay was carried out on the bioengineered corn and known susceptible and resistance wild type corn cultivars. The results of the infection assay show that disease rating in the transgenic plants was lower than susceptible wild type plants. To further confirm these results, further infection assays are needed. The movement of *P. stewartii* in the corn's vascular tissues was observed using GFP tagged bacteria and ultraviolet fluorescence microscopy. Fluorescent microscopy images show a clear difference in biofilm morphology and colonization between transgenic and wild type corn, possibly indicating ineffective biofilm adhesion and disruption of quorum sensing signaling. (Poster presentation.)

## THE *BISEXUAL* GENE REGULATES COURTSHIP BEHAVIOR IN MALE *DROSOPHILA*.

Girija Vijayaraghavan, Rie Ozawa, and Huey Hing, Department of Biological Sciences, Lennon Hall, Room 204B, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

The field of animal behavior is an active area of research, with debates centering on the relative contributions of genes and the environment. Although most scientists today accept the idea that genes play a role in controlling behavior, a number of questions remain including, "What are these genes?" and "How do they exert their effect?" The answers to these questions are by-and-large unknown. We have now discovered a novel *Drosophila* mutant whose males engage in high frequency of courtship behavior with other males (homosexual courtship). This is an unusual behavior because *Drosophila* males normally court females and avoid other males. We have identified the gene involved, and provisionally named it *bisexual* (*bisex*). Our preliminary data indicate that *bisex* functions in the antennae of male animals. Based on our findings, we hypothesize that the gene mediates the ability of males to smell other males, thus preventing a male-to-male courtship behavior. In mutant males, which lack the gene function, the courtship behavior becomes indiscriminate. Our study provides a direct link between genes and behavior in general and olfaction and courtship in particular. Our current work is directed at elucidating the cellular function of the *bisex* gene product. (Oral presentation.)

## SURVIVAL OF *E. COLI* O157:H7 IN VARIOUS FOODS.

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*E. coli* O157:H7 is a foodborne pathogen commonly found in the United States and Canada. This organism has been found to be normal flora of adult dairy cattle as well as in calves as well as in other wild animals. *E. coli* O157:H7 was able to survive over a broad pH range from 4-9 and also over a broad temperature range of 4-42 C. *E. coli* O157:H7 survived for at least 1-2 weeks in various dairy products including whole milk, heavy cream, ½ & ½, and skim milk at 4 C at levels higher than the reported dose size for disease generation (100 organisms/ml). *E. coli* O157:H7 also survived for at least one week in a highly acidic environment (3.51) at 4C of apple juice at levels still at the dose size for disease. In carrot juice where the pH was 6.41, there was less of a loss of viable cells over a week of incubation at 4C and in a carrot/apple juice blend *E. coli* O157:H7 survived at numbers still above the recommended dose size for disease. Finally, *E. coli* O157:H7 was found to survive at viable cell levels in both ground beef and cheddar cheese curds for at least a week that were above the recommended dose size for disease. *E. coli* O157:H7 was able to survive at both low pH and low temperature in various foods for at least one week and sometimes as long as 2 weeks before a reduction of viable cells dropped below the implicated dose size for disease. This strain of *E. coli* O157:H7 is extremely hardy, surviving in many different foods that have been implicated in disease outbreaks and may pose significant problems in food borne outbreaks. (Poster presentation.)

## RARE EARTH ELEMENT AND URANIUM-THORIUM VARIATIONS IN TUFA DEPOSITS FROM THE MONO BASIN, CA.

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Samples of fossil tufa deposits from several localities in the Mono Basin, eastern California, were analyzed for trace element concentrations in order to better understand changes in lake composition in the past. These deposits were formed during the last glacial cycle, mostly during deglaciation (Benson et al., 1990, PPP). Three elevations are represented by the analyses. Samples from near Highway 167 were sampled between 2063 and 2069 m asl. Samples from near Thompson Road were sampled between 2015 and 2021 m. One layered mound was sampled at 1955 m. Concentrations of the lanthanide rare earth elements (REE), in particular the heavy/light (HREE/LREE) distributions, have been shown to be sensitive to alkalinity in modern saline lakes (e.g., Johannesson et al., 1994,

GRL, 21, 773-776), and the same has been suggested for U/Th (Anderson et al., 1982, Science, 216, 514-516). Holocene to near-modern tufa towers exist in shallow water and around the current shoreline (1945 m). Tufa towers above 2000 m include a characteristic morphology termed thinolite, interpreted to represent pseudomorphs after the very cold water mineral ikaite. Most lower elevation towers do not have the thinolite morphology, but some layered tufa mounds at low elevations include several layers of thinolite, such as the one sampled for this project. Analyses were made on millimeter-scale bulk samples from tufa towers. Measurements were made on sample solutions with a Varian 820MS quadrupole ICP-MS.

Mono Basin tufa samples have total REE concentrations ranging from 0.029 to 0.77 times average shales. Samples have moderately LREE-enriched shale-normalized patterns with limited overall variability ($[La/Lu]_{SN}$ of 1.8 to 9.6) but with some variability in the slope of the HREE portion of the patterns. Tufa towers sampled from three elevations have $(Gd/Lu)_{SN}$ of 0.40 to 1.5. The REE patterns of most samples have small positive Ce anomalies, but a minority of samples, all from the layered tufa mound, have small negative Ce anomalies. Concentrations of U and Th range from 0.5 to 12 ppm and from 0.2 to 12 ppm, respectively, with substantial variability in U/Th (0.08 to 20).

Relative to modern Mono Lake water (Johannesson and Lyons, 1994, Limn. Oc., 39, 1141-1154) the tufa samples have 29 to 144000 times the total REE contents, but the water has HREE/LREE nearly twice as high as the most HREE-enriched fossil tufa. There is a general trend in which samples from higher elevation have lower average total REE and Th, and higher average U and U/Th, the latter ranging from 0.52 in the locality at lowest elevation to 10.5 at the highest. In general the results show promise for the application of this approach to paleo-alkalinity, although analyses of modern precipitates as well as laboratory precipitation experiments are needed to fully address the processes. (Poster presentation.)

## MOLECULAR MODEL BUILDING OF CHOLESTOSOMES™ AND ANTI-INFECTIVE ANALOGS.

Christopher Wirth, Dr. Lawrence Mielnicki, and Dr. Mary McCourt, Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109.

Polymer surface coatings on liposomes enhance the directional delivery capabilities of the vesicle and in fact they can be considered to be stealth vesicles for targeted drug delivery. Several common polymer surface coatings that are used include polyethylene glycol (PEG), polyamines and poloxamers. These polymer surface coatings result in an electrostatic external surface which facilitates deliverability and availability in the body. Cholestosomes™, a recently developed nanoscale drug delivery system, have been shown to be able to deliver drugs to cells without the benefit of surface coatings. This study explores the electrostatic properties of the cholestosomes™ and analogs of drugs that could be potentially used with them. It will help determine whether the use of cholestosomes™ will expand the use of the given drugs. Analogs are built using SYBYL and then charges are calculated using the Tripos MM force field. Isopotential surfaces are then explored and compared to those of the cholestosomes™. Cholestosomes are composed of neutral lipids that pack reflective of their crystallographic structures. Preliminary studies suggest an electrostatic compatibility between the cholestosomes™ and drug analogs. (Poster presentation.)

## PHOSPHORUS AND NITROGEN LIMITATION IN YOUNG AND MATURE NORTHERN HARDWOOD FORESTS.

Ruth D. Yanai[1], Edward B. Rastetter[2], Melany C. Fisk[3], Tera J. Ratliff[3], Timothy J. Fahey[4], Brendan K. Naples[5], Farrah R. Fatemi[6] and Steven P. Hamburg[7]; [1]Forest and Natural Resources Management, SUNY Environmental Science & Forestry, 107 Marshall Hall, 1 Forestry Drive, Syracuse, NY 13210; [2]The Ecosystems Center, Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA 02543; [3]Department of Zoology, Miami University, 160 PSN, Oxford, OH 45056; [4]Cornell University, 12 Fernow Hall, Ithaca, NY 14853; [5]Department of Biology, Appalachian State University, Boone, NC 28608; [6]Department of Plant, Soil and Environmental Sciences, University of Maine, Orono, ME 04401; and [7]Environmental Defense Fund, 18 Tremont Street, Boston, MA 02108.

Although temperate forests have long been thought to be primarily nitrogen limited, resource optimization theory suggests that ecosystem productivity should be co-limited by multiple nutrients. In northeastern North America, air pollution and forest harvesting disturbance elevate N availability and contribute to the likelihood of P limitation. We extended the Multi-Element Limitation (MEL) model to include P, light, and water as well as N and

carbon, and we applied it to simulate secondary succession in northern hardwood forests. The model predicted a greater response of aboveground productivity to N+P than N or P alone. In older stands, MEL predicted a greater response to N than to P addition, but in younger stands, the supply of N from detritus was predicted to be sufficient to create P limitation. To test for differences in N and P availability and acquisition as a function of forest age, we made field measurements in replicate young (26-30 years) and mature (>100 years) stands in the Bartlett Experimental Forest, New Hampshire. Foliar retranslocation of P exceeded that of N in yellow birch and sugar maple, especially in young stands. Phosphatase activity was higher in young forests than in mature forests, and fine roots foraged preferentially for P in young forests and for N in mature forests. Net N mineralization rates were higher in young than mature forests. Resin-available P did not differ between young and mature forests, but lower bicarbonate-extractable P in young forests suggests transfer of organic P to available pools, consistent with the idea of higher P mobilization in young forests. Microbial N:P ratios in the mineral soil in both old and young forests averaged 29:1, suggesting P limitation to microorganisms that may cause competition for P with plants. These results indicate that P could now be more limiting than N especially in young stands. (Poster presentation.)

## DOES BENTHIC MACROINVERTEBRATE BIODIVERSITY ENHANCE NUTRIENT TRASFORMATION AND REMOVAL?

Charles Yarrington and A. Christina Tyler, 106 Andrews Memorial Drive, Rochester Institute of Technology, Rochester, NY 14623.

Eutrophication is one of the greatest problems presently facing our estuaries, to the extent that we risk the loss of the many ecosystem services that these systems provide. Through burrowing, respiration, and feeding activities, benthic invertebrates can exert controls on nutrient and organic matter transformation and removal that are strong enough to influence eutrophication in its early stages. It is not clear, however, how individual species affect these processes or whether invertebrates species diversity plays an important role. In this study we sought to determine the effects of different species of benthic macroinvertebrates on eutrophication in its early stages through alteration of the oxidation-reduction boundary, and nutrient and organic matter transformation and removal. In a laboratory microcosm experiment we examined the affects of four different species of invertebrates that included gallery diffusers, biodiffusers, and surface grazers. Fluxes of dissolved oxygen, nutrients, ammonium and sulfide in porewater, total organic matter, and microalgal chlorophyll *a* were measured. Sediments and organisms were collected from West Falmouth Harbor, a shallow estuary on Cape Cod, MA, USA currently experiencing increasing loads of nitrogen. Experiments were conducted using each of the species separately and in increasingly complex assemblages. We found that species differ substantially in the effects on the measure parameters and that the degree of complementarity or redundancy of effects with increasing species diversity varies depending on the variable of interest. Overall, most of the species studied had an influence on processes that could contribute, positively or negatively, to the progression of eutrophication in shallow estuaries. The effects of eutrophication is will likely be buffered when diversity is high. (Poster presentation.)

## THE TEMPERATURE DEPENDENCE OF CONJUGATION OF AMYLOID BETA PROTEIN ON THE GOLD COLLOIDAL NANOPARTICLES' SURFACE.

Kazushige Yokoyama, Nicole B. Gaulin, Hyunah Cho, and Nicole M. Briglio, Department of Chemistry, SUNY Geneseo, ISC 326F, 1 College Circle, Geneseo, NY 14454.

The absorption spectrum of amyloid beta 1-40 peptide ($A\beta_{1\text{-}40}$) conjugated gold colloidal suspension of 15, 20, 30 and 40 nm size was examined under temperatures ranging from 5°C to 50°C. As the pH was externally altered repetitively between pH 4 and 10, $A\beta_{1\text{-}40}$-coated 20 nm gold colloidal nanoparticles exhibited a reversible color change for at an entire temperature range tested in this study except for 5 ± 0.3 °C. This reversible change may be due to the fact that hydrophilic $A\beta_{1\text{-}40}$ evolves between a three-dimensional network containing mainly β-sheet and α-helices, and an intermediate of this process implies a reversible step reported as initiation of fibrillogenesis in Alzheimer's disease. (Poster presentation.)

## IS WATER TIGHTLY BOUND TO IONIC LIQUIDS UP TO WATER MOLE FRACTIONS OF 0.5?

Anthony W. Zidell and Markus M. Hoffmann, Department of Chemistry, SUNY College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

The self diffusion of the cation, anion and water of the binary ionic liquid (IL)–water system 1-ethyl-3-methylimidazolium methanesulfonate ([emim][$MeSO_3$]) has been studied using a nuclear magnetic resonance (NMR) technique called diffusion ordered spectroscopy (DOSY). Self diffusion is the translational random Brownian motion of molecules. Self diffusion coefficients were obtained for 10 mixtures with water mole fractions ranging from 0 (pure IL) to 0.9 at 40°C, 50°C, 60°C, 70°C and 85°C. All three species, the cation $[emim]^+$, the anion $[MeSO_3]^-$ and water follow a smooth, continuous trend towards faster self diffusion with increasing water mole fraction. For each of the concentrations and each species, an Arrhenius analysis was performed to determine the activation energy ($E_a$) of translational motion. Interestingly, despite water having a diffusion coefficient about three times as great as $[emim]^+$ and $[MeSO_3]^-$, all three species have the same, linearly concentration dependent activation energy. These results seem to be contradictory to the belief that water is tightly bound to the IL up to water mole fractions of 0.5 since no discontinuity is observed in the composition dependent self diffusion coefficients. Rather, water and ionic liquid may be spatially separated into domains, which vary in relative size according to the composition of the binary mixture. Additional experimental results concerning the concentration and temperature dependent chemical shifts of the IL and $H_2O$ resonances provide further insights and will be presented as well. (Poster presentation.)

# THIRTY-SEVENTH ANNUAL SCIENTIFIC PAPER SESSION

## ROCHESTER INSTITUTE OF TECHNOLOGY
## ROCHESTER, N.Y.
## November 6, 2010

## LARRY J. KING MEMORIAL LECTURE

### Under Siege—Marine Life Versus the Oil Spill in the Gulf of Mexico
**Dr. Paula M. Mikkelsen**
**Associate Director for Science, Paleontological Research Institution, Ithaca, NY**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### A *METHYLOBACTERIUM* sp. FROM GRAPEVINE XYLEM FLUIDS AND TRANSPOSON MUTANTS DEFICIENT IN QUORUM-SENSING SIGNAL PRODUCTION.

Mior Ahmad, Azmeer Mior Ahmad Subki, Nurul Hawa Ahmad, André Hudson, and Michael Savka, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

A Gram-negative, pink-pigmented bacterium, designated as GXF-4, was identified to produce a significant amount of *N*-acyl-homoserine lactone (AHL) signals. Bacterium GXF-4 was characterized as a member of *Methylobacterium* sp. genus based on full-length 16 S rRNA sequencing and phylogenetic analyses. To identify an AHL synthase gene in *Methylobacterium* sp. GXF-4, a population of genetic mutants was produced by random insertion of transposon Tn5 into the genome. All of the mutants were recovered on potato dextrose agar medium supplemented with antibiotic, kanamycin, as the mutants carried kanamycin resistance on the transposon. A total of 7480 mutants were screened for a disruption in AHL signal production by using the AHL-dependent bacterial biosensor strain CV026. Three *Methylobacterium* sp. GXF-4 mutants, identified as numbers 771, 3085 and 5261 were shown to be deficient in AHL signal production based on biosensor CV026 T-streak plate bioassay and thin layer chromatography analysis with a second AHL-dependent biosensor, NTL4 (pZLR4). Future work is to isolate and clone the disrupted gene in the mutants by genetic analysis and perform complementation analysis. (Oral presentation.)

### EFFECTS OF ENHANCED PHENOLIC DISSOLVED ORGANIC CARBON ON THE GROWTH OF AQUATIC PLANTS.

Siti Aishah, Abdul Rahman, A. Christina Tyler, and Todd Pagano, Program in Environmental Science, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Dissolved organic carbon (DOC) in natural waters has been on the rise in recent decades. One component of the DOC pool is phenolic DOC compounds, which can be hazardous to ecosystem and human health. Several theories on factors that influence DOC in the water system have been generated. However, few studies have addressed variability of DOC composition, sources, or consequences for aquatic ecosystem and human water supplies. This interdisciplinary study intended to analyze the (1) sources, (2) effects, and (3) possible solutions to the problem of increasing DOC concentration. Preliminary experiments involved cultures of *Lemna minor, Microcystis aeruginosa* and *Selenastrum capricornutum*. These cultures were grown in standard culture media with treatments containing either mono-phenol or tannic acid. Preliminary results showed that the growth rate of both *S. capricornutum* and *M. aeruginosa* decreased in the presence of phenol. In contrast, *L. minor* not only grew well in

both treatments, but was also capable of reducing the phenol concentration in the water. A more detailed experiment investigated the effects of *Spirodela polyrhiza,* a species common to Conesus Lake, the study site for our project, on phenol, tannic acid and a bulk natural organic matter substrate. Results showed that S. polyrhiza grew well in the presence of all three phenolic DOC compound and also decreased the compounds concentration. Since duckweeds (*L. minor* especially) have successfully been used for phytoremediation, these experiments suggested that *Spirodela polyrhiza* has the potential for treating water with high phenolic DOC contents and thus decreases the potential hazardous effect of these compounds on other fragile aquatic organisms. (Oral presentation.)

## CALCULATION OF HUMAN LEUKEMIC CELL ROLLING VELOCITIES OVER FUNCTIONALIZED FLOW CHAMBERS TO MODEL RECEPTOR-LIGAND INTERACTIONS.

Phil Amsler[2], Karina Roundtree[2], John Dankert[1], Jennifer Reardon[1], Shane Reardon[2], Andre Hudson[1], David Gee[2], and Kate Wright[1]; [1]Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623, and [2] Kate Gleason College of Engineering, Rochester Institute of Technology, 77 Lomb Memorial Drive, Rochester, NY 14623.

Granulocyte macrophage colony-stimulating factor (GM-CSF) is a cytokine that specifically binds to GM-CSF receptor triggering differentiation of bone marrow progenitor cells into granulocytes. Overexpression of the GM-CSF receptor has been documented in a subset of human leukemia, suggesting this receptor may be a future target for bioengineered "smart" particles designed to interact with receptors expressed on human leukemic cells. Toxic substances encapsulated in bioengineered "smart" particles may then enter leukemic cells via receptor-mediated endocytosis for a targeted anti-cancer treatment. Using a physics-based model of receptor-mediated adhesion kinetics of receptor-ligand interactions can be studied in an environment that mimics inflamed endothelium. Apparent HL60 cell rolling velocities on 0.2mm x 5.0 mm flow-chambers functionalized with bovine serum albumin (BSA), the cell adhesion molecule P-selectin, or GM-CSF ligand were calculated. With a Shear Stress of 0.519 to 0.789 D/cm$^2$ HL60 rolling velocities were calculated in the range of 20-50 um/s$^2$ on P-selectin coated chambers. Rolling velocities of HL60 cells over flow-chambers functionalized with GM-CSF were calculated in the ranges of 150-350 um/s$^2$, respectively. The results, to date, suggest that functionalization with GM-CSF ligand, alone, is not sufficient to engage leukocyte rolling. (Poster presentation.)

## OXIDATION OF BENZYL ALCOHOLS UNDER ULTRAVIOLET LIGHT.

Lisa Andrews and Ronny Priefer, Department of Chemistry and Biochemistry, 206 DePaul Hall, Niagara University, NY 14109.

There are several well known methods for oxidizing alcohols. Swern oxidation, the use of pyridinum chlorochromate (PCC), and Dess-Martin periodinane (DMP) are examples of reagents for the conversion of alcohols to an aldehyde. While using acidic sodium dichromate or potassium permanganate leads to carboxylic acids. The focus of our research is to oxidize various benzyl alcohols under ultraviolet light using either acetic acid (AcOH) or trifluoroacetic acid (TFA) as the solvent and reagent. We are examining the applications as well as the kinetics of this reaction. (Poster presentation.)

## CONNECTIVE TISSUE GROWTH FACTOR EXPRESSION DURING ADULT MAMMARY GLAND DEVELOPMENT IN THE MOUSE.

Tiffany Barkley, Anita Sambamurty, Alvin Kim, and Julie Hens, St. Bonaventure University, Biology Department, William Walsh Science Building #213, St. Bonaventure, NY 14778.

Connective tissue growth factor (CTGF) is found in the mammary mesenchyme and plays functional roles in angiogenesis, cellular migration, and tumor growth. Recent studies have shown that CTGF is up-regulated in breast cancer cell lines but the role of CTGF in mammary development still remains unclear. Parathyroid hormone related protein (PTHrP) is expressed in the mammary epithelium and is a key regulator of mammary ductal outgrowth. We hypothesize that CTGF may be inhibited by PTHrP during mammary gland development. In this study we characterize where CTGF is expressed in the mammary gland of adult mice during branching morphogenesis and during pregnancy whether further development occurs. We further examine whether CTGF is directly regulated by PTHrP. To characterize the location of CTGF, mammary glands from transgenic mice containing one copy of

CTGF-β-galactosidase were examined at day 7, 5-week virgin, 12-week virgin, and mid-pregnant mice. Mammary glands were stained for β-galactosidase and counterstained with carmine alum. CTGF expression was not seen in adipocytes of the mammary fat pad, but did appear to be in myoepithelial cells around the mammary ducts and in the blood vessels at all adult ages examined. Heterozygous mammary glands did appear to have altered branching morphogenesis, and therefore we measured the length of mammary ducts between 5-week-old virgin wild-types and CTGF +/- mice and saw a significant decrease in branching ($p < 0.05$) in the CTGF +/- mice. This suggests that CTGF plays a role during branch morphogenesis during mammary gland development. The regulation of CTGF in the mammary gland was examined with the use of the cell line, NMuMG cells. Cells were treated overnight with PTHrP (10-7 M) and cells were examined for differences in CTGF expression and changes in proliferation. RNA was isolated from the cells, and real-time PCR was used to examine whether PTHrP altered CTGF expression using primers specific to CTGF and expression was normalized to GAPDH. However, after 24 hours, CTGF RNA expression did not change, indicating that PTHrP may not have a direct effect on CTGF. We further examined whether PTHrP would be involved in the proliferation of the mammary epithelial cells, by first treating with PTHrP, and then measuring proliferation, no difference was seen in the cells. Further work will include observing mammary glands of mice at different stages of development, including lactation and involution for CTGF, determine whether PTHrP may regulate CTGF indirectly, and determining the specific function CTGF has in the mammary gland. (Poster presentation.)

## DEVELOPMENT OF NEW POLYURETHANE-BASED SURFBOARD COATINGS.

Katelyn Barnhart and Andrew Robak, Department of Chemistry, Keuka College, 141 Central Avenue, Keuka Park, NY 14478.

Surfboards are most commonly coated with polyester or epoxy polymers. Both have properties, such as yellowing after ultraviolet exposure and noxious odors during the coating process, which make them non-ideal coatings. Polyurethane is a polymer that can be used as a coating with the potential for better properties. Polymers are ideal coatings for many applications because they are strong and flexible. Our polymers are created using Desmodur N-75 BA/X or Desmodur XP2410 polymerized with ethylene glycol and a catalyst. Polymers have been made into thin films on different types of media. The stability of the polymer has been tested in conditions made to approximate use in surfing. The polymer films are flexible and strong and avoid most of the problems that traditional coatings have. Current work is focused on testing the water sensitivity of the polymerization. Water may be the cause of bubbles in the film. Future experiments include creating cross-linked polymers, reducing the amount of air bubbles in the film, and application of the polymer using different application techniques. (Poster presentation.)

## MOLECULAR SOLVATION IN PHOSPHONIUM IONIC LIQUIDS.

Kathleen Barra and Dr. Mark Heitz, Department of Chemistry, The College at Brockport SUNY, 350 New Campus Drive, Brockport, NY 14420.

The goal of this research is to understand the solvation dynamics of coumarin 153 (C153) in an environmentally friendly "green" phosphonium ionic liquid (PIL) solvent. C153 is a prototypical fluorescent molecule known for its spectral sensitivity when in solution. Neat trihexyltetradecyl phosphonium chloride (RTPIL-Cl) and methanol (MeOH) solvents were used to form an array of IL mixtures in which C153 was dissolved. Solvation of C153 was determined using steady-state and time-resolved fluorescence spectroscopy. The C153 steady state data shows a systematic blue shift as PIL is added to solution. The solute emission intensity is quenched most effectively at a mole fraction of ~0.03 PIL suggesting that the solvent-solute interactions are most unique in this range of mole fraction. Similarly, the lifetime data show a minimum value at ~0.03 mol fraction PIL, also implying quenching of the probe at this solution composition. C153 is better solvated, more relaxed, at MeOH-rich mole fractions. The time-resolved center of gravity and associated solvation correlation function, $C(t)$, show that solvation of C153 occurs at a faster rate in solutions of lower mole fraction PIL. (Poster presentation.)

## POTENTIAL BIOMARKERS FOR OBSTRUCTIVE CORONARY ARTERY DISEASE.

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The leading cause of death in the United States is heart disease. In 2006, nearly 81 million people in the United States had been diagnosed with heart disease. It is important that the medical community develop better, more efficient ways to screen patients for heart disease. Analysis of blood plasma protein biomarkers is a promising technique that may improve risk assessment for heart disease as well as lead to proper treatment and preventative measures. We hypothesize that individuals with known coronary artery disease (CAD) present substantially altered levels of blood plasma protein markers. Three blood plasma proteins were studied in depth; tumor necrosis factor (TNFα) and interleukin 8 (IL8) are inflammatory cytokines and soluble CD40 ligand (sCD40L) is a member of the tumor necrosis factor superfamily. These proteins are all known to be involved in inflammation that contributes to atherosclerotic plaque progression and sCD40L also plays a role in thrombosis. Preliminary studies suggested that there are higher levels of IL8 mRNA present in patients with progressive CAD. A correlation between protein levels and disease state may provide novel markers for CAD risk assessment. Blood plasma samples were collected from 58 patients undergoing clinically indicated positron emission tomography–myocardial perfusion imaging (PET-MPI) at the Heart Center of Niagara Clinical, traditional risk factor, and demographic data were also collected. Protein levels were measured with ELISA and flow-cytometry. Thus far, data of the blood plasma proteins IL8 varied 46.58 fold between patients and there was an 11.36 fold range of values in the sCD40L concentrations. This data will be analyzed via linear regression to identify correlations between these blood proteins and the extent of CAD as a measured by PET-MPI. Further analysis of blood plasma will allow for better screening of patients at risk for heart disease, decreasing the mortality rate due to CAD. (Poster presentation.)

## INVESTIGATING THE ROLE OF HIF-1α in HUMAN EPIDERMAL I KERATINOCYTE DIFFERENTIATION AND STRESS ADAPTION.

Jeannette Bastedo, Andrew-Paul Deeb, and Peter LaCelle, Ph.D., Roberts Wesleyan College, 2301 Westside Drive, Rochester, NY 14624.

The epidermis, the outer portion of the skin, provides the body's critical barrier to water loss and microorganism colonization. The multilayered architecture of the healthy epidermis depends on precise regulation of cell growth, and differentiation. In addition, this organ must cope with environmental stress, particularly ultraviolet light exposure, that can damage DNA and kill cells. All these processes are regulated by coordinated expression of specific sets of genes that control growth, differentiation, cell death, or apoptosis. Growing evidence suggests that Hypoxia-inducible factor-1 α (HIF-1 α) may play an important role in such regulation. HIF-1 α is a member of a family of transcription factors that is becomes active under conditions of hypoxia. The functional HIF-1 is a genetic master switch whose targets include genes promoting glycolytic respiration and angiogenesis. HIF-1 α may also play a role in tumor cell transformation, cell survival within the hypoxic tumor interior, and in vascularization of solid tumors. More recently, we and others have observed an increase in HIF-1 α expression in human epidermal keratinocytes in response to ultraviolet light–induced injury. Others have identified HIF-1 α up-regulation in the outer layers of unstressed epidermis, suggesting a role in keratinocytes differentiation. In order to better understand the impact of HIF-1 α on the control of keratinocyte growth, differentiation, and the response to UV injury, we knocked down expression of, or overexpressed, HIF-1 α in keratinocytes using lentivirus vectors. Initial observations in the immortalized keratinocyte cell line HaCaT and in primary human neonatal keratinocytes confirm the observation that HIF-1 α overexpression triggers apoptosis. HIF-1 α knock-down in HaCaT and in the squamous cell carcinoma cancer cell line SCC-25 enhanced the proliferation rate. Further, the HIF-1 α -deficient HaCaT exhibited a reduced adhesion to the culture substrate. These results suggest that HIF-1 plays an important role in cell-cycle inhibition and in detachment from the basement membrane, that occur as proliferative keratinocytes leave the proliferative basal layer and commit to terminal differentiation. (Poster presentation.)

## USE OF PHOTOINTERPRETATION IN GIS TO DETERMINE THE RELATION BETWEEN LAKE LEVEL AND WETLAND VEGETATION IN ARCADIA MARSH, LAKE MICHIGAN.

John Bateman and Douglas Wilcox, Department of Environmental Science and Biology, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

The International Joint Commission is considering changes in the plan that regulates water levels of Lake Superior. Studies were conducted to assess the potential effects on downstream lakes Michigan and Huron, including sedge/grass-dominated Arcadia Marsh (Manistee County, MI). Photointerpretation of historical aerial images was used to examine the relation between lake level and vegetation over six decades. Delineations of vegetation types were back-tracked based on plant community signatures from 2010 ground-truthed photographs. Results indicate that the percentage of sedge/grass meadow increases during low lake-level periods, with a lag time of about four years for sedge/grass meadow to recover following a high lake level. These results are being incorporated into an environmental assessment model that will guide IJC decision-making. (Poster presentation.)

## THIN FILM DEPOSITION ON SEMI-CONDUCTING SUBSTRATES AND SUPERCONDUCTIVITY ANALYSIS.

Paul Bauch, Andrew Gaul, Dr. H. Trevor Johnson-Steigelman, and Dr. Mohammed Z. Tahar, Department of Physics, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

High purity indium (99.99%) was evaporated and deposited on glass, Si, Ge, and GaAs substrates. Films were grown in a bell jar deposition system with a base pressure of $1x10^{-5}$ torr. Growth was well controlled to 5nm/min by varying current through a tungsten boat to increase the temperature. Some correlation appeared between the indium deposition temperature and crystal size. Thickness analysis using x-ray transmission was done on all depositions using the glass substrates. Film thickness ranged from 100nm to 1100nm. The semi-conducting substrates are used to explore superconducting properties due to interaction of electrons at junction points. Ex-situ post deposition annealing increased the resistivity of the films suggesting increased oxidation. (Oral presentation.)

## CLIMATOLOGY OF LAKE-EFFECT PRECIPITATION IN THE LAKE TAHOE CA/NV REGION.

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The frequency and environmental conditions favorable for lake-effect precipitation over Lake Tahoe, Pyramid Lake, and Honey Lake in northern California and western Nevada were examined for the 14 winters (September-March) from 1996/97 to 2009/10. Weather Surveillance Radar-1988 Doppler (WSR-88D) data from Reno, Nevada (KRGX) were used to identify 64 lake-effect events. Events occurred as 1) well-defined isolated bands that had an extension downwind (BAND events), 2) an isolated region of convective precipitation that persisted over a lake (OLC events), 3) a BAND or OLC event embedded within a widespread region synoptic precipitation (SYNOP events), or 4) an event that transitioned between two event types (TRANS events). OLC events are a unique morphology not previously observed in lake-effect environments. Seventeen OLC events were documented in this study, with OLC events having occurred on both Pyramid Lake and Lake Tahoe. An examination of the characteristics of all 64 lake-effect events provides several findings that are useful for comparison with other lake-effect studies. Lake-effect events occurred most frequently in October with an average of 1.4 lake-effect events per year. This peak in event frequency is notably earlier than that observed for lake-effect in other regions. Events had an average duration of 6.2 hours, about half the duration as compared to observed events on Lake Champlain, the New York State Finger Lakes, or the Great Salt Lake. In general, lake-effect events in the Lake Tahoe region 1) had surface air temperatures below freezing, suggesting frozen precipitation, 2) average wind speeds of 2.1 m/s, notably weaker than in other studies, and 3) an average surface lake—air temperature difference of 9.7°C and an average lake—700-hPa temperature difference of 18.5°C. The climatology of lake-effect precipitation events shows some notable differences in lake-effect event characteristics from previous studies of lake-effect in other regions and

provides a foundation for the subsequent investigation of the connections between mesoscale processes and regional climate variability. (Oral presentation.)

## OLD GROWTH FOREST THREATENED BY INVASIVE PESTS.

Rebecca Bernacki and Dr. Mark Norris, Department of Environmental Science and Biology, The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Currently few old growth forests remain in Western New York and invasive pests threaten those that do remain. American beech (*Fagus grandifolia*) and Eastern Hemlock (*Tsuga canadensis*) are late successional species that are characteristic of old growth forests and both are susceptible to invasive pests. Beech bark disease (BBD) is an insect/fungus complex that kills beech while hemlock mortality is caused by the hemlock woolly adelgid (HWA). In order to determine the potential effects of BBD and HWA on an old growth forest, we surveyed the Gosnell Big Woods Preserve using the point-quarter method to determine current forest composition. Encountered beech were assigned a severity rating. Most beech (67%) show signs of both agents of the disease and have bark that is beginning to crack and canker. To determine species replacement after the loss of beech and hemlock, saplings and seedlings under selected canopy beech and hemlock were surveyed. It was determined that beech and hemlock were first and third respectively in terms of relative density, relative dominance, and importance value in the Preserve. Forest composition will change as a result of the losses associated with BBD and HWA and the vegetative resprouting properties of beech. The density of beech is expected to increase but shift to smaller individuals. The density of other species present in the Preserve, such as sugar maple (*Acer saccharum*), is also expected to increase, while the density of hemlock is expected to decrease. The Preserve is also at risk for invasion by invasive plant species, which are common in the neighboring preserve, because disturbance, such as the one caused by the loss of canopy trees due to invasive pests, often facilitates invasion. (Poster presentation.)

## IDENTIFICATION OF RAD52 PROTEIN ISOFORMS VIA SITE-DIRECTED MUTAGENESIS.

Martin Bontrager and Rey A. Sia, Department of Biology, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Mitochondria are organelles found in eukaryotic cells that generate energy for cellular processes via the production of ATP. Each mitochondrion contains several copies of an independent genome, the stability of which is critical to mitochondrial function. Accumulated mutations in the mitochondrial genome can lead to diabetes mellitus and neuromuscular and age-related disorders. In the lab, mitochondrial genome stability is studied using the budding yeast *Saccharomyces cerevisiae*. *S. cerevisiae* is a facultative anaerobe that can grow in the absence of fully functional mitochondria.

*RAD52* is a nuclear gene found on chromosome XIII of *S. cerevisiae*. Rad52 protein has been shown to play a role in the maintenance of the mitochondrial genome via homologous recombination and double-strand break repair. Western blots suggest that Rad52 exists as several distinct protein species (1). Our work has focused on generating a recombinant DNA construct including wild type *S. cerevisiae RAD52* and *HIS3* as a selective marker. Site-directed mutagenesis was then used to generate mutants of the construct with targeted non-functional start codons. The wt and mutant constructs will be transformed into *RAD52Δ* yeast in preparation for measurements of nuclear and mitochondrial direct repeat -mediated deletions (DRMDs) via homologous recombination reporter constructs. Analysis of DRMD events will allow the characterization of different Rad52 protein isoforms and the identification of those forms which are nuclear-directed and those which are directed to the mitochondria.

Reference: (1) Antunez de Mayolo, et al. *Nucleic Acids Research*, 2006. **34**, 2587-2597. (Poster presentation.)

## DOES *MERCENARIA MERCENARIA* INFLUENCE BENTHIC DENITRIFICATION EFFECTS OF BIVALVES IN DIFFERENT ESTUARINE SEDIMENTS?

Brittany Bourdon and Christy Tyler, 185 Lomb Memorial Drive, Rochester Institute of Technology, Rochester, NY 14623.

The effect of benthic macroinvertebrates on nutrient cycling in estuaries can be a main factor in maintaining ecosystem health. Two different types of sediment, a coarse grain size, low organic matter (less than 0.5%) and a finer grain size with higher organic matter (greater than 2%) were collected from West Falmouth Harbor, Cape Cod, MA in June of 2009 and 2010, respectively. Experimental microcosms were constructed using the collected

sediment. After three weeks of acclimation in flowing seawater tables two *Mercenaria mercenaria* were added to 12 of the microcosms leaving 12 microcosms as controls. After 20 days the microcosms were sampled for: sediment pore water sulfide and ammonium, and fluxes of dissolved oxygen, nitrate, ammonium, total nitrogen, phosphate and total phosphorous. Sediment porosity, organic matter and benthic chlorophyll *a* were also measured. Denitrification rates on the microcosms with clams and without clams were measured using the $^{15}N$ isotope pairing technique (Nielsen 1992).

Fluxes from coarse grained sediments show that clam microcosms had a significantly higher efflux of nitrate from the sediment and an efflux of ammonium greater than control microcosms. Clam activities also significantly decreased porewater sulfide at a depth of 10 cm ($p<0.05$) and lowered pore water ammonium in coarse grained sediments. Benthic oxygen consumption was greater in microcosms with sediment with higher in organic matter than it was in microcosms with lower organic matter due to the different organic contents. Due the effects the clams have had in microcosms with coarse grained sediments we suspect that they will have similar or greater effects in fine grained sediments upon sample analysis. The results of the denitrification measurements will ultimately enable us to determine whether or not the clams also facilitate complete removal of nitrogen from the system, which would slow the process of eutrophication. (Oral presentation.)

## THE GENESIS MANDATE REVISITED.

Lynn Braband, 47 Roslyn Street, Rochester, NY 14619.

The use and management of wildlife and other natural resources are embedded within the cultural history of a society. Frequently, environmental problems have been traced to views purported to have developed from Judeo-Christian ideas of dominating and subduing nature. White (1967) is often cited as being one of the first to articulate this perspective, often referred to as the "Genesis mandate". This paper traces the development of this perspective, and the responses to it. The current range of views on the relationship between Judeo-Christian theology/philosophy and environmental issues will be discussed. (Oral presentation.)

## VARIATION IN THE OVIPOSITION STRATEGIES OF TWO POPULATIONS OF BOG BUCK MOTH.

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The Bog Buck Moth or Cryan's Buck Moth (Lepidoptera: Saturniidae) is found in ten locations worldwide. Six of these populations are found in the fens of Oswego County, NY. The peculiar requirements of this moth have caused disagreements concerning its classification. Morphological and genetic similarities suggest a close relationship with *Hemileuca maia,* but its distinct behavior and ecology, including various adaptations to peatland habitats and the use of *Menyanthes trifoliata* as the larval food plant, suggest that it may be a separate species. Among its distinctive traits is its oviposition behavior. Rather than ovipositing on the larval host plant, as do most Lepidoptera, the bog buck moth oviposits on different wetland plant species. This occurs partly because *M. trifoliate* dies back before the breeding season and therefore its foliage is not present at the time of oviposition. We investigated the oviposition behavior of bog buck moths in two Oswego County peatlands. We found significant differences between the two populations in oviposition preferences. They differed in plant species preference, position on the plant, the size of the egg clusters, the distance from the larval host plant, and rates of egg parasitism. These findings suggest that these two populations, which we have previously found to differ genetically, are micro-adapting to their respective bogs. These data may provide further evidence of a recent divergence from other *Hemileuca maia.* (Oral presentation.)

## BEE GLUE, A PRODUCT FROM THE BEE HIVE, HAS AN ANTAGONISTIC AFFECT ON QUORUM-SENSING REGULATED BIOLUMINESCENCE, GENE TRANSCRIPTION, AND SWARMING MOTILITY.

Zackery Bulman, André Hudson, and Michael Savka, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Bee hive glue, also known as propolis, chemically complex, is collected by bees from local flora and is used to secure their hive. Historically, it has been used by humans to protect against viruses, bacteria, inflammation and

ulcers. The purpose of our study was to examine the effect of propolis on a bacterial gene regulatory mechanism called quorum sensing (QS), typical to Gram-negative bacteria.

QS regulatory activity of six regional samples of propolis was examined using four *N*-acyl-homoserine lactone (AHL)-dependent bacterial biosensors: *E. coli* strains JM109(pSB401), JM109(pSB1075), JM109(pSB536), and *Agrobacterium tumefaciens* A136. These biosensors report bioluminescence with activation by specific exogenous AHLs. When propolis and the cognate AHL were together exposed to the biosensors, the ability of the propolis to antagonize the quorum sensing activity was observed. To measure transcription of genes, reverse transcriptase polymerase chain reaction (RT-PCR) was used with wild type bacteria *Pectobacterium carotovorum* subsp. *carotovorum* after exposure to the propolis. Propolis is able to reduce transcription of genes known to be regulated by the QS mechanism in this organism. *Pseudomonas aeruginosa* (*P. aeruginosa*), an opportunistic pathogen, uses QS to conduct its swarming motility behavior. When propolis is added to the bacteria *P. aeruginosa*, swarming motility is reduced up to 58.5%.

Together this work shows that although complex, propolis contains compounds that exert an antagonistic affect on the QS gene regulatory mechanism in bacteria. In this regard, propolis could be used as an antipathogenic compound and thus valuable to the further development of therapeutics to disrupt QS signaling systems. (Oral presentation.)

## ROLE OF COMMON BENTHIC MACROINVERTEBRATES ON PHOSPHORUS RELEASE FROM EUTROPHIC LAKE SEDIMENTS.

Samuel Burke and Christy Tyler, Program in Environmental Science, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Nutrient pollution in freshwater systems produces detrimental effects on oxygen availability, nutrient cycles and indigenous communities of organisms through the process of eutrophication. Even in the absence of new nutrient inputs, excess nutrients stored in the sediments may be gradually released, continuing to fuel algal growth and holding the system in a eutrophic state. Behavioral traits of some bioturbating aquatic invertebrates may increase sediment oxygenation and advection of solutes from sediments to the water column, thereby enhancing release of stored nutrients to the water column. We hypothesize that as conditions improve, recolonizing organisms will facilitate the release of nutrients to the water column. Microcosms were constructed from sediments harvested from a eutrophic Lake Ontario embayment. Macroinvertebrates, from laboratory cultures (*Lumbriculus variegatus*, *Chironomous tentans*) or a local water body (*Hexagenia* spp.) were added to microcosms individually and in combination. Sediment-water column fluxes of nutrients, sediment chemistry and the growth of the opportunistic green macroalgae *Cladophora* sp., were measured. Sediment oxidation was greatest in the *Hexagenia* treatment at 10cm depth (186mM $NH_4 \pm 48.7$mM $NH_4$) versus the control (285mM $NH_4 \pm 24.3$mM $NH_4$). The growth of *Cladophora* was greatest in the *L. variegatus* treatment (0.36g ± 0.13g) relative to the control (-0.03g ± 0.09g), suggesting that the nutrient availability may be higher in this treatment. The results of these experiments will allow us to better predict the pathway of recovery from eutrophication in near-shore, shallow freshwater ecosystems. (Oral presentation.)

## SOIL TEXTURE INFLUENCES ON PLANT COMMUNITY COMPOSITION AND STRUCTURE IN A SAND AND GRAVEL MINE NEAR DELEVAN, NEW YORK.

Matt Candeias, Department of Biology, SUNY at Buffalo, and Daniel L. Potts, Biology Department, Buffalo State College.

Many active or recently active, open-pit sand and gravel mines are scattered across New York's southern tier. In addition to producing materials for the construction and transportation industries, these operations produce large quantities of non-merchantable silts and clays (pond settlings). The incorporation of pond settlings into mine restoration efforts may be economically attractive, however the influence of pond settlings on early successional plant community composition and structure is unknown. At a sand and gravel mine near Delevan, NY, we measured canopy cover and community diversity on adjacent, 10 x 30 m plots that were established in 2007 and subsequently allowed to be colonized by wind and animal dispersed seeds. Soil in the first plot consisted of fine textured pond settlings while in the second plot the soil was a coarse textured sand and gravel. In each plot, the plant community was sampled with 5, evenly spaced 30-m transects. Canopy cover was greater on the coarse soil than the fine soil (20% and 10% respectively). Similarly, diversity was greater on the coarse soil than on the fine soil (20 species and

13 species respectively). Interestingly, on the fine soil, 61.5% of the species were nonnative whereas on the coarse soil, 45% of the species were nonnative. Desirable natives such as cottonwood (*Populus deltoides*) and warm-season bunchgrasses had greater cover on coarse soil than on fine soil. Our findings suggest that fine-textured pond settlings provide a poor substrate for the establishment of a diverse, early successional community of native species. (Poster presentation.)

## DEVELOPMENT OF A METABONOMIC ASSAY FOR BREAST CANCER BIOMARKERS IN URINE.

Matthew Castaldo, Kevin Cutler, Michael Donahue, Stephen Fuest, Haley McClory, Sarah Roberts, Carolyn Trabert, Julie Hughes, Lawrence M. Mielnicki, Ph.D., and Mary P. McCourt, Ph.D., Department of Biochemistry, Chemistry and Physics, Niagara University, NY 14109.

Current statistics indicate that there is a 1 in 8 chance that a woman born in the United States will develop breast cancer during her lifetime. A successful outcome of the battle with this disease very much depends on early diagnosis and effective treatment choices. Women are therefore advised to have an annual mammogram beginning at age 40, but this procedure is both invasive and time-consuming for the patient. Moreover, the annual visit for a mammogram conjures up all sorts of images, none of which are pleasant. Imagine if the emotional, physical and monetary costs of that experience could be replaced by analysis of an easily obtainable urine sample, providing sufficient information as a primary screen to differentiate healthy from cancerous tissue.

Research shows that cancer cells have a different metabolism than normal cells and some metabolic products can be associated with specific tumors (e.g. choline metabolites and breast tumors). This laboratory is interested in using the power of NMR spectroscopy to identify and follow markers of disease as a tool for early diagnosis and to monitor treatment. The long range goals for the present project are to develop a $^{1}$H NMR spectroscopy based biomarker screen for differentiating healthy breast tissue from diseased breast tissue, identifying breast cancer progression markers, especially for metastatic disease, and ultimately, markers that could be used for the planning and evaluation of treatment.

The working hypothesis for metabolomic biomarker development is that metabolites and metabolite levels reflect the state of the organism and that changes in metabolites over time can be used as a predictor of disease state. Therefore differential disease states can be identified using statistical analysis in combination with various experimental spectroscopy techniques. In the present study urine samples will be analyzed to define breast cancer biomarkers using $^{1}$H NMR spectroscopy and statistical analysis.

As an initial step, the metabolomic analysis of an in vitro model representing the spectrum of breast cancer types and stages in breast cancer development is being utilized to establish a general profile of metabolic differences as well as working parameters for the identification and quantitation of anabolic and catabolic metabolites (e.g. choline biosynthesis and degradation)

Among the cells being analyzed are normal human mammary epithelial cells (HMEC), benign immortalized breast epithelial cells (MCF10A, MCF12A) and breast cancer cell lines (MCF7, MDA-MB-213, HCC1937). In order to meaningfully compare any of these cell populations via metabolic profiling, a set of standardized protocols must be developed. Currently, MDA-MB-231 cells are being used to develop the protocols for metabolite and lipid extractions as well as NMR spectral acquisition. Optimal data processing parameters using Chenomx software and statistical analysis will be determined using the resulting spectra. (Poster presentation.)

## GROWTH OF 3T3-L1 PREADIPOCYTE CULTURES IS FACILITATED BY INCUBATION WITH LOW NANOMOLAR CONCENTRATIONS OF MELANIN-CONCENTRATING HORMONE, BUT NOT A MELANIN-CONCENTRATING HORMONE RECEPTOR 1 ANTAGONIST.

Michael Cerasaro and Laurie Cook, Department of Biology, SUNY, The College at Brockport, SUNY, Brockport, NY 14420.

Many G protein-coupled receptors initiate changes in the cytoskeleton or modulate adhesive properties of cells when activated. Melanin-concentrating hormone (MCH) has been shown to facilitate preadipocyte migration, which has may promote the expansion of adipose tissue. MCH signals appetite control and energy expenditure. A study performed with leptin-deficient mice showed lean, hyperactive mice when the MCH receptor was knocked-out. Contrarily, its over-expression caused obesity and lethargy. The goal of this study was to determine the effect of

MCH on cell number in 3T3-L1 preadipocytes cultures over a long-term treatment time; we hypothesized that there would be a dose dependent increase. Cells were cultured in multi-well cluster dishes containing complete media with nanomolar concentrations of MCH ($K_D$ = ~11 nM), PMC-3881-PI (a MCH receptor 1 antagonist), or both for six days. We used a crystal violet assay to determine the relative density of cells, thus the effect of MCH on cell number for each treatment could be quantitatively assessed by spectrophotometry. In support of our hypothesis, wells treated with 1nM MCH over six days had approximately a 16% greater number of cells ($p<0.02$) when compared to control. Interestingly, wells treated with 100nM MCH had only 3% greater cells ($p<0.05$) suggesting that either mitotic expansion or cell adherence is particularly sensitive to low dose MCH exposure. When the experiment was repeated in the presence of PMC-3881-PI, all MCH-treated wells had 11 to 12% less cells than control ($p<0.001$). Thus, blocking MCH receptor 1 with an antagonist not only abolished the effect, but caused the opposing effect with fewer cells present at the end of treatment. Future directions will be aimed at elucidating whether MCH facilitates cell division or cell adherence, and whether these results can be observed in differentiated as well as undifferentiated 3T3-L1 cells. (Poster presentation.)

## CHARACTERIZATION OF OPEN-IMMATURE-FLOWER PHENOTYPE IN *ARABIDOSIS THALIANA* BY SCANNING ELECTRON MICROSCOPY.

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Scanning electron microscopy (SEM) can reveal fine details of the twelve developmental stages of the immature flower bud in *Arabidopsis thaliana*, as first described in the foundational work of Smyth et. al. SR45 is a splicing factor found in *Arabidopsis*. Recently, an *sr45-1* enhancer mutant was identified by its open immature flowers (OIF). We used SEM to examine in detail the developmental defects of immature flower buds in three double mutant alleles, *sr45-1;oif-1, sr45-1;oif-2* and *sr45-1;oif-ler*, relative to *sr45*-1 and wild type. In stage 9 and later flowers, we observed the malformation of the gynoecium cap, specifically as improperly shaped stigmatic papillae as well as slightly deformed, and pointed anthers in *sr45-1*. Similar phenotypes were seen in all *sr45-1;oif* mutants, with exaggerations particularly noticeable in *sr45-1;oif-ler*. Immature flowers from *sr45-1;oif-1* and *sr45-1;oif-2* also displayed an interesting combination of overgrowth of the gynoecium and over-curvature of sepals as early as stage 5. This resulted in numerous flower buds remaining open from stage 6 until stage 12 when the sepals should have enclosed the developing organs. Thus, the developmental abnormalities of the *sr45-1;oif* mutants provide an insight into the nature of the *open-immature-flower* mutant phenotype. (Poster presentation.)

## PREHISTORIC PITTSFORD: PTERYGOTIDS AND A STYLONURID (PITTSFORD MEMBER, VERNON FORMATION) FROM THE SALINA GROUP OF NEW YORK.

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The black shales of the Pittsford Member have yielded several fascinating—perhaps bizarre—prehistoric animals, preserved as fossils, for over 100 years. While Clifton Sarle (1903) discovered most of the known fauna, new forms (species) continue to be found as the shale is occasionally rediscovered due mostly to new construction activity in the region. No natural outcroppings of the Pittsford shale layers are known.

In addition to the scant pterygotid remains described by Sarle, we now have many additional specimens including a new species that has been designated *Pterygotus? sarlei.*

Finding nearly-whole pterygotid specimens is exceedingly rare. One specimen of *Erettopterus osiliensis* is 20 cm long and preserves most of the animal, except that the carapace was removed to reveal previously unknown ventral structures, i.e., the large coxae that attach to the swimming appendages. The bilobed telson is also present.

A group of spiderlike eurypterids is known as stylonurids—the swimming appendages are replaced with long jointed legs. A single specimen, preserving long legs, is believed to belong to an unknown stylonurid. The rarity of this specimen suggests that it could be another hundred years before we have a chance of finding enough material to describe the species.

See: Ciurca, Samuel J. Jr., Tetlie, O. Erik. 2007. Pterygotids (Chelicerata; Eurypterids) From The Silurian Vernon Formation Of New York. *J. Paleont.* 81(4) pp. 725-736. (Poster presentation.)

## ANALYSIS OF OXIDATIVE STrESS BIOCHEMICAL MARKERS IN CORONARY ARTERY PATIENTS.

Cory Clugston, AnneMarie Laurri, James Gordon IV, and Christopher S. Stoj, Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109.

According to the National Institutes of Health, more than half a million men and women die each year from coronary artery disease (CAD) in the United States making it the leading cause of death for Americans. CAD is caused by the build-up of plaques in the arteries lining the heart, which are themselves formed by the progressive accumulation of macrophages, rich with oxidized lipoproteins, at the atherosclerotic lesion. As plaques mature, blood flow to the heart is restricted resulting in localized ischemia. When the plaque in the vessels becomes compromised, platelets build up causing angina or possibly myocardial infarction. The severity of plaques have been demonstrated to correlate with biochemical indicators of oxidative stress including the presence reactive oxygen species and oxidative damage to a cellular components including proteins, lipids, and nucleic acids. Additionally, the relationship between altered organismal metal ion homeostasis and oxidative stress is well documented in the literature. The purpose of this study is to investigate a possible link between alterations to metal ion responsive blood plasma proteins and coronary artery disease status. (Poster presentation.)

## WHAT IS THE CAUSE OF INTERACTIONAL BEHAVIORS AMONG THE *LYCOSA CAROLINENSIS* WOLF SPIDER?

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Wolf spiders are solitary creatures that prefer to hunt at night using their senses as their guide. Their well developed vision and olfactory senses allows them to not only find the food they need, but also to mate when given the chance. This research looks into the reactions of the *Lycosa carolinensis* wolf spiders when obligated to use their different senses separately or in combination. The three types of experiments that were carried out showed how the spiders individually reacted to contact stimuli, visual stimuli only and olfactory stimuli only and the reactions were observed and recorded. The contact test includes placing the spiders together to see how they interact, the visual test requires the spiders to be in separate dishes and only encounter each other by sight, and the olfactory test requires a piece of paper with another spiders scent to be introduced. All of the reactions are then recorded to determine which stimuli induce which reaction types. The two reaction types specifically looked at were aggressive, which is when the spiders tussle or jump away from each other, and ritualistic, which is a rhythmic tapping of the pedipalps and front legs. The results from this experiment show that this species of wolf spiders require contact with one another to show any ritualistic behaviors, but will react to separate olfactory and visual stimuli aggressively. Like many other species, in spiders, the males and the females play different roles and therefore show different behaviors. (Poster presentation.)

## TEMPORAL COINCIDENCE OF METEORS.

Thomas Dey, ITT Corporation, Geospatial Systems, 2696 Manitou Road, PO Box 60488, Rochester, NY 14624.

The Leonid meteor storm of Nov 17/18, 2001 provided a once-in-a-lifetime display for observers in North America. I recorded the event using ITT Night Vision I3 image intensified video. Statistical analysis confirms that meteors exhibit dramatic temporal coincidence. When you see one you are more likely to see another soon. The data further suggest that loose associations separate well before reaching the atmosphere. (Oral presentation.)

## PHOTOMETRIC THROUGHPUT OF VISUAL-USE ASTRONOMICAL TELESCOPES.

Thomas Dey and Richard Bossert, ITT Corporation, Geospatial Systems, 2696 Manitou Road, PO Box 60488, Rochester, NY 14624.

Many amateur astronomers have returned to their roots and once again enjoy the sky-to-eye experience of visual observing. Yet telescopes can lose as much as 40% of the available light, rendering stars dimmer and nebulae less luminous. We measured the reflectivities and transmittances of telescope mirrors, refractive correctors and

eyepieces in red, green and blue light. Inferred net system throughputs range from 60 to 92%. Measurement results will be presented for numerous commercial eyepieces. (Oral presentation.)

## GASTROINTESTINAL MOTILITY PATTERNS IN FED AND FASTED ZEBRAFISH LARVAE.

Amanda Diamond, Brett Warren, and Adam Rich, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Gastrointestinal (GI) motility is the spontaneous, rhythmic, and coordinated contraction of smooth muscle within the alimentary canal. The zebrafish is a suitable model organism for the human GI tract because it is anatomically and physiologically similar to humans. The objective of our experiments is to compare the GI motility of zebrafish larvae in the fed versus fasted states. This is needed because different research groups rear larvae differently which may contribute to variable results.

Zebrafish were bred and at 5 days post fertilization (dpf) offspring were split into fed and fasted groups. Larvae were fed in the morning (powdered dry food or paramecium). Ammonia levels were checked daily and medium was changed after feeding. Enteric neurons, interstitial cells of Cajal, and smooth muscles cells are developed and at 7 dpf rhythmic propagating contractions are consistently observed in fasted larvae. Larvae were anesthetized, mounted in 1.2% agarose/embryo medium in a polyethylene tube, and lateral images of the GI tract were obtained each second for 10 minutes. Muscular contractions were easily observed in the digital images.

Fasted larvae consistently showed disorganized contractions in the anterior region and propagating contractions (oral to anal) in the mid intestine. Paramecium-fed larvae showed variable GI motility patterns. Three fed larvae were similar to fasted larvae, and three showed weak, infrequent GI motility. The dry-food fed larvae showed infrequent and disorganized GI motility.

These results show that GI motility patterns differ between fed and fasted larvae, and suggest that a standardized protocol is needed. Future experiments will increase sample size to verify these results and will quantify GI motility using spatiotemporal mapping. A standard protocol will be developed. (Poster presentation.)

## CANTHARIDIN ANALOGUES AS POSSIBLE ANTICANCER DRUGS.

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Cantharidin is a naturally occurring molecule that possesses an oxygen atom at the 7-position of a bicyclo[2.2.1]heptane ring system and a carboxylic acid anhydride moiety. It has been known to have antitumor activity for some time; however, it is also know to be extremely toxic. Our goal is to synthesize a number of variations on this structure, especially with respect to the oxygen atom and/or anhydride moiety. We have developed a simple synthesis of these derivatives which employs a Diels-Alder reaction under high pressure. These analogues will be tested for possible anticancer activity. (Poster presentation.)

## EFFECTS OF DIFFERENT DIETS AND RATION ON ENERGY CONTENT AND CONDITION INDICES IN LABORATORY-REARED ALEWIVES (*ALOSA PSEUDOHARENGUS*).

Todd Duval, SUNY Buffalo State College, Biology Department, 1300 Elmwood Avenue, Buffalo NY 14222.

The alewife (*Alosa pseudoharengus*) is a small schooling clupeid found in the Great Lakes. Introduced in the 19$^{th}$ century, the alewife has become an important source of forage for salmonids and walleye in Great Lakes recreational fisheries. For this project, commercially obtained alewives were raised under laboratory conditions using plant and fish oil based diets and two ration levels of 1% or 3% of mean body weight. The fish were separated into 4 replicate tanks of 20 fish per dietary treatment. After 8 weeks, fish were sacrificed and measured for length and weight and condition factor (Fulton's K) was calculated. Samples of 8 female fish per treatment were dissected and hepatosomatic and gonadosomatic indexes were calculated. The samples were then dried at 60°C for 5 days. Water content was calculated from dry and wet weights, and 4 samples from each treatment were measured for bomb calorimetry. Data suggest that Fulton's K is correlated with ration but not diet type; however the fish fed fish oils had higher K than plant oil fish. The difference in percent water between the samples was only significant between the ration levels. Analysis shows that energy content is more strongly correlated with ration level not diet

type. Hepatosomatic indexes were higher for plant oil fed fish, which indicates the possibility that the plant and fish oils are utilized differently. (Poster presentation.)

## DEVELOPMENT AND GENOTYPING OF MICROSATELLITE LOCI FOR EASTERN HELLBENDERS.

Rodney Duvra, Andrea Cifonelli, and Amy McMillan, Department of Biology, Buffalo State College, 1300 Elmwood Ave., Buffalo, NY 14222.

In New York State, the Eastern hellbender, *Cryptobranchus alleganiensis alleganiensis*, has been listed as a species of special concern since 1983. Since the 1800's hellbenders have been well-documented within the Allegheny and Susquehanna River Watersheds. However, recent studies in the Allegheny drainage show a decline in the number of individuals, and a skewed age class distribution biased towards older adults and fewer young. In order to protect this species, factors important in maintaining a sustainable population, such as genetic diversity and population structure, need to be better understood. Microsatellite DNA, genomic regions of short tandem repeats, is one of the best ways to determine population genetic parameters but require development for each species. In this study we successfully amplified DNA from New York hellbenders using two sets of primers identified in the closely related subspecies, *C. a. bishopi*, the Ozark hellbender. These primers were used to genotype 170 samples from animals collected in the Allegheny and Susquehanna drainages of New York and Pennsylvania. One locus yielded three alleles and the other had eight alleles, indicating a high level of genetic variability in the geographic area sampled. We also include additional microsatellite primers we designed from *C. a. alleganiensis* sequence posted on the NCBI database. This work is being done in conjunction with a headstarting program at the Buffalo Zoo that will support reintroduction efforts planned by the NYS DEC. Our data will be useful in assessing genetic parameters, such as parentage patterns and heterozygosity, which are important for establishing new populations. (Poster presentation.)

## GENETIC MAPPING OF THE CHROMOSOMAL LOCATION OF THE *BISEXUAL* GENE.

Rebekah Edgell, Mike Nguyen, and Huey Hing, Department of Biological Sciences, Lennon Hall, Room 204B, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

The field of animal behavior is an active area of research, with debates centering on the relative contributions of genes and the environment. The consensus among researchers today is that genes play a role in controlling behavior. However, many questions remain, including, "What are the genes?" and "How do they exert their effect?" The answers to these questions are largely unknown. A long-term goal of our lab is to understand the cellular and molecular bases of sexual behaviors. We have now discovered a novel *Drosophila* mutant whose males engage in a high frequency of courtship behavior with other males (homosexual courtship). This behavior is unusual because *Drosophila* males normally court females but avoid other males. We provisionally named the mutant *bisexual* (*bsx*). We hypothesized that the behavioral phonotype is caused by a mutation to the *bsx* gene. To test this hypothesis, we attempted to map the location of the *bsx* gene within the *Drosophila* genome. Our preliminary genetic studies showed that the *bsx* gene is located on the second chromosome, supporting our hypothesis. Our successful mapping of the *bsx* gene to the second chromosome is the first step in our characterization of the gene. Our goals in this project are to molecularly characterize the *bsx* gene, elucidate its cellular functions, and eventually decipher how it controls sexual behaviors. Accomplishments of our goals will shed light on the enduring question of how genes control behaviors. (Poster presentation.)

## DEVELOPING EFFECTIVE UNDERGRADUATE RESEARCH EXPERIENCE.

Michael Evans and Carolina Ilie, Department of Physics, 123 A Snygg Hall, SUNY Oswego, Oswego, NY 13126.

Undergraduate research is a valuable educational tool for students pursuing a degree in physics, but these experiences can become problematic and ineffective if not handled properly. Undergraduate research should be planned as an immersive learning experience in which the student has the opportunity to develop his/her skills in accordance with their interests. Effective undergraduate research experiences are marked by clear, measurable objectives and frequent student-professor collaboration. These objectives should reflect the long and short-term goals of the individual undergraduates, with a heightened focus on developing research skills for future use.

doublet on Western blot that collapsed upon treatment with PNGase H or F. Small, agonist-induced upshifts in high-MW MCHR-1 bands suggest phosphorylation occurs. Further experimentation will confirm this. Finally, co-expression of epitope-tagged MCHR-1and ubiquitin constructs were used to demonstrate that the two proteins co-immunoprecipitate with each other. Future experiments will be aimed at determining whether these modifications influence MCH receptor signaling and desensitization. (Oral presentation.)

## A COMPARISON OF TIDAL POOL COMMUNITIES ON SAN SALVADOR ISLAND, BAHAMAS.

Beverly Frissell-Fleig and Karen Steele-Avery, 25 Aberthaw Road, Rochester, NY 14610; and 13 Diem Street, Rochester, NY 14620.

While participating in BIO 182 on San Salvador Island in the Bahamas last year, we examined a tidal pool community in the rocky intertidal black zone at an area on the south end of the island known as The Blowholes. In this tidal pool, located several meters from shore and at least 4 meters above sea level, we observed several different species of gastropods as well as numerous goby fish. We were curious as to how these organisms could survive in and environment so distant from the ocean water source and conditions subjected to temperature changes, evaporation, effects of rainwater, and other environmental variables. Our curiosity led us to proposing and developing an independent research project focusing on tide pool ecology on San Salvador Island. From January 4-16, 2010, we collected data from five tidal pools around the island in attempt to compare their similarities and differences. We identified and documented each species and the number of organisms present in each tidal pool in order to calculate their community similarity. We also recorded GPS location; size and depth of the pools, distance from shore and atmospheric conditions of wind speed, direction, and air temperature. Measurements of pH, dissolved oxygen, and water temperature of each tidal pool as well as the same recordings of the surrounding ocean water were also recorded. A thorough discussion of our project and our results were presented at the Monroe Community College Scholars Day program on April 3, 2010. (Oral presentation.)

## INDIUM THIN FILM GROWTH, CHARACTERIZATION, AND ELECTRICAL ANALYSIS.

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Using vacuum vapor deposition, In films were grown on $SiO_2$, Nb, V, Zn, Al, and In substrates. Growth rate control methods were established, allowing for film thickness in range of 150–1100 nm. Post-deposition annealing of films showed indications of $In_2O_3$ growth, as evidenced by XRD. Film thicknesses were determined using X-ray transmission and micro-crystal size. Conductance and differential conductance measurements performed on indium-indium films (Josephson Junctions) showed electrical behavior of junctions to be ohmic at room temperature. Selected film samples were then prepared for studies of S-I-S and S-I-N junctions at low temperature. (Oral presentation.)

## GENERATION OF A TRANSGENIC ZEBRAFISH FOR THE CONTINUED STUDY OF THE IMPACT OF ENDOCRINE DISRUPTORS ON OOCYTE BIOLOGY.

Megan Gee*, Zachary Mills*, Edward Freeman, and Daryl Hurd, Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618. *Equal contributors.

As human females approach menopause there is an increasing chance of conceiving children with chromosomal anomalies such as too many (e.g. Down Syndrome, trisomy 21) or too few (e.g. Turner Syndrome, monosomy X [XO]) copies of a specific chromosome. The mechanism(s) that underlie this maternal age affect are not currently known. In experimental animals there is no naturally occurring maternal age affect which has made study of the human condition challenging. However, when animals are exposed to chemicals which alter their normal endocrine environment (for example, certain herbicides or pesticides) their reproductive cells can present a phenotype nearly identical to the human maternal age effect. This finding demonstrates that endocrine disruptors can be used as research tools to induce cellular changes in the controlled laboratory setting. We have begun the process of generating a transgenic zebrafish to facilitate our studies on the impact of various endocrine disruptors on oocyte biology. Specifically, we are attempting to construct a meiotic specific tubulin gene fused to green fluorescent protein (GFP). This would allow for direct visualization of the meiotic spindle and determine, following endocrine

disruptor exposure, the impact of the spindle and the impact of endocrine disruptors on meiosis. Thus far, the bacterial artificial chromosome (BAC) containing the gene of interest, *tubb2c*, has been successfully characterized. Transformation of the BAC into electrocompetent SW102 cells was achieved by means of electroporation. A cassette used for selection (*galK)* was prepared with 50 base pair homology arms that correspond to specific sites flanking the *tubb2c* gene. This cassette will be transformed into the SW102 cells, whereby it will incorporate itself into the BAC through means of homologous recombination.

## HOW TO CLOSE THE GENDER GAP IN SCIENCES?

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It is not a surprise that the number of women in sciences, especially in physics, is not impressive, and the reasons are diverse and well-known [1]. However, recently the science departments at SUNY Oswego experienced an increase of women in sciences for students as well as for faculty. Herein we discuss the factors that determined the increase and we inquire what else can be done to close the gender gap in physics and in sciences in general. This insight will hopefully benefit all science departments in which women are underrepresented.

Reference: [1] Rachel Ivie and Katie Stowe, *Women in Physics*, 2000, AIP Publication Number R-430. (Oral presentation.)

## IDENTIFICATION AND CHARACTERIZATION OF L,L-DIAMINOPIEMATE AMINOTRANSFERASE (DAPL) FROM *C. REINHARDTII.*

Irma Girón and André O. Hudson, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

In plants and most bacteria, the essential amino acid lysine is synthesized through the intermediate diaminopimelate (DAP). A new DAP/lysine pathway has been recently discovered through the identification of the novel enzyme; L,L-diaminopimelate aminotransferase (DapL). This enzyme catalyzes the conversion of tetrahydrodipicolinate (THDPA) to L,L-DAP in the anabolic direction of lysine synthesis. The orthologus DapL from algae was analyzed using *in vitro* and *in vivo* assays. The results show that the gene is able to complement the *E. coli dap* mutants and also the enzyme was able to convert THDPA to L,L-DAP and L,L-DAP to THDPA *in vivo.* The 3-dimensional (3D) structure of this enzyme is also of interest since it would be a good tool for the development of pseudo-substrates for enzyme inhibition. This is very important because it has been shown that this is an essential reaction in plants and bacteria. With the help of a collaborator we have obtained a preliminary 3D structure of the enzyme. This analysis confirmed that the enzyme is active as a dimer comprising of two identical monomers. We envision future studies will entail screening the enzyme activity using un-natural substrates to assess if inhibition is possible. Techniques used in this study includes; RNA isolation, cloning of the dapL gene from *C. reinhardtii*, functional complementation using *Escherichia coli dap* mutants and enzyme assays. (Poster presentation.)

## SYNCOPATED CHOPPER PEDAL.

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Standard guitar tremolo pedals vary the volume of a note between loud and soft. Volume variation creates a warbling of the output sound that can be heard on many songs in guitar based music. Tremolo pedals are somewhat limited as volume change can occur only at regular intervals. In addition, the tremolo rate must be adjusted manually to fit the tempo of each song.

MIDI (Musical Instrument Digital Interface) is a computer protocol that allows electronic devices to communicate digitally to each other. The Syncopated Chopper uses a PIC microprocessor to receive MIDI clock signals which are used to modulate the output sound on a wide variety of beat subdivisions (syncopations). The modulation used in the Syncopated Chopper creates a harder chopping sound than a softer tremolo unit. The PIC uses a synchronized MIDI signal from a MIDI clock generator to easily synchronize the rate of chopping with other MIDI devices, eliminating the need for each musician to dial in the tempo for his own device separately. (Poster presentation.)

## OPTIMIZATION OF SINGLE-WALLED CARBON NANOTUBE FILM PERFORMANCE.

Alysha Helenic[1,2], Paul Jarosz[2], and Chris Collison[2,3]; [1]Department of Chemical Engineering, Kate Gleason College of Engineering; [2]Nanopower Research Laboratories; [3]Department of Chemistry, College of Science, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Single-walled carbon nanotubes (SWCNT) films have been shown to be a potential replacement for the indium tin oxide (ITO). These SWCNT films can be applied to flexible plastic substrates without degradation of performance upon bending. unlike ITO. However, SWCNT coated plastic films must exhibit sheet resistances at transparency levels which are competitive with ITO (~100 ohms/square at >90% transparency). Reproducibility in film preparation must also be improved for technological viability. Towards these ends, the thermal purification of SWCNT material was explored as a means to optimize film performance, varying such parameters as temperature, time, and residual mass. These efforts were further informed by thermal gravimetric analysis (TGA). Films were prepared by spray coating dispersions of SWCNTs in 2-propanol with hydroxypropylcellulose polymer. It was found that lower purification temperatures and higher residual masses after thermal oxidation yielded more highly conductive films. It was also observed dispersion of the SWCNTs in dimethylacetamide prior to preparation of the polymer/SWCNT blend leads to greater reproducibility and more conductive films. (Oral presentation.)

## SHEAR-INDUCED VOLUME DECREASE IN RENAL EPITHELIAL CELLS.

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Using microfluidic cell volume sensor we measured the change in the cell volume of Madin-Darby Canine Kidney (MDCK) under the application of shear stress. A successive increase in flow shear stress from 2.0 to 20 dyn/cm$^2$ resulted in volume decrease, reaching a steady state volume approximately 20–30 % smaller than the original volume. Independent experiments based on fluorescence quenching method confirmed the shear-induced volume reduction of MDCK cells. The shear-induced cell shrinkage was an irreversible process. Flow dependent volume decrease cannot be blocked by 75 mM TEA, 100 μM DIDS, and 100 μM $Gd^{3+}$, suggesting that volume reduction is not through $K^+$ and $Cl^-$ channels that typically function during regulatory volume decrease, nor via nonselective stretch-activated channels. The process appears to be independent of $Ca^{2+}$-activated signaling pathways since it does not require $Ca^{2+}$ elevation. In addition, $Na^+$ and $Na^+$-$H^+$ exchanger (NHE) blocker did not eliminate shear-induced cell volume decrease. The origin of volume decrease yet to be determined, but it is likely due to the release of osmolytes other than ions, such as amino acids, nucleotides, proteins, or cell deformation caused by internal pressure. (Oral presentation.)

## CHEMICALLY-MEDIATED ANTIPREDATOR RESPONSES BY LARVAL BLACK FLIES (*SIMULIUM vVITTATUM* s. s.) DURING FIELD TRIALS.

Amanda Hiers, Christian Curran, Hannah Gardner, Johanna Hummelman, and Aaron Sullivan, Houghton College, One Willard Avenue, Houghton, NY 14744.

Our goals in this study were to characterize the behavioral responses of individual *Simulium vittatum* s. s. to chemical stimuli associated with predation and to monitor diel changes in antipredator behavior. We exposed individual larvae to one of five chemical treatments during daytime (1500 h) and nighttime (2300 h) trials: distilled water, injured earthworms (*Lumbricus sp.*), injured conspecifics (*S. vittatum*), uninjured predator (*Corydalus sp.*), and combination of injured conspecifics and predator chemicals. The results of both sets of trials indicate that the behavior exhibited by larval black flies is not homogenous with respect to the chemical stimulus to which they are exposed. The frequency of larvae that engage in 'curling' behavior is greater than expected when larvae are exposed to chemical stimuli from injured conspecifics, predators, and the combination stimulus. In addition, a greater frequency of larvae drifts in response to the combined conspecific and predator stimuli. Lastly, our data suggest that larvae are more likely to drift at night but only if exposed to the chemical stimuli associated with predation. These results suggest that larvae are capable of detecting and responding to chemical stimuli from injured conspecifics and invertebrate predators and that their responses exhibit diel periodicity. (Poster presentation.)

## RESOURCE ALLOCATION AND CANOPY ARCHITECTURE FACILITATE THE INVASION OF THE NONNATIVE WETLAND PLANT, *PHRAGMITES AUSTRALIS.*

John Hirtreiter and Daniel Potts, Biology Department, Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY, 14222.

*Phragmites australis* (common reed), a nonnative species, is currently displacing *Typha latifolia* (narrow leaved cattail) in the wetlands of Tifft Nature Preserve near Buffalo, NY. Because light is often a limiting resource for wetland plants, we hypothesized that species' contrasts in canopy architecture, photosynthetic capacity, and leaf nitrogen allocation could provide a mechanism for the invasion of *Phragmites* into this formerly *Typha* dominated ecosystem. We measured canopy profiles of photosynthetically active radiation (PAR), maximum rates of photosynthesis ($A_{MAX}$), and leaf nitrogen concentration (%N) for both species in mixed and monospecific stands. Compared to stands of *Typha*, light does not penetrate as deeply into stands of *Phragmites*. In mixed and monospecific stands of *Phragmites*, $A_{MAX}$ and %N were consistent along a gradient of height and light availability, whereas in *Typha* $A_{MAX}$ and %N were greater in sun leaves than in shade leaves. These results suggest that the photosynthetic capacity of *Phragmites* shade leaves, along with increased light penetration in *Typha* canopies, may contribute to the ability of *Phragmites* to invade *Typha* dominated stands. Because *Typha* shade leaves have low photosynthetic capacity and less light is available in *Phragmites* canopies, *Typha* is less likely to invade stands of *Phragmites*. By influencing resource availability and uptake, canopy architecture and patterns of plant resource allocation combine to influence competitive outcomes between *Phragmites* and *Typha*. Barring a disturbance or herbivore-mediated shift in this competitive interaction, we expect to see the continued displacement of *Typha latifolia* by *Phragmites australis*. (Poster presentation.)

## IS THE IONIC LIQUID 1-ETHYL-3-METHYLIMIDAZOLIUM METHANESULFONATE CAPABLE OF RIGIDLY BINDING WATER?

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The binary system of water and the ionic liquid 1-ethyl-3-methylimidazolium methanesulfonate, [emim][$MeSO_3$], was carefully studied with the initial hypothesis that water might be tightly bound to the ionic liquid up to water mole fractions of 0.5. which would explain why water has been observed to seemingly be deactivated for interfering with water sensitive chemical reactions. Measurement results as a function of composition and temperature were obtained for heat capacity, heats of dissolution, density, viscosity, conductivity, as well as NMR measurements on diffusion, proton chemical shift and $T_1$ relaxation times of cation, anion and water. The combined results do not confirm our initial hypothesis. Rather, we found that the ionic liquid medium remains highly structured even when loaded with water to very high mole fractions. The main structural motif is hypothesized to contain nonpolar domains in close resemblance to micellar aggregation. Thus, the deactivation of the water in chemical reactions may rather be explained by a highly structured ionic liquid framework keeping water physically separated from the reactant. (Oral presentation.)

## NATURAL VARIATION IN AGING—STUDYING LONGEVITY GENES IN *CAEORHABDITIS ELEGANS.*

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Aging research in humans is difficult. *Caenorhabditis elegans* provides a unique tool to better understand aging mechanisms, owing to the fact that *C. elegans* live for about 2~3 weeks at 20°C, they have a fast generation time (3~4 days), and can be easily maintained on an agar plate with *Escherichia coli*. Because more than 99% of the worms are hermaphrodites, producing homozygotes can be easily achieved. Additionally, aging *C. elegans* shares many similarities with human aging. Previous work suggested that a natural polymorphism in a region on chromosome IV is associated with longevity, and that the Hawaiian version of this region confers reduced lifespan relative to Bristol (Kleemann, Kruglyak, and Murphy, unpublished). Recombinant inbred lines (RILs) and Near

Isogenic Lines (NILs) were used to identify loci where allelic variation contributes to longevity differences. In this study we are using NIL152, since it has significantly shorter lifespan compared to wild type Bristol (Kleemann, Kruglyak and Murphy, unpublished). Our goal is to determine which longevity-linked locus is dominant for lifespan by creating heterozygotes and measuring lifespans. Also, we want to identify the causal gene in the longevity linked region by using RNAi to knock down each of 42 candidate genes and test their individual effect on lifespans. (Poster presentation.)

## HABITAT SELECTION AND DISPERSAL OF THE COBBLESTONE TIGER BEETLE (*CICINDELA MARGINIPENNIS* DEJEAN) ALONG THE GENESEE RIVER, NEW YORK.

Rhonda Hudgins[1], Christopher Norment[1], Matthew Schlesinger[2], Paul Novak[3], [1]Department of Environmental Science and Biology, SUNY, The College at Brockport, Brockport, NY 14420; [2]New York Natural Heritage Program, 625 Broadway, 5th Floor, Albany, 12233; and [3]New York State Department of Environmental Conservation, 1130 North Westcott Road, Schenectady, 12306.

The goal of this study was to determine ecological, behavioral and environmental factors that would facilitate a management plan for the rare cobblestone tiger beetle (*Cicindela marginipennis*). We used a mark-recapture study to document dispersal distances of the cobblestone tiger beetle along the upper Genesee River in western New York and binomial logistic regression models to compare habitat characteristics measured during occupancy surveys. Cobblestone tiger beetles occupied cobble bars with approximately twice the interior area and difference between minimum and maximum elevation, and higher shrub cover, than unoccupied cobble bars. Beetles occasionally dispersed distances greater than the maximum distance between cobble bars in our study area. In order to preserve cobblestone tiger beetles and riparian habitats along the upper Genesee River, habitats should be managed to reduce impacts from recreational activities and sand/gravel mining. (Oral presentation.)

## SURVEY OF VARIOUS MICROBIAL POPULATIONS ON THE LABRAL FAN OF THE LARVAL BLACK FLY *SIMULIUM VITTATUM*.

Johanna Hummelman, Hannah Gardner, and Jamie L. Potter, PhD., Dept. of Biology, Houghton College, 1 Willard Ave, Houghton, NY 14744.

The *Simulium* sp. (black fly) is known to be a common vector for several diseases that can infect birds, animals, and humans including River Blindness. This disease is found throughout Africa and Latin America, but it is rarely found within North America even though the black fly vector is present here and the climate is supportive. Competition for food and habitat may have a role in the absence of pathogenic species. This hypothesis led us to identify and quantify common microbes found on the feeding apparatus and within the intestines of the *Simulium* larva.

This research quantified the microbial populations within four different aggregates of *Simulium* inhabiting Seymour creek located in Houghton, NY. Using basic microbial lab techniques, thirteen different types of bacteria were found colonizing the labral fans and the intestinal tract. Six common bacteria were identified from all of the aggregates. Of these, five were Gram positive, and one was Gram negative. One fungus was also present in two of the aggregates. Genus and species of these organisms is not yet known, but genetic and molecular tests are still being performed for identification by genus. *Simulium* parasitic nematodes are unable to be cultured in the laboratory; genetic testing was necessary to test for their presence. Based upon the primary literature, the larvae were tested for five nematodes including *M. camdenensis, G. viridis, I. wisconsinensis, M. flumenalis, and O. volvulus*. From this work, we were able to identify a larval population that had a possible *M. camdenensis* colonization. No *O. volvulus* was found, the causative agent of River Blindness. Future work will include further classification of the bacteria and fungi using both genetic and molecular tests. Also, the DNA products will be sequenced to confirm identification, and the sample size will be increased to understand the dynamics of the larvae over time and location.

The information collected will aid researchers in their understanding of the microbial populations within *Simulium* sp. larval black fly in North America, and will provide information about the colonization and migration of medically important pathogens in the local population. (Poster presentation.)

## USING SURFACTANTS AS A MEDIUM IN CHEMISTRY AND OBSERVING THE BEHAVIOR OF D-LIMONENE IN SURFACTANT MIXTURES.

Khalil Jones and Markus Hoffmann, Department of Chemistry, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Interactions between surfactants and fragrant molecules are important to understand the stability of chemicals that are used every day such as detergents. Ionic, zwitter-ionic, and non-ionic surfactants were studied as mixed surfactants in a total of four investigated mixtures. Diethylene glycol butyl ether was also included in two of the mixtures as a typical additive to increase solubility. To observe the behavior of surfactant mixtures with fragrant molecules, D-limonene was studied, which is used as a renewable fragrant molecule in cleaning products. With the use of nuclear magnetic resonance, we could measure diffusion and $T_1/T_2$ relaxation time constants. The aggregate radii of the surfactant mixtures were determined from the diffusion and additional viscosity data. Combined these data show that D-limonene is part of the aggregate structure and that temperature and mixture composition have large effects on the aggregation structures. Overall, our findings further the understanding of interactions in aqueous solutions between surfactants and typical fragrant molecules. (Poster presentation.)

## UNDERSTANDING BIOLOGY STUDENT LEARNING PREFERENCES, IMPLICATIONS FOR TEACHING.

Martin Kelly, Department of Mathematics & Natural Sciences, D'Youville College, Buffalo, NY 14201.

Though the Index of Learning Styles (ILS) generates reliable data and its ability to evaluate learning preference has been validated, the ILS has had very limited application in undergraduate biology education. In an introductory biology laboratory, 63 students completed the ILS. The intent was to promote awareness for each student about their learning preferences and how to structure their study materials and activities to better fit their profile. With a class set of learning preferences, I gained insight into how to modify my teaching to better support learning. A typical student is active in their preference for processing information, sensing in their preference for perceiving information, visual in their preference for how information is presented, and sequential in understanding information. Overall academic performance was associated with a student's learning preference; as student preference to perceive information intuitively increased, student lab grades tended to decrease. Student preference in processing information is correlated with the student preference in how that information is presented. I can promote learning not only through the visual presentation of information, but also a student's tendency to be active learners. In addition, student preference in perception of information is very strongly correlated with the student's preference in understanding that information. I can promote greater learning in intuitive students by creating more opportunities to understand information globally. I encourage faculty to have their students complete the ILS. Instructors can make modest changes in their teaching to promote greater learning for students in the same class with contrasting preferences. (Oral presentation.)

## PROPERTIES OF GASEOUS HYDROGEN EXPERIMENT FOR A NEW UNDERGRADUATE "CLEAN ENERGY: HYDROGEN/FUEL CELLS" LABORATORY COURSE.

Ameya Khot, Lea Rubin, Jun Young, Tom Allston, and Gerald Takacs, Department of Chemistry, Center for Materials Science & Engineering, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

International interest in both renewable energies and reduction in emission levels has placed increasing attention on a number of electrochemical devices, such as, hydrogen-based fuel cells. Hence, there is a critical need for workforce preparation in clean energy technologies.

A new undergraduate laboratory course entitled "Clean Energy: Hydrogen/Fuel Cells" is being developed at RIT together with the current "Introduction to Hydrogen Technology" lecture course which uses the textbook of the same title [1]. One of the experiments in the laboratory course is "Properties of Gaseous Hydrogen". A fabricated pyrex trap, containing pressure and temperature sensors and a plunger in a syringe to alter the volume, is attached to a vacuum line for filling with hydrogen. Results will be presented for pressure and temperature measurements when the volume is changed.

Reference: [1] R. J. Press, K.S.V. Santhanam, M. J., Miri, A. V. Bailey and G.A. Takacs, "Introduction to Hydrogen Technology", John Wiley & Sons, Inc., Hoboken, New Jersey (2008).

The authors gratefully acknowledge financial support from a New York State Energy Research and Development Authority "Clean Energy Technology Training, Accreditation and Certification" grant. (Poster presentation.)

## THE EXPRESSION AND PURIFICATION OF FBPA IN *H. INFLUENZA*.

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All organisms require metal ions in order to perform vital biological processes such as respiration, transcription, and translation. However, the processes of uptake, distribution, and mobilization of metal ions, including iron and copper, are tightly regulated within the organism. Specifically, bacteria have adopted several different strategies to acquire, store, transfer, and employ iron for various cellular functions. Delocalization of iron could cause the formation of reactive oxygen species, including superoxides and hydroxyl radicals, leading to cellular dysfunction and ultimately cell death. The ferric ion binding protein (FbpA) is one such protein that lies within the bacterial periplasmic space and is involved with the internalization of iron. In this study, a histidine tagged version of FbpA was cloned from *Haemophilus influenza* into *E. coli* and over-expressed via IPTG induction. FpbA was then purified using metal ion affinity chromatography and assessed for purity by SDS-PAGE. Current studies involve analyzing iron binding and evaluating metal ion specificity. (Poster presentation.)

## ROLE OF CLU1P IN MITOCHONDRIAL GENOME STABILITY AND MORPHOLOGY IN BUDDING YEAST.

Luke Krembs, Laura Sudol, Jacqueline Walker, Lisa Dishaw, and Rey A. Sia, Department of Biology, SUNY, The College at Brockport, Brockport, NY 14420.

The mitochondrion is widely known to be the site of cellular respiration and the factory of cellular energy. Similar to the nucleus, mitochondria house genetic material (mtDNA), which is responsible for the production of proteins essential to mechanisms required for cellular respiration. Furthermore, if there is a mutation or deletion in the mtDNA there can be ramifications in terms of energy production, which will hinder cell viability. Additionally, mutations in the mtDNA are associated with certain neuromuscular diseases as well as contributing to the aging process.

Our studies utilized the budding yeast, *Saccharomyces cerevisiae*, as our model organism. Budding yeast is an excellent model organism for these studies due to its ability to produce energy via fermentation in the absence of respiration.

It is known that mtDNA, similar to nuclear DNA, requires proteins that are responsible for its maintenance. In an effort to study the mechanisms used by the mitochondria to maintain its genome, the role of the nuclear encoded *CLU1* gene was examined. The product of the *CLU1* gene, Clu1p, was previously found to be required for proper mitochondrial morphology and distribution (1). Our data from genetic assays indicate that loss of the Clu1p protein exhibits a mild effect on the stability of the mitochondrial genome. This leads us to conclude that altered mitochondrial morphology may not affect mitochondrial genome stability.

Reference: (1). Fields S.D., Conrad M.N., Clark M. (1998) J. of Cell Sci. 111 (Pt 12):1717-27. (Poster presentation.)

## DESIGNING AND BUILDING A MIDI LASER HARP.

Michael Lanighan, Michael Heilemann, Rich Lunghino, Robert Makin, and H. David Sheets, Physics Dept., Canisius College, 2001 Main St., Buffalo, NY 14208.

Mice, typewriter and piano keyboards and touch screens have long been standard controllers in human-computer interaction, both in everyday and artistic uses. As a result of research building electronic controllers and sensors for music and art using MIDI (Musical Instrument Digital Interface, a communications protocol) and PIC microcontrollers (single chip computers), it was realized that using the MIDI communication protocol, a visually pleasing, alternative controller could be built with lasers, a laser harp.

A PIC 16F877 microcontroller monitors cadmium sulfide sensors which detect laser beams mounted in a harp-like frame. A musician "plucks" the laser beams, momentarily blocking the beam from the sensor. The interruptions are detected by the PIC, and software in C analyzes the different inputs and sends MIDI signals corresponding to the

correct note value of the "string" that is plucked. Since the system is software controlled, alternate tuning systems may be readily implemented. This visually appealing, alternate controller can introduce and excite students about the possibility of musical electronics. (Poster presentation.)

## INTERGALACTIC MGII ABSORBERS IN THE SLOAN DIGITAL SKY SURVEY.

LeighAnn Larkin and Jacob Beyer, Department of Physics, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Absorption lines observed in quasar spectra provide a way to study the evolution of gas and galaxies that is independent of imaging techniques. In this contribution, we describe our efforts to identify and catalog quasar absorption lines due to singly ionized magnesium (MgII) atoms. Magnesium is produced during nucleosynthesis in massive stars, and enriches the gas of a galaxy when it is ejected in supernova explosions. MgII is an indicator of low ionization and neutral gas, and is therefore an excellent tracer of galaxies. In an ongoing program, we are searching the quasar spectra in the Sloan Digital Sky Survey (SDSS) for MgII absorbers. This summer, we searched over 30,000 spectra for MgII candidates and measured the strengths and redshifts of ~15,000 systems. Our results will become part of an online database of MgII absorbers made available to researchers for the purpose of studying the evolution of our Universe over the last 10 billion years. (Poster presentation.)

## HIGH SCHOOL CHEMISTRY EXPERIMENTS FOR HOME-SCHOOLED STUDENTS.

Felicia Lenzo and Andrew Robak, Department of Natural Sciences, Keuka College, 141 Central Ave., Keuka Park NY, 14478.

The purpose of this project is to develop a series of experiments for home-schooled students at the high school level. The experiments would demonstrate a variety of chemical principles and techniques that a student would normally learn in the classroom. These labs will allow the student to learn chemistry on their own with these easy to follow labs. These projects do not require specialty chemicals, kits or equipment. Everything needed to do the experiments can be found in most households or can be purchased at the grocery or hardware store. Within each lab there is listed a purpose, background information, materials, procedure and a question/answer section. The difficulty is trying to creatively construct a lab that uses only household items or materials you could purchase from the grocery or hardware store. Currently I have completed two experiments in this project—an electrochemistry lab involving pennies and a freezing point depression lab using road salt. The current topic is to create a chromatography lab where students can make their own chromatography paper and learn how dye molecules travel differently within a specific environment and to determine the composition of a mixed solution. During the process of creating this lab, I will determine the best at-home chromatography paper and what household liquid can be used as a solvent. (Oral presentation.)

## PHOTON-GRAVITON DUALITY.

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Gravitons are predicted by theory to be the carriers of 'pure' gravity, to be bosons, propagate at the speed of light, and to be quantized. The current theory of quantum gravity has thus far failed to provide a solution to the proposed quantization of gravity. Gravitons also have thus far eluded experimental detection. Thus, a novel approach is proposed to solve these enigmas.

Einstein predicted from the theory of relativity and the speed of light of photons, that photons are carrying twice the gravitational charge relative to mass-particles of equal energy. This prediction was experimentally confirmed through studying light deflection by the Sun. This observation leads to the conclusion that photons, by carrying gravity, double as gravitons. Photons share other suggested properties of gravitons, e.g., they carry gravity, are bosons, and propagate at the speed of light and are quantized.

Application of standard physical science results in the prediction that the specific gravity, $g_p$ of the photon-graviton, is quantized and equal to $2.0 g_m h\nu / c^2$ (and its equivalent $2.0 g_m h / c\lambda$). Here $g_m$ is the specific mass gravity and is equal to $G^{1/2}$, where G is the universal gravity constant, h Planck's constant, c the speed of light, $\nu$ the photon frequency, and $\lambda$ the photon wavelength. As a practical conclusion, gravity may be studied in the laboratory by

controlling photon gravity using optical concepts. Equations for photon-mass and photon-photon gravitational interaction were derived.

During the radiative conversion of mass (no speed) to photons (at the speed of light) in stellar systems, the gravity per energy unit is doubled. This effect is referred to as relativistic gravity doubling (RGD). RGD and the irreversible capture of photons in black holes provide the driving force for the reconstitution of the Universe. Further, this model leads to the understanding that photons have the property of theoretical dark matter. Like the theoretical, but not verified, dark matter, photons carry gravity and do not reflect light. (Oral presentation.)

## MIDI CLOCK GENERATOR.

Rich Lunghino, Mike Heilemann, Robert Makin, and Mike Lanighan, Department of Physics, Canisius College, 2001 Main Street, Buffalo, NY 14208.

Electronic music software often utilizes a timing feature in order to keep various loops and sounds in synchronization with one another. However, the timing messages are often not utilized outside of the computer itself and they may slow the computer by adding another task to execute. An external clock source is able not only to give the computer a specific tempo to sync its software to, but also can transmit this information to other musical devices through MIDI. This allows for artistic creativity for disc jockeys, video jockeys, and experimental musicians, giving them the ability to synchronize their music samples with other forms of media that are controlled by the external clock signal.

We built a MIDI Clock Generator that sends out a MIDI clock timing message 24 times per quarter note. The messages themselves are generated by a PIC microprocessor that utilizes information from a "tap-tempo" button to set this MIDI clock. The generator unit features three MIDI-Out ports that gives it the ability to interface with multiple devices. Half-Time and Double-Time buttons, as well as Increase and Decrease buttons, alter the tempo after it has been set. An LED indicates the tempo's rate. (Poster presentation.)

## DESIGN OF A MIDI SENSOR SYSTEM FOR AN INTERACTIVE ART DISPLAY.

Robert Makin, Mike Lanighan, Rich Lunghino, and Mike Heilemann, Physics Department, Canisius College, 2001 Main St., Buffalo, NY 14208.

The purpose of this project was to design and construct a PIC microprocessor-based sensor system that would allow an interactive art exhibit to adjust according to a viewer's position within the display. The design developed utilizes multiple pyroelectric sensors to monitor visitors' presence and location, and MIDI protocol to communicate this information to computer controlling the exhibit. The PIC monitors the sensors and sends out the corresponding MIDI message to the computer controlling the video displays when a sensor is tripped. Initially one sensor was designed and built for a prototype system. The prototype revealed some constraints of our constructed sensor, mainly that the range of the sensor could not easily be adjusted and that the housing was difficult to mount and align in the art display. Commercial pyroelectric sensors were modified to communicate with a custom PIC system. In the final system two of these modified commercial sensors were positioned to monitor viewer presence around two podiums in the art display. The system is currently operating in an art display at the Burchfield Penny Art Gallery. (Poster presentation.)

## DIPOLAR MOLECULES INTERACTION WITH DIPOLAR POLYMER FILMS.

Gregory Maslak[1], Mark Stewart[1], Lillie Ghobrial[1], Michael Evans[1], Luis Rosa[2,3], P.A. Dowben[2], and Carolina Ilie[1]; [1]Department of Physics, 123 Snygg Hall, SUNY at Oswego, Oswego, NY 13126; [2]Department of Physics and Astronomy, Jorgensen Hall 310L, University of Nebraska at Lincoln, Lincoln, NE; [3]Department of Physics and Electronics, CUH Postal Station, 100 Road 908, Humacao, Puerto Rico 00791.

We discuss herein the interaction of dipolar molecules (with focus on water) with three different polymers: the ferroelectric copolymer polyvinylidene fluoride with 30% of trifluoroethylene P(VDF–TrFE 70:30), the dipole oriented polymer poly(methylvinylidene cyanide) PMVC [1,2], and PMMA, poly(methyl methacrylate). PMMA is extensively used as a photoresist in photolithography. Our goal is to investigate if the water is adsorbed / absorbed on the photoresist, affecting the dimensions of the masks and therefore the quality of the device. Preliminary study of water absorption of photoresist polymer PMMA poly(methyl methacrylate) is presented. The theoretical

calculations of the unoccupied electron states are done using Hyperchem package, parametric method 3—neglecting differential overlap—PM3 NDO method. Previous studies of water absorption on P(VDF-TrFE) and PMVC proved that water adsorption leads to swelling and disorder within the (co)polymer chains and the water dipole interacts with the polymer films.

References:

[1] P.A. Dowben, J. Xiao, C.C. Ilie, L.G. Rosa, "Adsorbate/ absorbate interactions with organic ferroelectric polymers", *Journal of Electron Spectroscopy and Related Phenomena*, 174 (2009) 10-21.

[2] P.A. Dowben, L.G. Rosa, Carolina C. Ilie, "Water Interactions with Crystalline Polymers with Large Dipoles", *Z.Phys. Chem.* 222 (2008), 755-778. (Poster presentation.)

## USE OF MICROALGAE TO CLEAN WASTEWATER AND PRODUCE ALGAL BIOMASS FOR BIODIESEL PRODUCTION.

Nivetida Mathanagopalan[1], Emily Young[3], Eric Lannan[2], Dr. Ali Ogut[2], and Dr. Jeff Lodge[1]; [1]Department of Biological Sciences, [2]Department of Mechanical Engineering, and [3]Department of Chemistry, Rochester Institute of Technology, Bldg.75-CBET, 153 Lomb Memorial Drive, Rochester, NY 14623.

Numerous microalgae have been shown to produce a high lipid content which can be extracted and converted to biodiesel fuel which can be used directly in today's diesel engines. Coupled to the production of microalgal biomass is the use of the microalgae to clean wastewater which is serving as an inexpensive and nutrient-rich growth medium for the microalgae. In our lab we have focused on the treatment of wastewater and subsequent lipid extraction and conversion to biodiesel fuel utilizing three microalgae strains, *Chlorella vulgaris*, *Scenedesmus obliquus*, and *Chlamydomonas reinhardtii*. Initial experiments show that wastewater is an ideal growth medium for all three strains of microalgae. All three microalgae strains are able to reduce the level of ammonia, nitrate, and phosphate by 97%, 79%, and 99% respectively in as little as three days when using wastewater from the primary clarifier from the Frank E. Van Lare WWTP, Irondequoit, NY. Similar results are seen with all three microalgae strains when the wastewater comes from the primary clarifier at the Northwest Quadrant WWTP, Greece, NY. The rate of nutrient removal is much greater and much faster when wastewater is inoculated with one of our three strains than uninoculated wastewater subjected to similar fermentation conditions. There is a significant decrease in total and fecal coliforms with microalgal-treated wastewater than untreated controls. Microalgae can be harvested most efficiently by centrifugation and then dried at 37 C before lipid extraction. Hexane extraction of lipids followed by transesterification of the lipids using methanol and sulfuric acid (catalyst) leads to the production of fatty acid methyl esters (FAME) or biodiesel. Future experiments include the scale up of the process to 100-gallon tanks both indoors and outdoors to optimize algae growth and biodiesel production and further optimization of the extraction and transesterification of the algal lipids. (Poster presentation.)

## DEVELOPMENT OF BIOMARKERS FOR CORONARY ARTERY DISEASE.

Haley McClory, Julie Hughes, Lawrence Mielnicki, PhD., and Mary McCourt, PhD., 102 DePaul Hall, Niagara University, NY 14109.

The prevalence of coronary artery disease (CAD) in the developed world has caused an increase in the technologies used to diagnose and treat this debilitating disease, primarily in the symptomatic population. These techniques, which usually consist of invasive and sometimes painful procedures, have led us to consider metabonomics as a way of diagnosing CAD. Metabonomics is the study of the different metabolites and their concentrations in the body and is specific to the cellular processes that are carried out throughout the body. Using this metabonomic analysis could not only eliminate these procedures but it also has the potential to identify people at increased risk for its development. 26 blood plasma samples were obtained from Niagara Falls Memorial Medical Center from patients, both male and female, with at least one detectable risk factor of CAD. Samples were classified into two systematic groups, high risk and low risk that were then analyzed using tests NOESY, that allows for the observation of small molecules and Cpmg, which was used for protein analysis. The resulting spectral data was processed using manual and automatic processes of linebroadening, phasing and baseline correction with a Chenomx software package (6.0 Professional Edition). This software program not only allows for metabolite identification but also spectral binning. Spectral binning is the sub dividing of spectral data into specific sized regions (bins) which define manageable spectral areas more readily amenable to principal component analysis. This

statistical analysis is produced by Umetrics statistical software called SIMCA P+. This program will then be used to further identify the statistically significant parts of the spectra to determine data correlations.

By applying the aforementioned method with the plasma samples it is conceivable to differentiate between the high risk and low risk patients by utilizing the metabolites found in theses samples to identifying novel markers or the emergence of distinctive variations in concentrations of known markers. As a preliminary experiment this could add support for the utility of NMR for diagnosis and determination of disease state; leading to more effective diagnosis of the early stages of disease, better interventions and perhaps even reversal of the disease process. (Poster presentation.)

## NEW YORK BALD EAGLE GENETIC ANALYSIS.

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The New York State population of the American Bald Eagle, *Haliaeetus leucocephalus*, was nearly extirpated in the first half of the twentieth century as a result of habitat destruction and the bioaccumulation of pesticides, such as DDT. By the 1970s there was a single breeding pair of eagles in New York. The Department of Environmental Conservation initiated a conservation plan to rebuild the eagle population by introducing young eaglets taken from nests in Alaska. Since this program in the late 1970s and early '80s the eagle population of New York has rebounded to more than 100 nesting pairs. We were interested in determining whether the current nesting eagles in New York were likely to have originated from those that were released during this repopulation program or instead were more closely related to birds from other places in New England. First we used a PCR-based molecular method to sex juvenile eagles collected from various areas since they are monomorphic and we had interest in the distribution of male and female juvenile eagles. We then genotyped these eagles using five polymorphic microsatellite loci and combined our data with previously collected genotypes. Results will be presented that compare allele and genotype frequencies of eagles from Alaska, Maine, and New York. (Poster presentation.)

## ISOLATION AND SOCIAL NETWORKING IN AGING JAPANESE SETTINGS: MIXI AND THE NORTH COAST OF HONSHU.

Emika Mizuno, Department of Geography, SUNY College at Geneseo, 1 College Circle, Geneseo NY 14454.

Mixi is easily the leading social networking site in Japan, embracing approximately one fifth of the country's population. Prior research by Tamae Yamaguchi in 2008 showed the degree to which Mixi participation was then sensitive to facets of Japan's metropolitan settings, with much lower adaption rates in more rural and geographically isolated prefectures. Among the latter Akita, Shimane and several other north coast Honshu settings combine relative isolation, economic stress, stagnant population, exceptionally high median age, and limited social networking participation. My paper explores Mixi age- and gender-specific adaption rates in six coastal prefectures with different levels of proximity to Osaka- Kobe- Kyoto agglomeration via the Kansai gap. Mixi adaption rates remain strikingly low for adults over 40, and among youngest registrants made participation exceeds of females. Rates do tend to be higher in the less remote coastal settings. In cyber spatial terms the Japanese "playing field" is decidedly uneven and, so far at least, virtual access is no panacea for geographic isolation. (Oral presentation.)

## MELANIN-CONCENTRATING HORMONE RECEPTOR 1 INTERNALIZATION IS FACILITATED BY RECRUITMENT, BUT NOT CO-INTERNALIZATION, OF β-ARRESTIN 2.

Jay Moden, Katrina Haude, and Laurie Cook, Department of Biology, The College at Brockport, SUNY, Brockport, NY 14420.

Melanin-concentrating hormone (MCH) plays a role in appetite control and energy expenditure, suggesting it may assist in regulating the response to food intake. MCH binds the G protein-coupled receptor MCHR 1, whose signal cascade is hypothesized to be controlled by receptor desensitization. For some receptors, this involves phosphorylation of the receptor C-terminus followed by the recruitment of β-arrestins and receptor internalization. For MCH receptors, little is known about the extent to which internalization contributes to MCH desensitization. Recently, our lab obtained evidence to suggest MCHR1-mediated ERK phosphorylation rapidly desensitizes. The first aim of this study was to measure internalization of MCHR1 in cells treated with or without MCH for up to 30

min. We approached this question by 1) developing a cell-based ELISA by which changes in surface-localized receptor could be measured and 2) conducting fluorescence microscopy of live and fixed cells. Surface receptor localization was measured using BHK-570 cells transiently transfected with VSVg-MCHR1 ± β-arrestin 2. Cells co-transfected with MCHR1 and β-arrestin 2 exhibited a net loss of 22.5 ± 4.4 percent and 47.6 ±4.0 percent of surface receptor after 15 and 30 minutes respectively while controls − β-arrestin 2 showed a net loss of 5.8 ± 3.4 percent and 14.0 ± 4.4 percent after 15 and 30 minutes respectively. Weak internalization was also observed via microscopy. This data is indicative of a weak interaction between MCHR1 and arrestins and suggest that clathrin-mediated internalization of MCHR1 can occur, but that the extent to which it will occur is dependent on the expression level of related adaptor proteins in the applicable cell type. Therefore, desensitization of MCHR1 may be independent of receptor internalization. (Oral presentation.)

## DETERMINATION OF CRITICAL MICELLE CONCENTRATION OF SODIUM DODECYL SULFATE USING FLUOROGENIC COMPOUNDS.

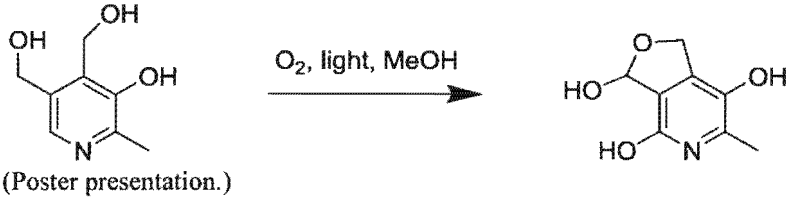
DeAnna Nigro, Ashley Wojtkowski, Derick Welch, and Jinseok Heo, Department of Chemistry, Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222.

We report a new method of determining critical micelle concentration (CMC) of surfactants using fluorogenic substances. Acetylmethoxy esters (AM) of 2′, 7′-bis-(2-carboxyethyl)-5-(and-6)-carboxyfluorescein (BCECF), carboxyfluorescein diacetate (CFDA) and calcein dyes are representative fluorogenic compounds. They show nominally non-fluorescent but exhibit strong fluorescence when hydrolyzed by the esterase enzymes that are present in the cells. These dyes are widely used to measure intracellular pH and cell viability. We carried out the hydrolysis reaction of CFDA-AM in a basic pH condition in the presence of different concentrations of sodium dodecyl sulfate (SDS) and measured time-dependent fluorescence intensity. We found that the reaction rate strongly depended on the concentration of the surfactant and we could determine the CMC of the surfactant from the plot of the reaction rate vs. SDS concentration. In this presentation we will report our findings on the determination of CMC using the fluorogenic substances. (Poster presentation.)

## EXPLORING THE CHEMICAL NATURE OF VITAMIN $B_6$ OXIDATION BY SINGLET OXYGEN.

Kirsten Norrell and David Hilmey, Department of Chemistry, St. Bonaventure University, St. Bonaventure, NY 14778.

Vitamin $B_6$ has been shown to have antioxidant properties in both plants and humans. It specifically has a protective affect against singlet oxygen. Studying the reaction between singlet oxygen and various vitamin $B_6$ derivatives may reveal more about the mechanism of its function as an antioxidant. In a series of experiments modeled after research performed by Christopher Foote, the $B_6$ vitamer, pyridoxine, was reacted with singlet oxygen under two conditions, 0.25 M phosphate buffer and methanol. Rose Bengal was used to excite triplet oxygen to singlet oxygen and two different light sources were used for this process, unfiltered light and a green filtered LED. Three products were identified from these reactions. Under aqueous conditions the same first product was formed using either light source. When the experiment was performed in methanol, a second product was formed using the green filtered LED while the third product was formed after using unfiltered light. All new products were analyzed by proton and carbon NMR, 2D NMR, and mass spectrometry. Pyridoxal and pyridoxal-5-phosphate (PLP) were also tested, but they proved unstable to purification by normal phase column chromatography. Future work includes HPLC purification of PLP oxidation products and oxidation of protein bound PLP, as vitamin $B_6$ is primarily a bound cofactor for numerous enzymes.




(Poster presentation.)

## CRISIS IN THE HEARTLAND: THE DARWINIAN DISINTEGRATION OF PLACE VIABILITY IN FLYOVER AMERICA.

Darrell Norris, Department of Geography, SUNY College at Geneseo, 1 College Circle, Geneseo, NY 14454.

Traditions in American Human Geography can be usefully simplified to the three words 'place', 'space', and 'meaning'. The latter has held sway for a generation encapsulated by post-modern discourse. The uniqueness of 'place' and 'region' captures a much longer and essentially descriptive scholarly tradition. 'Space' (more exactly spatial analysis) characterizes Geography's shift to normative social science which began in earnest in the 1950s, held sway in the 1970s, and—over-extended—lost its impetus in the 1980s. Central to this quantitative revolution were attempts to systematize the structure and pattern of places as 'central places' providing goods and services to customers. Systemic decline and extinction were generally not addressed, despite the inherently Darwinian nature of place competition. Non-economic foundations of places were also ignored, despite the many social-cultural and demographic elements of place viability and persistence. Now the United States faces the loss of thousands of rural centers with, apparently, no hope of reprieve for most of these places. I call them 'undead towns'. Their failure and ultimate disappearance seems to be based on an interdependent set of catalysts for decline, which are reviewed here based on field survey of places along coast-to-coast U.S. Highway 20. Systematic and spatial-analytic analysis of this developing crisis is overdue. (Oral presentation.)

## SOIL CARBON DYNAMICS FOLLOWING LAND COVER CHANGE IN WESTERN NEW YORK.

Mark Norris, Department of Environmental Science and Biology, The College at Brockport SUNY, 350 New Campus Drive, Brockport, NY 14420.

Land cover/ land use change is one of the major anthropogenic drivers of global ecological change. One of the predominant patterns of land cover change in the temperate zone is afforestation and woody plant expansion which have received considerable attention with respect to the global C cycle as a substantial terrestrial C sink. Vegetative change in western New York has followed a common pattern of presettlement forest cover to extensive agricultural use back to shrublands or early successional forests. This study investigates soil C dynamics with respect to this land cover change as old fields succeed to shrublands to early successional forests. Three habitats each of four dominant plant community seres (meadow, early successional shrubland, late successional shrubland, and early successional forest) along a successional chronosequence were analyzed at the Iroquois National Wildlife Refuge. The early successional habitat was further divided into distinct shrub islands in an herbaceous community matrix. Soil respiration rates were measured *in situ* six times during the summer 2008 with simultaneous soil moisture and temperature measurements. Soil C content, fine root biomass, peak aboveground herbaceous biomass, and woody basal area were collected once. Despite substantial shifts in the plant community composition and structure, soil C dynamics did not change correspondingly nor with significant effects of habitat type. Soil respiration rates were generally greatest in meadow sites, decreased with shrubland development, then increased with forest establishment. In contrast, soil organic matter was greatest in the early successional shrublands then decreased over time. Soil microclimate changed predictably over the chronosequence as soil moisture generally increased and soil temperature decreased, perhaps influencing patterns of soil C fluxes. While consequences of this land cover change in western New York remain inconclusive, the scale of this change could result in substantial shifts in regional ecosystem C dynamics. (Poster presentation.)

## A GREENHOUSE GAS SENSOR USING A CONDUCTING COMPOSITE WITH SINGLE WALLED CARBON NANOTUBES IN A PARALLEL CONFIGURATION.

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There is active interest in developing sensors for greenhouse gases such as carbon dioxide, methane, nitrous oxide and ozone. In the previous work we reported the development of methane sensor (1). In continuation of this work we report here the development of a carbon dioxide sensor with single walled carbon nanotubes-baytron-P that operates at ambient temperature (22°C). The sensor was constructed with a Si chip by depositing the composite between two gold electrodes. Two identically made sensors were connected in a parallel configuration. By

connecting them in parallel, the starting resistance is kept at less than a kilo ohm, enabling a wider range of concentration of analyte to be examined. The resistance of the sensor was measured before and after injection of carbon dioxide; the decrease in resistance is found to be proportional to the amount of carbon dioxide. The sensitivity of the sensor is determined in the temperature range of 22°C to 70°C. The sensor can detect about 10 micromoles of carbon dioxide. The sensor's response time is about 60 s. The composite is characterized by Fourier transform infrared spectroscopy (FTIR) and it showed peaks at 731 $cm^{-1}$, 1265 $cm^{-1}$, 1566 $cm^{-1}$, 1647 $cm^{-1}$, and 3277 $cm^{-1}$. The reproducibility and sensor stability are measured over a period of three months. The increased conductivity upon adsorption of dry carbon dioxide on the sensor is highly fascinating and indicates its potentiality for developing highly conducting polymers. Adsorption of carbon dioxide on to the composite seems to provide greater delocalization of electrons into the composite that enables it to switch from more conducting to less conducting states in carbon dioxide sensing. The increased delocalization that occurs with carbon dioxide provides a pathway for differentiating between the two green house gases, methane and carbon dioxide; while methane decreases, carbon dioxide increases the delocalization.

Reference: Lein, G.; Paquette, S.; Vadhavkar, S.; Fuller, L.; Santhanam, K. S. V. Sensors and Actuators, B: Chemical (2009), B142(1), 147-151. (Poster presentation.)

## STUDY OF THE THERMO-STABILITY OF DIBENZYLIC DIALKOXY DISULFIDES.

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Dialkoxy disulfide derivatives have been shown to undergo thermolytic decay. The rate of degradation of para-substituted benzylic dialkoxy disulfide molecules seems to differ according to the substitutions they possess. The decomposition of these molecules has been shown to follow Swain and Lupton's constant. We took a more in depth look at why these molecules behave the way they do under thermolytic conditions. We investigated the thermo-stability of these molecules in the presence of electron withdrawing and electron donating groups. They were synthesized and subjected to heat using the TGA and DSC. (Poster presentation.)

## POSTNATAL ALLOMOTHERING IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

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In the wild, beluga whales inhabit waters along the ice edges in the high Arctic, areas where opportunities to observe their natural behavior are extremely limited. In order to fill in one gap in our knowledge about this species, the behavior of pod members following the births of new calves was investigated in a wild-caught population of belugas held in captivity at Marineland of Canada (Niagara Falls, Ontario). Data for this investigation were obtained following 4 births that took place in 4 dams. The births occurred in pools that contained 2 to 6 other adult female belugas. In the hours immediately following the birth, each incident in which one of the non-parturient females touched the neonate, and/or swam with it in close parallel fashion, were tabulated. On the whole, allomothering was found to be very common, occurring in high frequency following each of the births recorded. The adaptive value of this behavior, and its possible relevance to the natural history of this species, are discussed. (Poster presentation.)

## WATER-SOLUBLE JULOLIDINE DERIVATIVES: PROGRESS TOWARD THEIR SYNTHESIS.

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Julolidine, or 2,3,6,7-tetrahydro-1H,5H-benzo(i,j)quinolizine, is a derivative of aniline in which the nitrogen is connected to the ortho positions of the aromatic ring through chains consisting of three methylene groups. It is a common constituent of dyes, due to the enforced overlap between the aniline nitrogen lone pair and the aromatic ring, leading to dyes with longer wavelength and greater molar absorptivity. Julolidine-based dyes find application in physics, chemistry, biology and medicine. Given that medical applications often require water-solubility, it would be useful to prepare water-soluble julolidine dyes. However, solubilizing groups attached to the carbons of the julolidine aromatic ring tend to create steric problems resulting in poor dye properties. Therefore, our goal is to synthesize water-soluble julolidine compounds with one or more carboxylate ion groups on one of the methylene groups connecting the nitrogen to the aromatic ring, where it would not be expected to change the dye properties.

Progress along two potential synthetic pathways starting from 1,2,3,4-tetrahydroquinoline has been achieved and will be described. NMR spectroscopy, gas chromatography and gas chromatography-mass spectrometry were used to determine the structures of impurities in intermediates and to optimize the reaction conditions to obtain improved yield and purity. (Poster presentation.)

## ILLUSTRATIONS OF ISOPODS.

Lydia Perkins and F. Harvey Pough, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Illustrations of diagnostic characteristics of isopods are valuable aids for identification. The images produced in this project will be used in a diagnostic key to the species of isopods found in central New York. They emphasize aspects of the isopods that are important for species and sex identification, including body form, anatomical details, color and pattern, and sexually dimorphic structures.

The process used to illustrate the isopods blends anatomical accuracy with the subtle emphasis of important features that line drawings permit. The first step is the creation of photomicrographs to use for reference. Then an initial graphite sketch is made in freehand and transferred to scratch board with graphite transfer paper. This method produces a clean, precise image. The final illustration is achieved by tracing over the light graphite image with pen. The details are added with stippling. Any unnecessary line marks are scratched away with an Exacto-blade. (Poster presentation.)

## CAN MULTI-TOUCH TECHNOLOGY CHANGE HOW WE LEARN PHYSICS?

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Advancements in technology have opened multiple doorways to build new teaching and learning methods. Through conjunctive use of these technologies and methods, a classroom can be enriched to stimulate and improve student learning. The purpose of our research is to ascertain whether or not multi-touch technology enhances students' abilities to better comprehend and retain the knowledge taught in physics. At their basis, students learn via visual, aural, reading/writing, and kinesthetic styles. Labs provide for all four styles, while lectures neglect kinesthetic learning. Pedagogical research indicates that kinesthetic learning is a fundamental, powerful, and ubiquitous learning style [1]. By using multi-touch technology in lecture, a wider spectrum of students can be ushered to improving overall learning.

Reference: [1] Wieman, C.E, Perkins, K.K., Adams, W.K., Oersted Medal Lecture 2007: "Interactive Simulations for teaching physics: What works, what doesn't and why.", *American Journal of Physics* **76** 393-99. (Oral presentation.)

## EFFECTS OF BIOTURBATING INVERTEBRATES ON DECOMPOSITION IN A SHALLOW EUTROPHIC ESTUARY.

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In shallow estuaries, benthic processes tend to drive ecosystem function because of the high ratio of sediment surface relative to the water volume and the potential for high levels of benthic primary production within the extensive photic zone. High anthropogenic nitrogen loading, from sources such as sewage or fertilizers, can lead to an explosion of opportunistic macroalgae which subsequently lead to lower dissolved oxygen when these large amounts of organic matter (OM) decompose. Invertebrates rework the sediment, move organic matter, irrigate burrows, graze on microbes and detritus and excrete nutrients. These activities, in turn, significantly alter microbial communities and chemical or microbially mediated reactions in the sediment, affecting decomposition and the subsequent release of nutrients to the water column. This study investigated the effects of the hard shelled clam *Mercenaria mercenaria* and the Eastern mudsnail *Ilyanassa obsoleta* on decomposition of bloom-forming macroalgae. The test hypothesis was that infauna will increase decomposition rates by promoting aerobic decomposition and redistributing OM. We used a microcosm experiment with sediment and animals collected from West Falmouth Harbor in Cape Cod, MA where macroalgae detritus was added to simulate a very large bloom collapse. Micro-electrodes were used to measure oxygen profiles at the sediment surface, and pore water

measurements were taken to measure ammonium and sulfide. Water column samples were taken to measure benthic oxygen consumption, nitrate, phosphate, total nitrogen, total phosphorus and ammonium. It was found that *I. obsoleta*, both alone and in treatments with *M. mercenaria*, removed detritus significantly more than treatments without the mudsnail. (Poster presentation.)

## INVESTIGATION OF DIFFUSION OF TRIHALOMETHANES THROUGH POLYDIMETHYLSILOXANE USING MEMBRANE-INTRODUCTION FLAME IONIZATION DETECTION.

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Chlorination is the most widely used drinking water disinfection process in the world; however undesired halogenated by-products such as the trihalomethanes (THMs) are formed. Because these by-products are suspected carcinogens, they are regulated by the USEPA in drinking water. Current USEPA methods of analysis are well suited for compliance monitoring, but are limited to periodic monitoring, are relatively expensive, and sometimes require organic solvents. Membrane-based methods, which are solvent free and relatively inexpensive can, provide a suitable alternative to these methods. In previous research, a membrane-based GC method was developed for the analysis of THMs in drinking water with promising results, though only preliminary optimization studies were performed. This research aims to further optimize and improve the membrane sampling technique associated with this method. Optimization studies were performed using a membrane-sampling device, with polydimethylsiloxane tubing, coupled directly to a flame ionization detector. The effect of changing experimental parameters upon response time, lag time, analytical signal, and diffusion was investigated. The greatest improvements in analytical signal and response times were achieved by increasing the membrane temperature and the stripping gas flow-rate. An Arrhenius plot was used to describe the temperature dependence of diffusion coefficients and estimate activation energies for the THMs. Overall, the experimental results showed good agreement with diffusion theory and computational results. The correlation values were all greater than 0.990, which suggests that the diffusion of THMs through polydimethylsiloxane is the rate-determining step for this process. (Poster presentation.)

## THE HUMUS FAUNA.

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Nine samples of humus were collected in the undeveloped section of Letchworth State Park and extracted in a Tullgren funnel. A total of 17 taxa of invertebrates were found. These invertebrates, plus bacteria, break down the humus into soil. The four dominant groups of invertebrates found were mites (Acari), springtails (Collembola), terrestrial isopods (Oniscidea), and flies (Diptera). (Oral presentation.)

## DYNAMIC MODELING OF WETLAND HYDROLOGY.

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The Northwest section of Woodlawn State Park contains a unique series of wetland ecosystems that separate Lake Erie from nearby residential and industrial zones. The local drainage infrastructure is channeled into a category 3 waterway (Bladsdale Creek) which flows through the wetland interior and empties into the lake. Although state employees have regularly tested the creek for nutrient loading and bacterial counts under a regulated beach monitoring program, the wetland region has remained largely unstudied. In April 2010 researchers from Buffalo State College began characterizing the wetland in order to assess its local importance and to recommend promising mitigation measures to the state. A calculated battery of meteorological, hydrological and water quality data was collected from the wetland during the months of May thru September 2010. Limited collection will continue until seasonal factors indicate a logical end. Bladsdale Creek serves as the primary source of water to the wetland area and also functions as a key drainage gateway for the Bladsdale Creek watershed. A dynamic hydrological model of the wetland system is being developed to accurately assess what mitigation efforts will effectively (1) maximize the pollution removal efficiency of the wetland system at Woodlawn State Park and (2) decrease the threat of flooding in nearby residential and industrial zones. The versatile modeling program *Stella* will be used in conjunction with other established 3D models to achieve this goal. All contributing processes central to the flow of water through the

area will be accounted for using grid-based analysis. The model will be designed and validated with reference to data sets collected in the field and adapted to provide information that may guide future mitigation efforts. (Poster presentation.)

## EFFECTS OF WASTEWATER TREATMENT ON ANTIBIOTIC RESISTANCE OF *PSEUDOMONAS* SPECIES.

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*Pseudomonas aeruginosa* causes urinary tract infections, respiratory system infections, and gastrointestinal infections, and aggravates the condition of those with burns, cancer, cystic fibrosis and HIV/AIDS. Antibiotic resistance, which limits therapeutic antibiotic treatment of disease, is conferred by mechanisms of horizontal gene transfer (conjugation, transformation and transduction). Wastewater treatment plants are potential 'hot spots' for horizontal gene transfer of antimicrobial resistance genes. This work describes a study of antibiotic resistance of *Pseudomonas* in wastewater in Rochester, NY. Samples were collected from five stages of the treatment process: influent, mixed liquor, activated sludge, primary effluent and final effluent. Bacteria were cultured from each of these sample sites and characterized as a Pseudomonad by metabolic tests and a molecular approach. After confirmation of species identity, antibiotic resistance testing was performed. (Poster presentation.)

## METABONOMIC ANALYSIS OF HUMAN BREAST CANCER CELLS.

Sarah Roberts, Julie Hughes, Lawrence Mielnicki, Ph.D., and Mary McCourt, Ph.D., Department of Chemistry, Biochemistry, and Physics; Niagara University, NY 14109.

Approximately 1 in 8 women will develop breast cancer in the course of her lifetime. The current method for early detection of breast carcinoma is mammography. This procedure is invasive, painful, and costly. The development of a simple non-invasive method would help increase the numbers of women who submit to breast cancer screening. Urinalysis represents a simple inexpensive alternative to mammography. One of the long-term goals of the present research is to be able to diagnose breast cancer by analysis of the metabolites in urine samples. In order to determine which metabolites are unique to breast cancer, normal mortal human breast epithelial cells (HBEC), benign immortalized HBEC and tumorigenic HBEC are being utilized in $^{1}$H NMR spectroscopic analyses to determine their metabolic profile. The present study describes the preliminary effort to establish metabolic profiles of MCF-10A and MDA-MB-231 cells. The MDA-MB-231 cell line is composed of adherent HBEC that were extracted from the mammary gland of a woman with metastatic disease. The MDA-MB-231 cells are a model of aggressively growing breast cancer cells, and therefore of advanced stages of the disease. The MCF-10A cell line is composed of HBEC derived from the mammary gland of a woman with a benign fibrocystic disease. The MCF-10A cells are a model for cell growth in an early benign stage in the progression towards invasive breast cancer. $^{1}$H NMR analysis will be used to identify differences in metabolites associated with these two extreme forms of breast epithelial cells. Cell pellets representing varying densities (from $10^{6}$ to $10^{7}$ cells/pellet) have been snap-frozen in liquid nitrogen and stored at -80°C. Pellets have been extracted with methanol/chloroform (2:1) and both extraction phases have been lyophilized to dryness. These will be used in experiments to establish the overall metabolic profile and the threshold detection levels for both concentration controls (e.g. DSS) and specific metabolites (e.g. choline metabolites). Whole cell $^{1}$H NMR analysis will be performed to compare the mobile lipid fraction with the extracted lipid profile. (Poster presentation.)

## PALLADIUM CATALYZED REACTIONS: A SEARCH FOR A GREENER OXIDATION PATHWAY.

Melissa Rosenburg, Scott MacBeth, and Karen Torraca, Department of Chemistry, Houghton College, 1 Willard Avenue, Houghton, NY 14744.

In the field of organic chemistry a key area of research is focused on the formation of carbon-carbon bonds for building complex molecules. One of the most commonly used methods for making carbon-carbon bonds is the aldol reaction which requires the use of aldehydes and ketones. One of the standard reactions used to generate aldehydes and ketones is the direct oxidation of alcohols. Although there are many current synthetic organic methods for completing this oxidation, several of them have significant disadvantages for large-scale manufacture: the use of

stoichiometric amounts of heavy metals, the use of hazardous reagents, the use of molecular oxygen in the presence of highly flammable organic reagents, and the use of solvent-intense extractive work-ups. In light of this, our research is focused on the development of a mild and green oxidation method that would be amenable to implementation at large scale. Our initial efforts have focused on the use of palladium catalysis to complete this oxidation. Reagents we examined included various palladium sources, bases, and temperatures. The highest conversion obtained at the conclusion of this summer's research oxidized 1-phenylethanol to 1-phenylethanone using 0.10 equivalents of palladium acetate, 1.0 equivalent of sodium fumarate as the base, and 2.0 mL of dioxane as the solvent at 85°C for 24 hours, with no additional additives or oxidants. The reaction was kept under argon gas for one hour before the argon hose was removed and the contents of the reaction flask were left open to air, allowing volatile components to escape. The resulting percent conversion of the reaction was 97.5% according to HPLC. Future research will focus on understanding the mechanism of this reaction, application of the method to several types of alcohols and development of a simple extractive work-up method. (Poster presentation.)

## SEX RATIO BIAS IN ZOO-HOUSED HYLOBATIDS.

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Various explanations have been proposed for the occurrence of sex ratio bias in primates. Multiple theories have been suggested as to why sex ratio biases may occur in populations. Two of the most common theories are the Trivers and Willard theory which states that a female in good condition will produce an offspring of the sex that will most benefit from extra maternal investment, and Clark's theory of local resource competition which states that a female will produce the sex that disperses in order to decrease competition in the area. Here, we use zoo records, in the form of studbooks, to determine if a sex ratio bias exists in zoo-housed populations of gibbons. We analyzed 40 years of demographic data on three species: white-cheeked gibbons (*Nomascus leucogenys*), white-handed gibbons (*Hylobates lar*), and siamangs (*Symphalangus syndactylus*). We identified a strong male-biased sex ratio only in *N. leucogenys*. The male bias was significant for the whole 40-year period (61% male births) and for the most recent 10 year period (70% male births). In addition, male infant mortality was consistently higher than female infant mortality, but this difference was not significant. We discuss these findings in light of current theories on sex ratio bias in primates. (Poster presentation.)

## THE INFLUENCE OF TYPICAL IMPURITIES ON THE SURFACE TENSION MEASUREMENTS OF BINARY MIXTURES OF WATER AND THE IONIC LIQUIDS 1-BUTYL-3-METHYLIMIDAZOLIUM TETRAFLUOROBORATE AND CHLORIDE.

Joseph Russo and Markus Hoffmann, SUNY, The College at Brockport, 350 New Campus Drive, Brockport NY 14420.

Surface tension measurements were obtained for binary water systems of ionic liquids (ILs) of the cation 1-butyl-3-methyl imidazolium tetrafluoroborate with anions tetrafluroborate and chloride, [bmim] [$BF_4$] and [bmim] Cl, at 25°C and atmospheric pressure. Surface tension is a temperature dependent quantity in units of force per unit length. It is defined as the required force to increase the area of a liquid film. Impurities were added to investigate the source of the large discrepancies among published surface tension data. The impurities considered were mineral acids and bases, potassium chloride, 1-methylimidazole, acetone, ethanol, vacuum grease and a nonionic detergent. It is most likely that nonionic detergent and/or vacuum grease are the leading cause for discrepancies amongst previously published work. For both binary water-ionic liquids the results could be fitted to an exponential decay function, and the critical aggregation concentrations were found to be in mol fraction of ionic liquid at 0.026 for [bmim][$BF_4$] and 0.234 for [bmim]Cl. (Poster presentation.)

## BUBBLE PLAY BEHAVIOR IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Adrienne Salerno and Michael Noonan, Canisius College, 2001 Main St., Buffalo, NY 14208.

Play with underwater bubbles may be unique to cetaceans. Although it has not yet been systematically studied, bubble play appears to be particularly prolific in the beluga whale. The goal of the present investigation was to assess frequency and forms of bubble play in a captive population of 27 belugas. The subjects were 4 male and 17 female adult belugas that had been previously captured in the Chukchi Sea 2–5 years earlier, and 6 of their captive-

born juvenile offspring, over 3 hours of observation. One hundred and forty four instances of underwater bubble play behavior were observed. Eighty percent involved formation of circular rings from either the blowhole (37%) or mouth (63%), 5% took the form of a single bubble (100% of the time from the mouth), 16% took the form of bubble drips (100% of the time from blowhole), and 1% took the form of bubble bursts (100% of the time from the blowhole). The production of bubbles was followed 87% of the time by mouthing of bubbles, which involved shape distortion (8%) and misting (83%). Other manipulations included fluke swatting (4%), pectoral fin slaps (1%), and head or body swim-throughs (2%). These findings establish belugas as among the most creatively playful of all animal species. (Poster presentation.)

## CHARACTERIZATION OF CONNECTIVE TISSUE GROWTH FACTOR EXPRESSION IN MAMMARY GLANDS OF EMBRYONIC MICE.

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Connective tissue growth factor (CTGF) functions during angiogenesis, cellular migration, and fibrosis. Recently, CTGF was shown to be up-regulated in breast cancer cell lines, but the role of CTGF in mammary development is still unknown. In this study, we characterize where CTGF is expressed in embryonic mammary gland development. To characterize the expression of CTGF, we acquired a mouse that contains an allele where CTGF was knocked out with β-galactosidase, but still under the control of the CTGF promoter. Embryos from embryonic day (E) 13.5, E15.5, and E18.5 were harvested from a cross between CD1 female and CTGF +/- male mice. Embryos were stained with β-galactosidase and examined for β-galactosidase localizations. It was found that in E13.5 and E15.5 embryonic mice, CTGF +/- mice expressed β-galactosidase in most of the mammary buds, but was concentrated in the 3$^{rd}$ and 4$^{th}$ mammary buds of CTGF +/- at E13. In E15.5 mice, a male embryo expressed strong prominent staining in the remnants of the mammary buds, but much less was seen in E15.5 buds. Histological sections through E15.5 mammary buds confirmed that β-galactosidase was sparse in the mammary buds, but some sporadic evidence of β-galactosidase still exists. Male E15.5 mice had strong staining of β-galactosidase in the remnants of the mammary bud. At E18.5, embryos had very little β-galactosidase staining, indicating that CTGF was reduced in expression. No β-galactosidase expression was observed in the ducts or the mesenchyme of the E13, E15, and E18 mice. Further work will examine the regulation and role of CTGF in the mammary gland. (Poster presentation.)

## HEATS OF DISSOLUTION OF SEVERAL IMIDAZOLIUM-BASED IONIC LIQUIDS IN LOW DIELECTRIC MEDIA.

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In our previous research, particularly strong, long-lived ion pairs were discovered for several different imidazolium based ILs dissolved in chloroform, as evidenced by the presence of two resonance sets in $^1$H NMR spectra. Variation of experimental conditions such as temperature and concentration changed the relative intensities in the $^1$H NMR spectrum indicating an equilibrium between freely dissolved and paired ions. From this discovery, it became relevant and of interest to measure the heats of dissolution of these ILs into chloroform to further assess the thermodynamic stability of the ion pair formation.

We will report experimental results for heats of dissolution for the ILs 1-ethyl-3-methylimidazolium bis(trifyl)amide ([emim][$NTf_2$]), 1-hexyl-3-methylimidazolium bis(trifyl)amide ([c6mim][$NTf_2$]), and 1-hexyl-3-methylimidazolium tris(trifyl)amide ([c6mim][$CTf_3$]). The ILs [emim][$NTf_2$] and [c6mim][$CTf_3$] both contain long-lived ion pairs, and the IL [c6mim][$NTf_2$] does not. However, the heats of dissolution were found to be the largest for [c6mim][$NTf_2$]. Overall, we discovered that the heats of dissolution into chloroform were smaller than originally expected. (Poster presentation.)

## MACROINVERTEBRATES AND THEIR EFFECTS ON EUTROPHICATION: SCALING UP IN A SHALLOW ESTUARY.

Christopher Scheiner, Christy Tyler, and Karl Korfmacher, Department of Biological Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Estuaries are threatened by numerous factors, including eutrophication caused by excess nitrogen inputs. Within an estuary, the benthic invertebrate community and the sediment physico-chemistry are mutually dependent but vary spatially. As is understood through small-scale experiments, many benthic invertebrates modify their immediate surroundings, impacting nutrient removal and potentially affecting eutrophication rates. Scaling experimental results to the system-level requires understanding how environmental conditions are affected by scale and how conditions vary spatially at large scales. To consider scale effects, microcosms of multiple sizes were constructed using sediment collected from West Falmouth Harbor (WFH), an estuary on Cape Cod, MA. *Mercenaria mercenaria* were added to half the microcosms as a treatment. After six weeks, the microcosms were sampled for physico-chemical (sediment porosity and organic matter content, nutrient concentrations) and biological (microalgal chlorophyll *a*) conditions. Porewater ammonium and sulfide concentrations appeared to be scale-dependent, suggesting that microcosm size can affect the results of small-scale experiments. To examine large-scale spatial variation, two sub-basins of WFH were divided into strata defined by existing environmental conditions. Points within all strata were sampled and the resulting data interpolated in ArcGIS. The analysis revealed similar spatial patterns between several variables, including porewater ammonium concentration and benthic oxygen consumption. Nutrient concentrations measured in the laboratory fell within the range of those measured in the field. We will determine the relationship, if any, between measured variables at the experimental and system levels; any existing relationship will allow the impacts of laboratory experiments on multiple invertebrate species to be extrapolated to a larger scale. (Poster presentation.)

## COMPARISON OF GEOCHEMICAL AND BIOLOGICAL CHARACTERISTICS OF NATURAL AND CONSTRUCTED WETLANDS IN WESTERN NEW YORK.

Katrina Scheiner and Christy Tyler, Program in Environmental Science, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Wetlands are critical habitats that promote biodiversity, carbon storage and improved water quality, in addition to many other important ecological functions and services. Unfortunately, wetlands continue to be degraded or destroyed. To alleviate this problem, Federal law mandates that mitigation occur such that replacement wetlands are created or restored, resulting in "no net loss" of wetland area. In spite of their importance, we don't yet understand if mitigation wetlands are functionally equivalent to their natural counterparts. The RIT campus is a prime study location as it contains both constructed and natural wetlands. In this study of two natural (N1, N2) and two created wetlands (C1, C2), biological factors, including vegetation and macroinvertebrate abundance and community structure, as well as geochemical characteristics, such as soil organic content and nutrient uptake capacity, were measured in the spring, summer, and fall. Together, these interdependent factors will be used to assess equivalency of ecosystem function between natural and created wetlands. Our preliminary analysis suggests that vegetation diversity was greatest in the spring for all wetlands except N2, and C1 showed the greatest diversity throughout all three seasons. Preliminary spring soil organic data were variable, but N2 had the highest organic matter (OM) content (13.46%) with lower values in the two constructed marshes (C1 = 10.96% ; C2 = 6.52%), though only C2 was significantly lower. While further analysis may indicate statistically significant differences, some trends are evident now. OM is lower in both of the created wetlands, but the vegetation diversity in C1, a more recently managed wetland, is higher than that of the natural wetlands. (Poster presentation.)

## UNITED STATES HATE GROUPS.

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As our nation appears to be outwardly fostering tolerance and acceptance, deep-seated hatreds have surfaced, just as they did two decades ago. Organized hate groups are proliferating; their tenets differ but often overlap. Overt stances are variously apt to be Neo-Nazi, white supremacist, anti-immigration, anti-Semitic and holocaust denial, anti-Muslim, secessionist, anti-feminism, anti-gay, and anti-gun control. Hate Group proliferation has been especially evident since 2007, with Obama as an obvious lightning rod for such venom and the Internet as an

effective hate speech lubricant. Old mental stereotypes, based for example on the Ku Klux Klan, incorporate a mental map of hate. Is such a map out of date? This paper identifies and discusses the geography of organized hate in the United States, based on organized monitoring, news items, and hate groups Websites. Apparent regional biases related to isolation, economic stress, and racial compositions are discussed. (Oral presentation.)

## ANALYSIS OF THE SPATIAL EXPRESSION PATTERN OF ETGCM AND ETBRA IN THE CIDAROID SEA URCHIN *EUCIDARIS TRIBULOIDES.*

Deepika Sharma and Hyla Sweet, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Sea urchins and sea stars diverged from their common ancestor 520-480 million years ago. The cidaroid and euechinoid sea urchins diverged 250 million years ago. The purpose of this project is to elucidate the similarities and differences in expression of several important genes (*tbrain, brachyury, gatae, gcm, gatac*) between cidaroids and other echinoderms. The results will show how the expression of these genes has evolved in the echinoderm phylum and may explain the differences in development among different echinoderm groups. In the euechinoid sea urchins, *gcm* is expressed at the vegetal pole and then at the gastrula stage at the tip of the archenteron where pigment cells form. In contrast, in sea stars *gcm* expression is scattered within the ectoderm. In situ hybridization in the cidaroid *Eucidaris tribuloides* shows that *gcm* is expressed in the cells that will form pigment cells. Interestingly, a new area of expression in coelomic pouches was discovered. On the other hand, the expression of *brachyury* was observed at the base of the archenteron and around the mouth, which is different from the expression pattern in euechinoids where it is expressed at the base of the archenteron only. Overall, the expression patterns of *gcm* and *brachyury* are similar to expression in euechinoid sea urchins but they have some striking differences as well. (Oral presentation.)

## CHANGES IN CANONICAL WNT SIGNALING IN MICE LACKING CADHERIN-11 DURING EMBRYONIC MAMMARY GLAND DEVELOPMENT IN THE MOUSE.

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The mammary gland develops from surface epithelium and underlying mesenchyme. Development begins with the formation of bilateral milk lines on embryonic day (E) 10.5. Canonical Wnt signaling is essential in embryonic mammary gland development. Wnt genes begin to be expressed within the mammary line between E11.25 and E11.5. This pathway involves the intracellular mediator β-catenin, which interacts with transcriptional factors such as the TCF family to activate genes. Cell adhesion protein, cadherin-11 (Cdh11), is found at the cell membrane and has been found to function in the differentiation of mesenchymal cells. Canonical Wnts and Cdh11 both interact with β-catenin. The purpose of this experiment was to determine if canonical Wnt signaling is altered in CDH11 knockout mammary glands. Wnt reporter mice called, TOPGal, contain a β-galactosidase gene under the regulation by canonical Wnt signaling were used to observe Wnt signaling at E15.5 Wnt expression was indicated by blue staining with X-gal, a substrate for β-galactosidase. Mice were genotyped using PCR. Tissue samples were stained with hematoxylin and eosin as a counter stain. In CDH11 knockout mice, strong blue staining was observed in the mesenchyme surrounding the first mammary bud, rather than within the bud itself. These differences in staining indicate potential changes in the Wnt signaling pathway in the mammary mesenchyme. Further studies will involve understanding the regulation of these molecular mechanisms involved with Cdh11 during mammary gland development. (Poster presentation.)

## DEVELOPMENT OF NANOSCALE VESICLES FROM NEUTRAL LIPIDS FOR DRUG DELIVERY.

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Many promising drugs never evolve into effective treatments due to poor bioavailability that could stem from poor solubility, poor specificity or steric effects. Drug delivery vehicles, such as liposomes, niosomes and nanoparticulate carriers, have been created to try and solve these problems but even these vehicles have their limitations. Liposomes commonly contain a charge, which can limit the array of drugs that can be encapsulated, the surfactants used in niosomes can lead to toxicity when administered in high doses and nanoparticulate carriers

usually can load only certain bioactive molecules (such as DNA). These vehicles also may have to be coated with a polymer, such as polyethylene glycol (PEG), to increase their stealth properties. In the present study a novel vesicle called a Cholestosome has been developed based on molecular modeling. Thermodynamic and crystallographic studies were used to develop models of the vesicle. Molecular modeling using the SYBYL program was able to predict the structure of the cholestosome with certain properties such as a cavity in the middle and a certain size (approximately 200nm) and shape (spherical). Using the modeling information, a preparative method was developed to create this delivery vesicle. These were characterized using electron microscopy (EM) and dynamic laser light scattering (DLLS). In proof of principle experiments, cholestosomes have been shown to deliver substances, *in vitro*, into living cells. Some advantages that cholestosomes have over other delivery vehicles is they are made from binary combinations of neutral lipids and therefore contain no net charge, have a wide range of pH stability, and are not toxic to cells. A predicted advantage that the cholestosomes have is that due to the neutral charge a wide range of payloads may be accommodated in the internal cavity. Cholestosomes are therefore predicted to have applications in multiple fields. (Oral presentation.)

## EFFECT OF LIPID SOURCES ON LAKE TROUT *SALVELINNUS NAMAYCUSH* ALEVIN GROWTH PERFORMANCE AND FATTY ACID COMPOSITION.

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Highly unsaturated fatty acids (HUFAs) are known to be important for fish survival, development, and reproduction. The objective of this experiment was to evaluate the effects of HUFAs on lake trout alevin development using diets with different fatty acid compositions; diet 1, oleic acid (OA); diet 2, linseed oil (LO); diet 3, cod liver oil (CLO); and diet 4, lecithin (LE).

Using a flow-through system, lake trout alevins (mean initial weight 94 ± 19 mg, mean initial length 26 ± 1.3 mm) were randomly assigned in triplicates to one of four dietary treatments and fed three times daily for eight weeks. Upon completion of the experiment, survival, length, weight, weight gain, specific growth rate (SGR), and food conversion ratio (FCR) were compared among dietary treatments. Whole body lake trout lipid and fatty acid content were also compared among dietary treatments.

Results from this experiment suggest that lake trout alevins fed CLO, which provide HUFAs, outperformed the other dietary treatments with regard to survival, length, weight, and SGR. Fish fed the OA diet, which lacks HUFAs, displayed the poorest growth performance when compared to the other treatments. Total whole body lipid content was significantly higher in fish fed CLO and LO diets than in fish fed OA and LE diets. Fatty acid profiles of lake trout were reflective of the dietary treatment. This data suggests dietary fatty acids have an effect on fish performance and fatty acid composition. (Oral presentation.)

## INFLUENCE OF NITROGEN AND PHOSPHORUS ADDITION ON $CO_2$ EXCHANGE IN A RESTORED TEMPERATE GRASSLAND.

Lynn Socha and Dr. Daniel Potts, Biology Department, Buffalo State College 1300 Elmwood Avenue, Buffalo, NY 14222.

Nitrogen (N) and phosphorus (P) affect grassland structure and function by altering plant competitive interactions, shifting root:shoot ratios, increasing ANPP and altering rates of soil microbial respiration. In a factorial N and P addition field experiment in a restored temperate grassland at Tifft Nature Preserve near Buffalo, NY, we measured ecosystem $CO_2$ exchange, canopy light interception and soil moisture during the 2010 growing season. We predicted that N addition would stimulate autotrophs and therefore increase ecosystem photosynthesis (GEE). Likewise, we predicted P addition would stimulate soil heterotrophs, increasing ecosystem respiration (Re). Representing $CO_2$ assimilation and loss by an ecosystem, GEE and Re are important component fluxes of the ecosystem carbon budget. Following our predictions, N did significantly stimulate GEE, but also stimulated Re. The effect of N, however, is strongly dependent on time and greatest in the early portion of the growing season. In contrast to our predictions, P had a limited effect on Re. Interestingly, N and P have an interactive effect on ecosystem carbon balance, suggesting that P-mediated increases in Re offset the positive effect of N on GEE. It is likely that the effects of N and P on ecosystem $CO_2$ fluxes were masked in the middle and late growing season due to limited water availability, the inefficiency of C3 photosynthesis at higher temperatures, or a combination of these

two factors. The effects of N and P addition on ecosystem $CO_2$ fluxes in combination with dynamic patterns of water availability and temperature may have unforeseen effects on ecosystem carbon balance. (Poster presentation.)

## INVESTIGATION OF SINGLE NUCLEOTIDE POLYMORPHISMS FOUND ON THE *PYCS* GENE FOR ASSOCIATION WITH PRESBYCUSIS.

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The exact causes of age related hearing loss, also known as presbycusis, are mostly still unknown. While many environmental factors are known to contribute, our laboratory has chosen to focus on the genetic factors. A study in a mouse model for presbycusis showed a correlation between age, hearing ability and expression levels of the *Pycs* gene in the auditory system. Preliminary results from our laboratory showed an association between a single nucleotide polymorphism (SNP) in the human homologue (*PYCS*) and presbycusis in human subjects. We are further investigating the role of this gene in presbycusis by analyzing an additional nine SNPs in *PYCS* for our sample of approximately 750 human subjects. TaqMan® (real-time PCR) assays were used to genotype seven of the SNPs, a KASPar assay is planned for one, while for the last SNP was found to have three alleles and therefore required a combination of TaqMan® assays, sequencing, and restriction fragment length polymorphism analysis (RFLP). Although genotyping is not yet complete, preliminary analysis with seven of the SNPs suggest that *PYCS* may be associated with cochlear and/or central nervous system function. This work could be the first to show that *PYCS* is involved in the development of human presbycusis. Further work is needed to determine the mechanism. (Poster presentation.)

## DEVELOPMENT OF A MEMBRANE-BASED GC-MS METHOD FOR THE ANALYSIS OF TRIHALOMETHANES IN DRINKING WATER.

Laura Spaman and Michael Brown, Department of Chemistry, The College at Brockport, SUNY, 350 New Campus Drive, Buffalo, NY 14420.

Chlorination is one of the most cost-effective drinking water disinfection processes; however it forms halogenated disinfection by-products (DBPs) such as the trihalomethanes (THMs). THMs are known carcinogens and are therefore regulated by the USEPA. Currently, the maximum contaminant level concentration for THMs in finished drinking water is 80 $\mu g\ L^{-1}$. To monitor concentrations of THMs and other DBPs the USEPA has developed four GC-based methods. All of these methods provide acceptable results, though can be quite expensive to perform or require organic solvents. This research involves the development of an alternative membrane-based GC-MS method, which allows for the direct extraction of THMs from drinking water without the need for organic solvents. A membrane sampling device was constructed and adapted to a GC-MS instrument and a suitable method was developed and optimized. Several parameters such as membrane length, sample loop size, electron multiplier voltage, and sorption time were optimized prior to calibration studies. The optimized method was applied to drinking water samples collected at The College at Brockport, SUNY. Total THM concentrations averaged between 30 to 40 $\mu g\ L^{-1}$. Water samples collected from across Monroe Country and eventually New York State will provide additional data and a better assessment of the method's performance in different water matrices. (Poster presentation.)

## EMBRYONIC EXPRESSION PATTERNS OF GENES THAT PLAY A ROLE IN ENDOMESODERM CELL DIFFERENTIATION IN BRITTLE STARS.

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Isolation of endomesoderm-specific genes and characterization of their expression patterns in brittle star embryos will be used to address the long-term goal of comparison of mesoderm development across the phylum Echinodermata. *Brachyury, GataE, GataC, GCM,* and *Tbrain* are part of a set of genes that regulate the specification of endomesoderm cells and their derivatives. A comparison of gene expression between sea urchins and brittle stars will give us details about how their expression patterns have changed through time. *Ophioplocus esmarki (Oe)* and *Ophiothrix spiculata (Os)* are the species of interest in this research and they undergo direct and indirect

development, respectively. Direct development indicates a specimen bypasses a feeding and swimming larval stage. A comparison of gene expression between *Oe* and *Os* will begin to give us clues for how their expression patterns differ in relation to the different types of development. These genes can be analyzed through collections of total RNAs at varying developmental stages, reverse transcription to create complementary DNAs (cDNA), degenerate PCR to isolate internal fragments, and rapid amplification of cDNA ends (RACE) to obtain the ends of these cDNAs. Thus far, *GataC* and *GataE* internal fragments were isolated for both species and RACE primers were designed. The 5' and 3' ends of *GataC* and 3' end of *GataE* were found for *Os*. Future directions include finding the remaining ends of these cDNAs, using the end sequences to amplify full-length cDNAs of these genes, establishing timelines of gene expression, and performing *in situ* hybridization to discover where the genes are expressed in the embryos.

## TEMPORAL EXPRESSION OF KITA, KITB, KITLA, & KITLB IN THE GASTROINTESTINAL TRACT.

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Gastrointestinal (GI) motility is the muscular contractions that move intestinal contents in an anterograde direction and is necessary for nutrient absorption and elimination of waste. GI motility is highly coordinated resulting in rhythmic contraction patterns. Interstitial cells of Cajal (ICC), enteric neurons, and smooth muscle cells all regulate GI motility. ICC function as a pacemaker cells and determine contraction frequency. ICC growth and development is influenced by Kit, a tyrosine kinase receptor located on the plasma membrane of ICC. Constipation, delayed gastric emptying, and bloating have been correlated with deficits of ICC in GI tissues.

A functional Kit receptor and stimulation of Kit with Kit ligand is necessary for ICC growth and development. However, little is known about ICC development in adults or in developing GI tissue. The objective for this project is to determine the relative expression levels of kita, kitb, kitla, and kitlb in the zebrafish model system at several developmental time points. Understanding the temporal expression pattern of these genes is the first step towards a more complete understanding of ICC development and turnover.

The zebrafish model system is anatomically similar to the human GI tract and at early time points the zebrafish is transparent. One advantage to this model system is that GI motility may be examined in the intact larvae. RNA was isolated from dissected zebrafish GI tissues and used as template for reverse transcriptase reactions to make cDNA. Relative expression levels of kita, kitb, kitla, and kitlb was determined at 5 days past fertilization (dpf), 7dpf, 11dpf, 28dpf, and in adult gut tissues for real time PCR.

At 5dpf kitlb had 3.5 fold greater expression compared to kitla, and kita expression was 0.5 fold greater than kitb, which shows minimal expression. From 7dpf onward kitlb expression was minimal. This suggests that kitlb only plays a role in early GI development and not the maintenance of ICC. Kitla expression increases throughout development, and maintains expression levels at the adult time points. This suggests that kitla plays a role in ICC maintenance. Kita expression is higher in early time points (5-11dpf) while kitb expression increases at later time points (28dpf and adult). The temporal expression patterns suggest that kitb may be activated by kitla and that kita may be activated by kitlb. (Oral presentation.)

## PHEROMONE-MEDIATED AGGREGATION BY *ONISCUS ASELLUS*.

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Pheromones are chemicals that are released by an organism and affect the social behavior of another organism of the same species. Individuals of *Oniscus asellus*, a terrestrial isopod, are normally found in groups. We tested the hypothesis that pheromones play a role in this aggregation, and compared the responses of male and females to pheromones. We placed single isopods in Petri dishes that contained two shelters, one resting on sterile filter paper and the other on pheromone-impregnated filter paper, and recorded the location of the isopod after 12, 24, 36, and 48 hours. We tested four combinations of pheromone source and isopod sex: Female pheromone + female isopod, female pheromone + male isopod, male pheromone + female isopod, and male pheromone + male isopod. Isopods were considered to exhibit aggregation behavior when they were observed under the shelter containing the pheromone-impregnated filter paper. Preliminary results reveal a significant preference for the shelter with the

pheromone-impregnated paper for all four combinations of pheromone source and isopod sex ($p < 0.003$ in all cases, binomial test with the probability of selecting the pheromone-impregnated paper set at 0.5). (Poster presentation.)

## SYNTHESIS OF 2,4,6-TRIS(TRIFLUOROMETHYL)ANALINE AS A PRECURSOR TO FLUORINATED β-DIKETIMINATE LIGANDS.

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The desired compound 2,4,6-tris(trifluoromethyl)aniline was synthesized from 1,3,5-trifluoromethyl benzene through two reaction schemes. Both schemes used 2,2,6,6-tetramethylpiperidinyl lithium for deprotonation of the starting material. One method reacts the resulting 2,4,6-tris(trifluoromethyl)phenyl lithium with imidizole-1-sulfonyl azide, followed by a reduction of the azide to an amine using Pd/C and $H_2$ gas in an 11% yield. The second method quenches the deprotonated starting material in iodine followed by a copper coupling reaction involving $NaN_3$, $Cu_2O$, and proline to yield 45% 2,4,6-tris(trifluoromethyl)aniline. (Poster presentation.)

## HISTORICAL GEOGRAPHY OF THE DUTCH UNITED EAST INDIA COMPANY.

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The Dutch United East India Company (VOC) surpassed all competitors in international trade from the 17th to the 19th century. As the world's first megacorporation, the VOC was able to expel most Portuguese presence in Asia within just a few years of its formation and postpone the success of all other rival companies for hundreds of years. During that time, the VOC accumulated adequate wealth to move beyond the simple act of ferrying foreign products to European markets. The company established a trade network with hundreds of outposts around the world before it was overwhelmed by a fiscal crisis in the early 19th century.

This study analyzes the remnants of VOC settlements in the modern world. It takes a compilation of trading posts founded or taken by the VOC and then evaluates their progress or deterioration over time. The study compares historic maps to contemporary Google Earth imagery to create several categories of surviving Dutch influence, ranging from thriving cities, to scenic tourist locations, to remote and abandoned foundations. (Oral presentation.)

## DIRECT POSITIVE EFFECT OF NUTRITION ON *DAPHNIA* EXPOSED TO ULTRAVIOLET-A RADIATION.

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Earth's terrestrial and aquatic climates are significantly affected by the reduction of the stratospheric ozone layer. In nearly all ecosystems, organisms must develop mechanisms to increase their own fitness (survival and reproduction) with global climate change. Of particular interest are the changing global temperatures and the increased levels of ultraviolet (UV) radiation to which the organisms are exposed. The physiological responses of organisms to these stressors are not well understood, but it is known that both temperature and UV induce significant physiological stress, DNA damage, and potentially death in many organisms. The fitness response to UV-A was studied in a model freshwater microcrustacean, *Daphnia magna*. In this study, *D. magna* was raised through several generations on two different algal-based food sources, and then exposed to variable acute doses of UV-A. *D. magna* have showed a positive correlation between nutrition and reproduction rates over a 2-3 weeks period following an acute dose of UV-A. These experiments suggest an increase tolerance of *Daphnia* spp. to UV-A if nutrition is sufficient to support repair of the UV-induced physiological damage. Understanding the nutritional requirements that can compensate for environmental stressors in the model organism *Daphnia* will provide insight into how other organisms, including humans, may be able to better cope with the inevitable climate changes to which the planet is being, and will continue to be, exposed. (Poster presentation.)

## PROFESSIONAL SCIENCE MASTER'S AT THE COLLEGE OF BROCKPORT.

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I would like to take this opportunity to describe an exciting new Master's program in the Dept. of Biology at The College at Brockport. The program is a Professional Science Master's Program (PSM). This program has just started this Fall 2010. Students completing this program will receive a Master's of Science in Biology with a PSM designation. The PSM is an innovative, non-thesis master's program designed for those interested in working in biotechnology—in particular in positions that interface between the research scientist and company management. These individuals will need expertise in cellular and molecular biology, business, and management. As an interdisciplinary degree program, the PSM will provide these skills. Students in the program will take a number of graduate courses focusing on cell and molecular biology, but what sets this program apart from traditional biology master's programs is the inclusion of courses in management and business (Plus Courses) and an internship in a science-based business, or government or non-profit organization. The Plus Courses were arrived upon and designed after consultation with members of local life-science companies and through comparisons with other PSM programs. Through the internship, students will receive hands-on experience with processes such as drug discovery, product testing, and project design and implementation. (Poster presentation.)

## EXPRESSION AND PURIFICATION OF MULTICOPPER OXIDASES IN *S. CEREVISIAE*.

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Metal ions act as essential cofactors and prosthetic groups for a variety of proteins and enzymes throughout nature. Specifically, there exists a unique interplay between iron status and copper status in eukaryotes where if an organism is copper deficient it is also found to be iron deficient. This interplay is best understood by examining a class of proteins called the multicopper oxidases which utilize copper to oxidize and metabolize iron. In this study, two multicopper oxidases, yeast YDR506C and human Ceruloplasmin, have been cloned into yeast expression vectors for protein expression in the baker's yeast *Saccharomyces cerevisiae*. (Poster presentation.)

## RESPONE OF HUMAN MACROPHAGES TO OXIDATIVE STRESS.

Nikko Velazquez and Deborah Leonard, Biology Department, Academic Center for Integrated Sciences, Niagara University, NY 14109.

Microhemorrhage in advanced atherosclerotic lesions may lead to iron-catalyzed lipid peroxidation and oxidative stress. This project used the human monocytic cell line THP-1 as an *in vitro* model to examine the relationship between expression of genes involved in the oxidative stress response and coronary artery disease. Both free iron and the oxysterol 7-ketocholesterol stimulate an inflammatory response in THP-1 macrophages. In this study, the ability of macrophages to respond to redox-active iron and/or oxysterols by enhancing the expression of genes encoding antioxidant enzymes was measured. THP-1 cells were be differentiated into macrophages and treated with iron ascorbate and/or 7-ketocholesterol. Total cellular RNA was isolated and the expression of thioredoxin (TXN), glutathione synthase (GSS), and sulfiredoxin 1 (SRXN1) was measured using quantitative RT-PCR. Iron increased the expression of TXN but GSS mRNA levels decreased and there was no significant change in SRNX1 mRNA. In contrast, 7-ketocholesterol caused a slight increase in SRNX1 mRNA but had no significant effect on GSS or TXN. Simultaneous addition of iron and 7-ketocholesterol caused a synergistic increase in SRNX1 mRNA levels. This suggests that iron and 7-ketocholesterol cause different oxidative stress responses in macrophages and that for some genes the effects may be synergistic. (Poster presentation.)

## THE ROLE OF CADHERIN-11 IN BRANCHING MORPHOGENESIS AND ITS EFFECTS ON WNT SIGNALING IN THE ADULT MAMMARY GLAND.

Megan Vos, Neha Sanyal, Priya Singhal, Ashish Kumar, and Julie Hens, St. Bonaventure University, Biology Department, William Walsh Science Building, #213, St. Bonaventure, NY 14778.

Mammary gland development is based on the interactions of the mesenchyme and epithelial cells. After birth, the mammary gland grows to fill the fat pad. Endocrine signaling, such as progesterone, regulates branching morphogenesis in the mammary gland. In addition, Wnt 4 and Wnt5a signaling recently was shown to regulate

branching morphogenesis. Cadherin-11 (CDH11) is a mesenchymal cadherin that has been shown to regulate morphogenesis in other organ systems. We hypothesized that CDH11 plays a role in branching morphogenesis in the mammary gland and to test this we used CDH11 knock-out (KO) mice. We examined 5 week, 12 week, and mid pregnant mice in WT and CDH11 KO mice. Morphology was examined in mammary gland whole mounts stained with carmine alum. In 5 week old mammary glands from CDH11 KO and WT mice, branching morphogenesis was examined (N=5). CDH11 KO mice showed significant decrease in branching with an increase in end bud size ($p<.05$). Further, in 12 week old CDH11 KO mice, branching structure was still decreased when compared to wild-type mice. To determine whether Wnt signaling was altered in KO mice, we examined RNA from mammary glands of 5 week old CDH11 KO mice, and examined expression of Wnts (Wnt1, Wnt4, Wnt10b, and Wnt11). Several of the Wnts were altered in CDH11 KO mice. Preliminary research demonstrated the PTHrP, which is necessary for mammary gland development, was shown to regulate CDH11 expression. Therefore we examined whether PTHrP could alter mammary mesenchyme proliferation using the mesenchymal cell line C3H10T1/2 cells. Treating the cells overnight with $10^{-7}$ M PTHrP, we saw a decrease in proliferation when compared to the control. This concludes that Wnt signaling and CDH11 interact in the mammary gland and that PTHrP may be upstream of CDH11 function. Future studies are examining the levels of b-catenin, a protein involved with transcription and Wnt signaling, in addition to characterizing where CDH11 is expressed in the adult during pregnancy, lactation and involution. (Poster presentation.)

## SYNTHESIS OF HOMOTAURINE DERIVATIVES AS AN AID IN THE PREVENTION OF ALZHEIMER'S DISEASE.

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Every 70 seconds an American develops the most prominent form of dementia, Alzheimer's disease. It is characterized by the presence of neurofibrillary tangles composed of Tau protein within the cell body as well as amyloid protein plaques on the exterior of neuronal cells. It is commonly accepted that abhorrent accumulation of these proteins leads to neuronal dysfunction and to eventual cell death. Work on disrupting the formation of both of these possible causes is heavily researched areas. It is known that when the Amyloid Precursor Protein (APP) is digested, two possible pathways can be taken. In one of those routes, water insoluble amino acid fragments Aβ1-40 and Aβ1-42 are produced from APP by the enzyme, β-secretase. The manufacturing and accumulation of these fragments leads to the formation of amyloid-β fibrils and ultimately to amyloid plaque. Inhibition of plaque formation via the suppression of β-secretase has become a common area of research. The approach that we are undertaken, however, is to find a compound that will instead bind to Aβ1-40 and Aβ1-42, allowing it to remain water soluble, thus promoting further digestion. Simple homotaurine has been shown to bind to Aβ1-40 and Aβ1-42 and has a very good bioavailability (>40%). However, any derivatives that have been synthesized with increased binding affinity are incapable of crossing the blood brain barrier (BBB). Our research focuses on the synthesis of homotaurine derivatives that will hopefully exhibit a high binding affinity as well as a logP values efficient enough to facilitate the crossing of the BBB. (Poster presentation.)

## IMAGING OF LATEN FINGERPRINTS FOR THE DETECTION OF MULTIPLE ILLEGAL DRUGS BASED ON ANTIBODY TAGGED MAGNETIC NANOPARTICLES.

Derick Welch and Jinseok Heo, Department of Chemistry, Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222.

In this presentation we propose a method of detecting multiple illegal drug metabolites from fingerprints using antibody-tagged magnetic nanoparticles. The magnetic particles are encapsulated within thin polymeric coating layer containing fluorescent dye. The surface of the polymeric layer is covalently modified with antibodies that can specifically interact with a target drug or its metabolite. These antibody-bearing magnetic beads can be applied to the fingerprints and those specifically bound to the target drug or metabolite on the fingerprints can exhibit fluorescence emission. The fluorescent image of the fingerprint will not only reveal the individual's abuse of illegal drugs but also provide the identification. Magnetic particles of other colors can be modified with different antibodies that interact with other drug and drug metabolites. These multi-color magnetic particles will enable simultaneous detection of multiple drugs or their metabolites. To test our idea, we are currently targeting the simultaneous detection of cotinine (nicotine metabolite) and caffeine from the fingerprints. (Poster presentation.)

## CHANGES IN COMMUNITY COMPOSITION AS INFLUENCED BY THE LITTER OF DOMINANT WETLAND PLANTS (*Typha xglauca* and *Lythrum salicaria*).

E. Bradley Wells, Katie Beaumont, and C. Eric Hellquist, SUNY at Oswego, Snygg Hall, Oswego, NY 13126.

*Typha xglauca* (Hybrid cattail) and *Lythrum salicaria* (Purple loosestrife) are widely distributed dominant wetland plants that can alter freshwater wetland community composition. *Lythrum* is an exotic, nuisance species that is considered invasive, but this historic view has recently been questioned. In a preliminary study, a *Lythrum*-dominated marsh community was compared to a *Typha*-dominated marsh community at Rice Creek Field Station, Oswego, NY. *Typha* was more detrimental to wetland community composition in every area analyzed in our preliminary study. Species richness was significantly higher in the *Lythrum* community (t-test; $p = <0.05$). The mean biomass of *Lythrum* in the *Lythrum*-dominated community was significantly less (t-test; $p < 0.05$) than the mean biomass of *Typha* in the *Typha*-dominated community. The biomass of all plants excluding *Lythrum* and *Typha* was significantly greater in the *Lythrum* community (t-test; $p < 0.05$). Based on our initial sampling and previous research, we then hypothesized that *Typha* litter is the major factor that limits species richness in these marsh communities. In 2010, a reciprocal litter transplant study was conducted in areas dominated by *Lythrum* and *Typha*, respectively. Biomass, stem counts, plant height, root density, water depth, and litter depth were measured throughout the summer across four treatments (*Typha* litter, *Lythrum* litter, no litter, and control) in a *Lythrum*-dominated community and in a *Typha*-dominated community. Our preliminary results indicate that root density and litter depth of *Typha* may be important factors limiting growth of neighboring species in these wetlands. (Oral presentation.)

## TRACE ELEMENT DISTRIBUTION IN DOLOSTONES FROM THE PERMIAN BASIN, WEST TEXAS.

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Dolomites from the San Andres and Clearfork Formations show intervals of anomalous uranium enrichment on spectral gamma ray logs. To better understand the fluids that were responsible for dolomitization and as a way of comparing the two dolomites we have used multiple analytical tools to examine elemental distribution, particularly of redox-sensitive trace metals. Phosphor imaging of the slabs shows that the uranium is excluded from the associated anhydrite and that the uranium distribution in the dolomites is heterogeneous. Using these images as a guide for more detailed analyses we took thin sections to the microprobe at X26A at the National Synchrotron Light Source. Using new flyscan technology we were able to map several millimeter-sized areas with high spatial resolution. In both sample groups the microdistribution of U appears primarily to take the form of < 0.01 mm granules and clumps. In both sets of samples elevated Pb concentrations are generally correlated with those of Fe, but areas of U-enrichment correlate with neither. Certain distinctions exist between the San Andres and Clearfork samples, however. In the San Andres formation the overall texture of elemental distribution on sub-millimeter scales is patchy. Regions of elevated Fe + Pb concentration are larger (up to 0.1 mm) and more morphologically complex. Elemental distribution in the Clearfork formation is more uniform, lacking patchiness and with few trace element enriched grains of > 0.02 mm.

Four small (100-1000 $mm^3$) sub-samples of one Clearfork core segment from 6473 feet depth were extracted from specific parts of one thin section tablet (i.e., from within several mm of each other), digested in nitric acid and analyzed by quadrupole ICP-MS. The samples are primarily dolomite with some traces of anhydrite, which was left as an insoluble residue. These sub-samples yield restricted variability in U concentration (~30 ppm) and elemental ratios such as U/Pb (~ 40), U/Th (~2). Concentration of U is modestly correlated with redox-sensitive V ($R^2$ = 0.87), whereas abundances of other first row transition metals (e.g., Mn and Zn) are largely invariant. Other redox-sensitive (e.g., Mo, W) and fluid-mobile (e.g., Li) trace elements show positive but non-linear correlation with U concentrations. Sub-samples have weakly positively-sloped shale-normalized REE patterns with prominent negative Ce anomalies and flat HREE distributions. (Poster presentation.)

## WINTER BIRD MIGRATION OBSERVED BY WSR-88D RADAR IN THE VICINITY OF THE GREAT SALT LAKE, UTAH.

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Annual damage to aircraft due to collisions with birds and biases in meteorological radar data provide significant reasons to study bird migration patterns. Limited analysis of bird migration events has been performed for the Great Salt Lake, Utah area. Furthermore, the migration events observed by radar in the vicinity of the Great Salt Lake during this study have several notable differences than previous radar studies which have primarily focused on songbird migrations. The current study investigates migration events, specifically of the tundra swan and other waterfowl, in the vicinity of the Great Salt Lake using Weather Surveillance Radar-1988 Doppler (WSR-88D) data from Salt Lake City, Utah (KMTX). A total of 277 migration events were identified in the months of November through January for the winters of 1997/98 through 2009/10. Three classifications were determined based on the evolution of radar reflectivity patterns using WSR-88D level II and level III data. Each event was defined as concentrated, widespread, or combination. Nearly all migration events observed by radar had start times between 0000 and 0200 UTC and durations of less than 2 hours. Of the 13 winters examined, there was an average of 21 events per winter, with a 2009/10 minimum of 12 events and a 2002/03 maximum of 38 events. The largest frequency of migration events was observed during the month of December. The months of November and January had approximately 57% and 27% of the frequency observed in December, respectively. In order to further relate migration findings to meteorological conditions, atmospheric soundings and surface observations were analyzed for the Salt Lake City, Utah area, for both event and non-event days. (Oral presentation.)

## DETERMINING THE STAGES OF BREAST CANCER THROUGH URINE ANALYSIS BY NMR SPECTROSCOPY.

Christopher Wirth, Haley McClory, Andrew Hogenkamp, Kevin Cutler, Levin Oscarlce, Julie Hughes, Lawrence Mielnicki, Ph.D., and Mary McCourt, Ph.D., Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109.

All cells in the body generate metabolites as by-products of the myriad of chemical reactions that occur within them. Research shows that most types of cells have different sets or concentrations of metabolites associated with their processes. Thus every tissue and cellular process in the human body has a metabolic signature, including those processes that occur within cancer cells. It follows then that cancer cells should have a different metabolic profile than their non-cancerous counterparts. The present study seeks to develop a method to analyze these metabolites and establish relationships between metabolic profile and disease state in human breast cancer and breast cancer progression. Most current methodologies to examine the metabolites of breast cancer cells require a biopsy to obtain the source cells. A noninvasive procedure to identify and analyze breast tumor cell-associated metabolites would be ideal. Metabolomic analysis of urine using $_1$H Nuclear Magnetic Resonance (NMR) spectroscopy is just such a procedure. The working hypothesis for metabolomic analysis development is that metabolites and metabolite levels reflect the state of the organism and that changes in metabolites over time can be used as a predictor of disease state. Therefore differential disease states can be identified using statistical analysis in combination with various experimental spectroscopy techniques. The goal is to determine differences in metabolites between patients presenting with the various stages of breast cancer. The samples will be drawn from the Army of Women and commercial biobank sources, such as BIOSERVE. Once the baseline determinations have been made, 1000 samples will be obtained, with at least 100 from each of the stages of breast cancer progression. The present study will utilize a Varian 400MHz NMR. Currently sterile urine samples have been obtained and have been treated with a buffer/standard cocktail consisting of 0.75M phosphate buffer, $D_2O$, 5mM DSS and 0.1M imidazole. The samples were then separated into 1mL aliquots and frozen at -80°C until use. To set baselines for urine spectra and to assure all NMR users are consistent, the aliquots are run 10 times each using PRESAT and 1D NOESY protocols. The PRESAT is used to suppress the water peaks in the spectra and the 1D NOESY is used to collect data from macromolecules in the sample. (Sample data can then be used to ascertain the ability and consistency of the user.) Statistical analysis will be performed using SIMCA-P program from a Umetrics statistical package to obtain PCA/PLS-DA. Operator reliability and relevant differences in the data can then be determined for each spectra. This will determine the accuracy of each spectra compared to each other, as well as to other NMR users. Once clinical

human urine samples are obtained and the users spectra have been validated as acceptable, statistical data will be obtained to monitor consistency, and the determination of concentration of metabolites will be factored in. The concentrations of metabolites will be obtained through the use of Chenomx software. (Poster presentation.)

## COMPARISON OF AMINO ACID SEQUENCE IN MESODERM-RELATED GENES IN EUECHINOID AND CIDAROID SEA URCHINS.

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Within the Echinodermata phylum, the Class Echinoidea is divided into two Subclasses, the Euechinoidea, which are commonly used as models, and the Cidaroidea, which have striking morphological differences in both the embryo and adult stages. These sea urchins are believed to have diverged approximately 250 million years ago. The sea urchin models will provide insight into the developmental function and evolution of five specific transcription factors. T-brain, Brachyury, GCM, GataE, and GataC regulate the development of the mesodermal germ cell layer. In this study, sequences from euechinoid sea urchins were used as references and compared with the internal sequence fragments we obtained from the cidaroid sea urchin. Amino acid sequences were then compared using Simple Modular Architecture Research Tool (SMART), which allows for identification of domain architecture within a specified sequence. From the data collected, schematics of referenced gene sequences were aligned with the obtained partial internal sequences for visual analysis. These preliminary data provide a basis for future work in 1) amplifying the 5' and 3' ends of the genes of interest, 2) discovering the location in the embryo where the genes are expressed, and 3) identification of the function of these transcription factors. (Poster presentation.)

## THE RELATIONSHIP BETWEEN *ILYANASSA OBSOLETA* AND BLOOM-FORMING MACROALGAE.

Charles Yarrington and A. Christina Tyler, Program in Environmental Science, School of Biological and Medical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Eutrophication is one of the greatest problems presently facing our estuaries, to the extent that we risk the loss of the many ecosystem services that these systems provide. In shallow estuaries, the eutrophication that results from excess nutrient loading can lead to dense mats of opportunistic algae. When these algae decompose they can lead to low oxygen levels, and ultimately ecosystem collapse. A clear seasonal association between the Eastern Mud Snail, *Ilyanassa obsoleta* and these opportunistic algae has been observed in the field ($p<.0001$), but the basis for and ramifications of this association are not known. Through field and laboratory experiments we seek to determine the basis for the co-occurrence of *I. obsoleta* and *Ulva lactuca* and the potential for mutual facilitation. Field surveys and three separate field experiments were conducted in both late June and early August 2010. Four separate lab experiments were conducted throughout the summer of 2010. Sediments and organisms were collected from West Falmouth Harbor, a shallow estuary on Cape Cod, MA, USA currently experiencing increasing nitrogen loading. Preliminary data confirms the existence of the attraction of the snail to the algae, but only early in the summer when the snails are reproductive. Algae fertilized with snail excreta grew better than when it was fertilized with other nitrogen species. Also algal growth response may differ depending on the presence of snails and/or sediment. In spite of higher algal growth rate in the presence of snails in the laboratory, differential algal growth rates in the field seem to be due to intersite variation. Further field experiments show that the snails could be attracted to the algae by their need to lay eggs on a hard substrate and not as a refuge. Data suggest that the causes for the association between *I. obsoleta* and *U. lactuca* are complex and not mutually exclusive. (Oral presentation.)

## *OPEN IMMATURE FLOWER (OIF)*, A GENETIC ENHANCER OF *SR45*, IS INVOLVED IN THE REGULATION OF FLOWER DEVELOPMENT IN *ARABIDOPSIS THALIANA*.

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Alternative splicing is an important mechanism for regulating protein levels and increasing protein diversity that is conserved throughout eukaryotes, including plants. SR45 in *Arabidopsis thaliana*, belongs to a family of splicing factors (the serine-arginine-rich (SR) proteins) which recognizes splice sites and initiate spliceosome

assembly for splicing to occur. A mutation in the *SR45* gene (*sr45-1*) causes mild defects in the flower development and fertility. We isolated a genetic enhancer of *SR45* and named it *OPEN IMMATURE FLOWER* (*OIF*). Double mutants (*sr45-1;oif*) show more severe developmental defects in different flower organs and significantly reduced fertility. The premature flower opening appears to result from a combination of the overcurvature of the sepal and the accelerated longitudinal growth of the abnormal carpel, while reduced fertility is likely due to defects in both anther and carpel development. We compared the splicing pattern of potential gene targets and the flower development in details among *sr45-1*, *sr45-1;oif* mutants, wild type strains of *Arabidopsis*. Our findings suggest that *oif* mutations enhance the effect of *sr45-1* on the regulation of the splicing pattern of some SR protein genes. Our hypothesis is that OIF functions with SR45 in the regulation of a subset of SR proteins which in turn regulate the splicing targets in the flower development. We are currently in the process of mapping *OIF*. (Oral presentation.)

# THIRTY-EIGHTH ANNUAL SCIENTIFIC PAPER SESSION

## MONROE COMMUNITY COLLEGE
## ROCHESTER, N.Y.
## October 29, 2011

## LARRY J. KING MEMORIAL LECTURE

### Disappearing Ice! Mass Loss and Dynamics of the Greenland Ice Sheet
**Dr. Beata Csatho**
**Department of Geology, University of Buffalo**

## ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

### HYDROCARBON DEGRADING BACTERIA ISOLATED FROM A PINE STAND IN MENDON PONDS, MENDON, NY.
Mohd Nico Abel and Dr. Jeff Lodge, Rochester Institute of Technology, School of Life Sciences, Rochester, NY 14623.

Two bacterial isolates were found that can degrade various hydrocarbons by enriching soil samples from a pine stand in Mendon, NY with a mixture of medium chain length alkanes, gasoline, and motor oil. The isolates PF1 and PF2 degraded various hydrocarbons such as medium chain length alkanes, an alkane mix, motor oil mix, CIMS organic mix, and biodiesel fuel. PF1 and PF2 can degrade a hydrocarbon mixture over a broad range of oxygen concentrations with the best degradation occurring at high aeration rates. PF1 and PF2 could degrade hydrocarbons when grown in different environmental conditions/media including water from Canandaigua Lake and Slater creek water and sediments. The ability to degrade hydrocarbons under a variety of environmental conditions may be important when developing a commercial blend of bacteria for use at contaminated sites. (Poster presentation.)

### DO RECENTLY METAMORPHOSED AMERICAN TOADS (*BUFO AMERICANUS*) RESPOND TO CHEMICAL STIMULI FROM VERTEBRATE AND INVERTEBRATE PREDATORS?
Michele M. Adams, Maya M. McElfish, and Aaron M. Sullivan, Houghton College, Department of Biology, Houghton, NY 14744.

Many vertebrate species use chemical cues from predators or injured conspecifics to evaluate predation risk. Chemoreception offers advantages as chemicals may persist after a predator has left an area and may be effective in small quantities or when visual cues are limited. Our study attempted to evaluate the chemically mediated behavior of newly metamorphosed American toads (*Bufo americanus*) exposed to the chemical stimuli from four potential predators: fishing spiders (*Dolomedes* sp.), ring-necked snakes (*Diadophis punctatus*), and garter snakes (*Thamnophis sirtalis*). We asked four questions with our study: 1) Do toads alter their activity when exposed to chemical cues from predators? 2) Is toad activity correlated with body size? 3) Do toads avoid substrates soiled with the chemical stimuli from invertebrate and vertebrate predators? 4) Will groups of toads alter their spacing patterns in the presence of predator chemical cues? To evaluate activity, we conducted trials in petri dishes whose lids were visually divided into quadrants and we recorded the number of times that toads moved between quadrants. At the conclusion of the 15-min trial, the total length of each toad was measured. To determine if toads would avoid substrates containing predator cues, we placed two semicircles of filter paper within petri dishes, one receiving the control and the other a predator cue, and we tallied the amount of time spent on each. To observe how toad cohesion was affected by the presence of predator cues, three toads were placed in petri dishes and the average distance between toads and the center of the triangle formed by their bodies was calculated after 10 minutes. Our data

suggest that recently metamorphosed *B. americanus* do not respond chemical cues from predatory *Dolomedes*, *Thamnophis* or *Diadophis* by altering their activity, avoiding substrates containing chemical cues, or increasing the cohesiveness of their groups in the laboratory setting. In addition, toad activity does not appear to be correlated with body size in the presence of the different predator cues. Because earlier studies suggest that toads respond more effectively to visual cues during the day, a series of experiments similar to these, but performed at night or in the absence of visual stimuli, may reveal interesting aspects of the chemically mediated predator-prey interactions. (Poster presentation.)

## CHARACTERIZATION OF STAPHYLOCOCCI ISOLATED FORM WHITE-TAIL DEER.

Susana Agudelo-Uribe, Mary Gallo, Patrick Teixeira, and Mark Gallo, Ph.D., Niagara University, NY 14109.

Staphylococci are common inhabitants of warm-blooded mammals. One species in particular, *S. aureus*, is known to be a pathogen. Antibiotic resistance has become a big concern regarding this bacterium in the clinical and agricultural settings. This investigation addresses the level and diversity of antibiotic resistance in Staphylococci isolated from white-tail deer, *Odocoileus virginianus*. (Poster presentation.)

## THE USE OF BIO-CHAR IN NATIVE AMERICAN CORN HILL AGRICULTURE.

Ali Ahmed and Paul Shipman, School of Life Sciences, Rochester Institute of Technology, Lomb Memorial Dr., Rochester, NY 14623.

Recent discoveries indicate that as much as 30% of the land mass in the Amazon River Basin in South American may consist of human-created soils that were part of an agricultural system prior to the arrival of Europeans on the continent. An important component found in these Terra Preta, or dark earth soils, is the amendment of anthropogenic carbon known as bio-char. Bio-char has recently been the focus of an increasing number of studies because of its possible use for increasing agricultural production, soil remediation, and carbon sequestration. Growing corn on small human-constructed hills in multi-species planting arrangements is a documented Native American agricultural practice in North America known as Three Sisters gardening. We found anecdotal references that indicate the possible historical use of bio-char in North American corn hill agriculture. We performed an experiment to test for benefits of incorporating bio-char in corn hills on the Rochester Institute of Technology's campus. We found significantly greater plant growth and corn production on corn hills that had bio-char compared with our control plantings. This study provides evidence for the possibility that bio-char may have been a much more important component of historical Native North American agriculture than previously thought. (Oral presentation.)

## A MICRO RNA SCREEN FOR NOVEL EUKARYOTIC FLAGELLAR MOTILITY PROTEINS.

Noveera Ahmed[1] and Beth Ferro Mitchell[2]; [1]St. John Fisher College, Department of Biology, 3690 East Avenue, Rochester, NY 14618; and [2]Le Moyne College, Department of Biological Sciences, 1419 Salt Springs Road, Syracuse, NY 13214.

Motile flagella and cilia are highly conserved organelles found in all branches of eukaryotic life. The characteristic internal structure includes two rows of motor proteins, the inner and outer dynein arms, attached to 9 outer doublet microtubules. The dynein arms are large ATPase protein complexes which drive flagellar movement. Previous studies of these protein complexes shows that cytoplasmic factors are required for both their correct assembly from component polypeptides and their targeting/transport to the proper flagellar location. We have begun looking for novel dynein assembly factors using artificial microRNAs to create targeted knockdowns of candidate genes in the flagellated unicellular alga *Chlamydomonas reinhardtii*. Candidates were selected through a combination of comparative genomic, transcriptomic and proteomic analysis, and based on results from mutations in a variety of other model organisms. Two plasmids containing artificial microRNA sequences were created for each candidate gene, and *C. reinhardtii* transformed with these plasmids were then screened for flagellar motility defects. Cells which could still assemble flagella, but could not swim normally were selected for further analysis. Phenotypes of selected transformants included cells with paralyzed flagella (complete inability to swim), cells that could swim slowly, and cells showing other atypical forms of movement. Experiments are underway to screen selected transformants to confirm the predicted decreased mRNA and protein expression, and to characterize the

knockdown phenotypes at the level of flagellar ultrastructure and motility. Additional planned validation involves complementation of knockdown phenotypes (back to normal motility) by expression of coding regions that lack microRNA targeting sequences and that include epitope tags for protein localization studies. (Poster presentation.)

## TEMPERATURE DEPENDENCE OF SELF-ASSEMBLY OF AMYLOID BETA PEPTIDE AT NANOSCALE GOLD COLLOIDAL SURFACE.

Michael Annese, Giang Nguyen, and Queeny Pan, SUNY Geneseo, 10 MacVittie Circle, Geneseo, NY 14454.

The reversible self-assembly process involving oligomer of amyloid β1-40 peptide was examined on gold colloidal suspension of 20, 30, and 40 nm size under temperature ranging from 5 to 45 °C. As the pH was externally changed repetitively between pH 4 and 10, a reversible assembly was observed for an entire temperature range for 20 nm gold colloid. However, 30 and 40 nm colloids support the reversible process at lower than 18 °C and 6 °C, respectively. Even when temperature was increased in the middle of the self-assembly process, the reversible process was maintained. This specific and unique size and temperature dependence in reversible color change strongly suggests that the initially constructed conformation of the amyloid under the surface potential drives an entire reversible assembly process. (Poster presentation.)

## STABLE OPTICAL LIFT.

Alexandra Artusio-Glimpse, Grover Swartzlande, Tim Peterson, and Alan Raisanen, Rochester Institute of Technology, Carlson Center for Imaging Science, Rochester NY 14623.

We are pioneering a new, opto-mechanical process called "optical lift". In this process, carefully shaped, refractive objects, termed "lightfoils", experience a force in the direction perpendicular to a uniform illuminating beam of light. In practice, lightfoils are on the order of several microns, and experience picoNewtons of force due to the change in the momentum of incident light. Arrays of lightfoils may be combined to generate forces of greater magnitude. We are further exploring this discovery for use on solar sail technology. Here we report our initial theoretical and experimental findings. (Poster presentation.)

## SCREENING OF TRANSPOSON MUTANTS OF *SPHINGOBIUM* SP. KK22 ALTERED IN QUORUM-SENSING SIGNAL SYNTHESIS.

Nazrin Abd Aziz and Michael A. Savka, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Dr., A350 Gosnell Hall, Rochester, NY 14623.

We have shown that bacterium, *Sphingobium* sp. KK22, produces communication signals known as N-acyl-homoserine lactones (AHLs). AHLs signals function in a cell-to-cell gene regulatory process called quorum sensing (QS) that is cell density dependent. *Sphingobium* sp. KK22 was subjected to genetic mutagenesis using transposon Tn5 and the resulting mutants were screened for differences in AHL signal accumulation as compared to the wild type strain. Growth of wild type *Sphingobium* sp. KK22 in various media has showed that this strain produces different AHL signal profiles on different media and that the AHL profile is altered in different growth phases. Growth in R2A/TYE medium resulted in two AHL signals whereas growth in only R2A showed five AHL signals. Among the 1404 mutants screened, mutant M666 has been identified as overproducing AHL signals. The identification of the gene mutated in M666 will enable the identification of a gene responsible for AHL signal synthesis or a gene that acts in the regulation of AHL synthesis in this bacterium. (Poster presentation.)

## SURFACE EVOLUTION AND RETREAT PATTERNS OF THE NORTHWEST GREENLAND ICE SHEET: A MULTITEMPORAL, MULTISENSOR APPROACH TO UNDERSTANDING DYNAMIC GLACIER BEHAVIOR.

Greg Babonis[1], Bea Csatho[1], Toni Schenk[1], Cornelis van der Veen[2], [1]SUNY at Buffalo, 411 Cooke Hall, Buffalo, NY 14260; and [2]University of Kansas, 203 Lindley Hall, Lawrence, KS 66045.

Over the past twenty years we have seen dramatic changes in the behavior of Greenland Ice Sheet (GrIS) outlet glaciers. Mass balance trends show acceleration in ice-mass loss, resulting in greater sea level rise than model predictions. Moreover, the mass loss is rapidly spreading towards higher latitudes and elevations; in particular along

the northwestern coast. Although recent outlet glacier changes are well documented, the driving processes are not well understood. To better understand the mechanisms initiating these changes, it is important to extend the observational record to investigate long-term thinning and retreat of the GrIS. This study presents a reconstruction of surface evolution and outlet glacier retreat behavior within the northwest GrIS combining data from topographic maps, aerial photography, satellite imagery, and the synthesis of airborne and satellite altimetry measurements. Here we present results from our novel, comprehensive method called Surface Elevation Reconstruction And Change detection (SERAC), which estimates surface changes through simultaneous reconstruction of surface topography from fused multisensor data. We investigate the relationship between previous work on retreat patterns and new thinning histories. We compare changes in ice-mass over time, and the propagation of thinning to higher elevations, with climate records of both ocean and surface temperatures to constrain mechanisms driving these changes. Additionally we seek to estimate the potential contribution of the northwestern sector of the GrIS to sea level rise. This will be a benchmark for future studies, which will look more comprehensively at individual mechanisms. (Poster presentation.)

## CED-3 MUTANT *CAENORHABDITIS ELEGANS* DEMONSTRATE A DECREASED AMOUNT OF APOPTOSIS WITHIN THE GONAD.

Katelyn Barnhart and Joan E. Magnusen, Keuka College, 141 Central Avenue, Keuka Park, NY 14478.

Apoptosis is the process of programmed cell death and occurs after a signaling cascade takes place which in the end signals the cell to die. The process of apoptosis has been a topic of interest because when cells that typically undergo apoptosis do not, the result can be cancer. Caenorhabditis elegans is a model organism that has been used to study the process of apoptosis. Previous studies showed that within the first 3 to 4 days of adulthood 300 germline cells undergo apoptosis within the gonad of the N2, wild type, strain of C. elegans. Ced-3 mutants lack the protein ced-3 which functions similarly to a caspase found in humans. It is involved in a signaling cascade that results in apoptosis. We tested the hypothesis that ced-3 C. elegans would have a decreased amount of apoptosis in the gonad as compared to N2. In order to study apoptosis within the gonad, a technique was developed for visualizing the germline of C. elegans using differential interface contrast (DIC) microscopy. Using a 3mM levamisole solution, which acts as a relaxant to prevent movement, in a well made of petroleum jelly, DIC was used to visualize the gonad of the C. elegans. When using a 100x objective oil immersion lens normal and apoptotic germline cells can be distinguished due to their appearance. To quantify the number of apoptotic cells within each gonad, images were taken at 1000x and a counting field was imposed on the image. The number of apoptotic cells was recorded and compared between N2 and ced-3 mutants. Analysis of photographs revealed consistently fewer apoptotic cells in the gonad of ced-3 mutants compared to N2. These results suggest that ced-3 protein is involved in normal cell death of germline as well as somatic cells. (Poster presentation.)

## THE INVESTIGATION OF TIN(II) FLUORIDE AS A LEWIS ACID CATALYST FOR BIODIESEL PRODUCTION.

Emily Benton and Richard Hartmann, PO Box 65 Nazareth College, Chemistry Department, 4245 East Ave., Rochester, NY 14618.

Biodiesel has become a very popular alternative fuel due to the increasing scarcity and expense of petroleum. One common and inexpensive precursor of biodiesel is waste cooking oil. However, this oil often contains high levels of free fatty acids (FFA), which require pre-treatment in the form of acid catalyzed esterification. Typically this is accomplished with methanol, and an inexpensive Brønsted acid catalyst, such as sulfuric acid. However, sulfuric acid is very corrosive and can cause the sulfur content of the final product to exceed the 7 ppm, a limit established by the EPA. We have been investigating the use of the Lewis acid tin(II) halide, in order to avoid the adverse characteristics associated with sulfuric acid. Our results show that these Lewis acids effectively catalyze the methylation of oleic acid. Kinetic studies were performed using 1H NMR by converting the integrals at 3.7 ppm (methyl ester) and 2.3 ppm (□-carbonyl) into percent methyl ester formation. From the data collected thus far, the following trend in increasing activation energy has been obtained: SnI2 < SnBr2 < SnCl2 < SnF2. (Poster presentation.)

## THE INFLUENCE OF WATERSHED LAND USE ON THE COMPOSITION OF DISSOLVED ORGANIC MATTER ENTERING CONESUS LAKE, NY.

Morgan R. Bida, Todd Pagano, and A. Christina Tyler, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Drive; Rochester, NY 14623.

Agricultural land use within the watershed of the Finger Lakes Region of New York State influences the quality of water supplied to freshwater aquatic ecosystems by increasing the delivery of inorganic nutrients such as nitrate and phosphate. We know much less, however, about the influence of farming on the quantity or composition of dissolved organic matter (DOM) supplied to these systems. With 70% of the flow to Conesus Lake supplied by more than 18 unique streams and several smaller tributaries, the lake has a topography that makes it an ideal study site for an analysis of the effects of land use on DOM quality. Further, the recent decline in the water quality of Conesus Lake suggests that the ability of the system to sustain its multiple uses may be at risk. A comprehensive characterization of DOM entering the lake in relation to sub-watershed land use will provide valuable information for ongoing watershed restoration efforts. The chemical composition of DOM is significant for the support of aquatic food webs, the availability of nutrients and metals in aquatic ecosystems, and the optical properties of water. We hypothesize that the proportion of agricultural land use can be correlated to the chemical composition of DOM delivered to the system. By exploiting the optical properties of DOM using UV-visible spectroscopy and fluorescence excitation-emission matrices (EEMs) with parallel factor analysis (PARAFAC), a chemometric technique for the decomposition of characteristic fluorescence peaks, along with measurement of dissolved organic carbon (DOC), phenol, and nutrient concentrations, specific UV absorbance at 254 nm (SUVA254), and the fluorescence index (FI), we will assess the influence of land use on the quality of DOM entering Conesus Lake. (Oral presentation.)

## CREATING HIGH RESOLUTION IMAGES FOR ENHANCED UNDERSTANDING OF BIOLOGICAL ORGANISMS.

Erika Bliss[1], Kaitlyn Rubin[2], Dina Newman[3], Karen Evans[4], and Jeff Pelz[4]; [1]Rochester Institute of Technology, Department of Chemical and Biomedical Engineering, Rochester, NY 14623; [2]Rochester Institute of Technology, School of Photographic Arts and Sciences, Rochester, NY 14623; [3]Rochester Institute of Technology, School of Life Sciences, Rochester, NY 14623; and [4]Center for Imaging Science, Rochester Institute of Technology, Rochester, NY 14623.

Many professors who teach biology, particularly for non-majors, have considered switching to digitized microscope images because of perceived savings in time and money. With digitized slides, instructors would no longer have to spend large amounts of class time teaching individuals how to use a microscope and would no longer need to purchase and maintain a microscope for every student. New technology enables instructors to present the digitized images on a computer in a way that mimics the microscope. Although the technology is out there, there is not research discussing whether the latest technology is more beneficial to a student's understanding of the material. First, we want to know if it is even possible to simulate the experience of using a microscope on a computer. Can the digitized images provide an equivalent experience to that of a microscope? If it can, which method aids in the understanding of the material the most? This project was designed to determine students' needs and viewing preferences and to find a method to facilitate the transition to digital images. Digitizing the images consists of shooting multiple layers of the microscope slide, stitching the layers together, and then either outputting a focus-stacked image or leaving the layers intact for dynamic focusing. Focus-stacking collapses the various layers into a single layer and provides a uniform picture at each point in the 2-D plane of the image. Dynamic focusing enables the users to step through the multiple layers and look at each layer individually, similar to using a microscope. The current phase of our project focuses on running pilot studies, which will reveal how students utilize the different viewing formats and their preference. Ultimately, we want to know if the average student would still need to learn to use the microscope as an educational tool or if it would be more advantageous to replace it with the computer. (Poster presentation.)

## INVASIVE PLANTS SURVEY AT HIGH ACRES NATURE AREA, PERINTON, NY.

Kathryn Boa[1], Lisa Kratzer[1], Matt Paufve[2], Christy Tyler[1]; [1]Rochester Institute of Technology, School of Life Sciences, Environmental Science Program, 85 Lomb Memorial Drive, Rochester, NY 14623; and [2]Monroe Community College, Biology Department, 1000 East Henrietta Road, Rochester, NY 14623.

Wetlands are important ecosystems that provide many services such as stormwater detention, nutrient absorption, groundwater recharge, and wildlife habitat. Invasion of wetlands by aggressive species such as *Typha* sp. (cattail), *Phragmites australis* (common reed), *Phalaris arundinacea* (reed canarygrass), and *Lythrum salicaria* (purple loosestrife) alters community dynamics and is a management concern. Efficient use of nutrients, clonal growth forms resulting in monoculture, positive feedback loops and allelopathy are all potential invasion mechanisms. High Acres Nature Area (HANA) in Perinton, NY is a 250-ha site owned and managed by Waste Management Corp., and includes four mitigation wetlands constructed in 2009 along with a mosaic of natural wooded and emergent wetlands. Current management plans include mechanical and chemical means of control for invasive plants. GIS software ArcMAP was used to create a 10 m by 10 m point grid overlaying the created and natural wetlands at HANA to create potential survey points. Between 18 June 2011 and 20 August 2011 we surveyed 2000 points to determine plant cover and detect source populations of invasive plants. Wetland invasive species covered approximately 20% of the wetlands, with *Typha* sp. as the dominant invasive (11.6% cover), followed by *P. arundinacea* (8.4%) *P. australis* (6.3%), and *L. salicaria* (2.8%). Establishment of this baseline vegetation cover and permanent sampling points will allow for monitoring of the invasive species over time and assessment of control efficacy. (Poster presentation.)

## INVESTIGATION OF THE LOW $\nu$ METHOD TO DETERMINE NEUTRINO FLUX AT LOW ENERGIES.

A. Bodek[1], U. Sarica[1], D. Naples[2] and L. Ren[2], [1]University of Rochester, Department of Physics and Astronomy, Rochester, NY 14627, and [2]University of Pittsburgh, Pittsburgh, PA 15260.

We investigate the low ν method (developed by the CCFR/NuTeV collaborations) to determine the neutrino flux in a wide band neutrino beam at very low energies, a region of interest to neutrino oscillations experiments. Events with low hadronic final state energy $\nu < \nu\text{cut}$ of 1, 2 and 5 GeV were used by the MINOS collaboration to determine the neutrino flux in their measurements of neutrino ($\nu\_\mu$) and antineutrino ($\bar{\nu}\_\mu$) total cross sections. The lowest $\nu\_\mu$ energy for which the method was applied is 3.5 GeV and the lowest $\bar{\nu}\_\mu$ energy was 6 GeV. At these energies, the cross sections are dominated by inelastic processes. We investigate the application of the method to determine the neutrino flux for $\nu\_\mu$ and $\bar{\nu}\_\mu$ energies as low as 0.75 GeV, where the cross sections are dominated by quasielastic scattering and Δ(1232) resonance production. We find that the method can be extended to low energies by using νcut values of 0.5 and 0.25 GeV, which are feasible in fully active neutrino detectors such as MINERvA. (Oral presentation.)

## A STUDY OF POWER GENERATION USING FERROMAGNETIC LIQUIDS.

Rory Burke and Adrian Ieta, SUNY at Oswego, Department of Physics, Oswego, NY.

Ferrofluids are usually made of liquid carrier in which ferromagnetic nanoparticles are coated with a surfactant float. The fluid magnetizes while in magnetic field but it loses almost all the magnetization while the external magnetic field is removed. We study mechanical energy conversion using the magnetic properties of a ferrofluid. The ferrofluid is used in a circular configuration that can rotate. The magnetic liquid is placed in a permanent magnetic field and it can enter and exit the signal pickup coils placed in a permanent static magnetic field. As the fluid enters the pickup coil, the inductance of the coil changes and voltage is induced in the coil. The induced voltage is studied at different fluid rotational frequencies and ferrofluid column lengths. The efficiency of the mechanical energy conversion is also assessed. (Poster presentation.)

## EXPERIMENTAL STUDY OF BROWN-BIEFELD EFFECT.

Rory Burke, Christopher Wahl, Gabriella Medina, Tajia Rae Thurston, and Adrian Ieta, SUNY at Oswego, Department of Physics, Oswego, NY.

When a high voltage above corona onset is applied, an ion wind is generated. If used properly, it can be conducive to having the entire device fly in the air. This levitation phenomenon is called Brown-Biefeld effect, after the scientists who discovered it. Originally, and even in the last couple of years, this levitation phenomenon was thought to be generated due to forces that may be some sort of antigravity forces. However, recent research showed theoretically and experimentally that lifting forces can be explained on the basis of corona wind only. We designed, built, and successfully levitated a few lifters from balsa wood with masses between 5 g and 10 g. The levitation was achieved within the 17 kV to 25kV range. The main goal of the experimental research was to reveal the actual parameters when corona wind is in fact noticeable in different cross-sections of the different electric fields generated by the built devices. In this respect, additional devices were built (not designed to levitate) for observing corona wind inception only. Liquid nitrogen, smoke, and a 10o fan angle laser sheet were used in the setup. Parameters were linked to the associated measured corona current. (Poster presentation.)

## METHYLATION OF PHENOLS WITH DMF-DMA USING A LABORATORY MICROWAVE.

Veronica L. Campanella, Pavel Belov, Alison W. Smith, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

We evaluated the potential of N,N-dimethylformamide dimethylacetal (DMF-DMA) as a methylating agent for a library of para-substituted phenols under microwave irradiation. The rate of reaction was dictated by the electronic nature of the para-substituent. With an electron-withdrawing group the reaction was completed within 30 min. For electron-donating groups, the reaction times were 60 min. Esterification and enamino-ketone formation was also observed with carboxylic acid and ketone functional groups, respectively. (Poster presentation.)

## STUDIES TOWARD THE TOTAL SYNTHESIS OF TROCHELIOPHOROLIDE A.

Anthony Carestia, Jennifer Swartzenberg, Stephanie Dorn, Jessica Smith, Moni Augusto, William Spencer and Dr. Christina Collison, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Trocheliophorolide A is one of four butenolide natural products found in the soft coral *Sarcophyton trocheliophorum* located in the Red Sea. The reason there is interest in synthesizing Trocheliophorolide A is because it has shown to be biologically active against *Staphylococcus aureus* and *Bacillus subtilis*. The synthesis of Trocheliophorolide A will be a convergent synthesis culminating in an organometallic coupling to join the two advanced intermediates. (Poster presentation.)

## HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC) ANALYSIS OF VITAMIN D3 IN ALGAE SAMPLES.

Joy Valerie Carrera, Diane Catlin, Dr. Loraine Tan, Dr. Sandra Connelly, Dr. Jeremy Cody, Kelly Walling, and Stephanie Bowles, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Increasing levels of ultraviolet radiation (UVR) in freshwater systems have been detected with constantly changing environmental conditions. Organisms of freshwater ecosystems must adapt accordingly, these systems are particularly susceptible due to their high exposures to solar radiation. The overall purpose of this collaborative research is to determine the survival and reproduction rates of vitamin D3 exposed *Daphnia* spp. under varying UVR conditions. In *Daphnia* spp., vitamin D3 was evaluated for its photo-protective properties under UV-A and UV-B exposure. Vitamin D3 and its metabolites were analyzed in experimental samples using High Performance Liquid Chromatography (HPLC). Vitamin D3 and several metabolites were recovered in the *Daphnia* spp., algae food source (*Selenastrum capricornutum*), and aqueous samples following UV exposure in a controlled microcosm setting. In previous experimentation vitamin D3 was recovered in control samples (0% vitamin D3 addition) indicating a strong role of algae in the transport of nutrients to the *Daphnia* spp.

The current focus of this research is to test algae under stressed conditions to better understand the metabolic effects of vitamin D3 and UVR with and without *Daphnia* spp. Through this experimentation, the source of vitamin D3 metabolic conversion in freshwater ecosystems as well as the potential for the vitamin D3 to act as an of environmental stress reducer in *Daphnia* spp. can be better understood. (Poster presentation.)

## DEVELOPING MICROPLATE ASSAYS FOR MCH SIGNALING.

Robert T. Carroll and Laurie B. Cook, The College at Brockport, SUNY, 217 Lennon Hall, 350 New Campus Drive, Brockport, NY 14420.

Melanin-concentrating hormone (MCH) signaling regulates appetite and energy expenditure in mammals. Manipulation of MCH signaling pathways could potentially suppress appetite in obese patients. Our lab is interested in understanding how cells turn off this appetite signal. This study aims to develop microplate assays to measure MCH signaling leading to both leptin transcription and intracellular calcium flux in a BHK-570 cell culture model. MCH-induced secretion of leptin from adipogenic stores is used as a feedback mechanism to shut down appetite. To assess the dynamics of this signal, we cotransfected the mouse leptin promoter luciferase construct p(-762)ob-luc with MCHR1-eYFP and exposed the cells to MCH for various times. We were successful in measuring 2.8-fold increase in luciferase activity over control after 6 h of treatment. Using this method, we have explored the role of caveolin-1 in regulating MCH signaling and our preliminary data using RNAi suggests caveolin acts to suppress MCH signaling. A second cascade tested in microplate format was MCH signaling to calcium. We took two approaches: the first measures indirect calcium-mediated activation of a PKC responsive luciferase reporter construct AP1-fos –luc and the second utilized a calcium-sensitive dye Fluo-4 to measure calcium directly. With the PKC-responsive luciferase reporter we successfully measured 1.34 fold activation over control following 6h treatment with MCH. We are currently using this assay to explore the role of beta-arrestin 2 in regulating MCH-mediated calcium signaling. With the second approach, Fluo-4 allows us to measure rapid MCH-induced calcium transients. We compared signaling by MCHR1 to that of MCHR2 and found MCHR1 was able to signal changes in intracellular calcium levels via Fluo-4 fluorescence intensity better than MCHR2. We are currently working to optimize this assay for measure MCHR-1 signals. In conclusion, MCH signaling can successfully be studied in microplate format increasing output and broadening our lab's investigative capabilities. (Poster presentation.)

## SYNTHESIS AND CHARACTERIZATION OF NOVEL ORGANOSILICON COMPLEXES.

Daniel P. Caruso, William W. Brennessel, Bradley M. Kraft, St. John Fisher College, Department of Chemistry, 3690 East Avenue, Rochester, NY 14618; and University of Rochester, Rochester, NY 14627.

A series of novel organosilicon complexes of the form RxSi(OL)4-x and RxSiCly(OL)4-x-y [R = hydrogen, alkyl or aryl; OL = 4-methyl-2,6-bis(4-methylphenylimino)phenoxy] were prepared and characterized by 1H, 13C, and 29Si NMR spectroscopy. All of the compounds exhibit tetracoordinate geometries in benzene solution at room temperature. The solid-state structure of R2Si(OL)2 (R = methyl) was determined by single-crystal x-ray crystallography and exhibits a hexacoordinate bicapped tetrahedral structure with two nitrogen atoms weakly interacting with silicon. (Poster presentation.)

## FACULTY AND TEXTBOOK ASSUMPTIONS OF STUDENT KNOWLEDGE THAT AFFECT LEARNING THE CONCEPTS OF MEIOSIS.

Christina Catavero, L. Kate Wright, Dina L. Newman, Rochester Institute of Technology, School of Life Sciences, 153 Lomb Memorial Dr., Rochester, NY 14623.

Students and professors rely on textbooks to accurately and reliably convey information. However, in order for textbooks to be useful, they must meet students where they are conceptually. In addition, faculty must be aware of their students' prior knowledge and mastery of a topic. Meiosis, a special type of cell division that creates sperm or ova, is a topic that many students have difficulty understanding but is extremely important in genetics and evolution. Transcription and analysis of student interviews conducted at RIT about meiosis have provided insight into students' thoughts and confusion. Issues such as chromosome structure and ploidy are among the most common stumbling blocks. These ideas are core concepts that must be comprehended before the specialized knowledge of meiosis can be clearly understood. We examined the explanations of meiosis in seventeen different college textbooks written for different levels (non-majors, majors introductory, and advanced), and surveyed faculty who teach the subject about

what they believe students should know at each level. We found that both textbook authors and faculty make incorrect assumptions about how much students know at each level. Thus, instructors may not realize that they begin at the wrong place in their explanations. Since students never learn the basics, few students ever progress further to truly comprehend meiosis, and by extension genetics and evolution. This project has the potential to enhance biology education across the country by eliminating sources of misconceptions in meiosis, through the creation of better lesson plans, meiosis figures and/or an improved textbook chapter. (Poster presentation.)

## TIN (II) HALIDES AS CATALYSTS FOR THE ESTERIFICATION OF BIODIESEL.

James Chambers, Nazareth College, 4245 East Ave, Rochester, NY 14618.

Waste vegetable oils can be converted into biodiesel in the form of fatty acid methyl esters (FAME) as an effective replacement for petroleum diesel. Unfortunately waste oils often possess high free fatty acid (FFA) concentrations requiring acid catalysis in order to form the FAME found in biodiesel. Lewis acid catalysts represent a promising means of catalyzing the esterification of FFAs because they are less corrosive than the traditionally employed Bronsted acids and do not add sulfur to the final product. The tin (II) halides are a common family of Lewis acids, which we have studied as catalysts for the methylation of oleic acid. The progress of this reaction was monitored via 1H NMR and the kinetic data obtained shows the following order of increasing catalytic activity: SnF2 <SnCl2<SnBr2<SnI2. Analysis of this trend reveals an unexpectedly weak correlation with halide electronegativity and a strong correlation with both covalent and ionic radii of the halide. This talk will include a presentation of the methods employed as well as a discussion of the implications these results have on the mechanism of this reaction. (Oral presentation.)

## THE USE OF MICROSATELLITES AS A MEANS TO STUDY THE POPULATION STRUCTURE OF THE EASTERN HELLBENDER SALAMANDER, *CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS.*

Sarah Chudyk, Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222.

Populations of the Eastern Hellbender salamander, *Cryptobranchus alleganiensis alleganiensis*, are quickly declining, making this a species of special concern in New York State. Contributing factors to their decline include UV radiation, predation, disease, habitat modification, and changes in climate. Because of this, hellbender habitats are becoming fragmented. This leads to isolation among populations, which impedes gene flow between populations of hellbenders. In order to determine how to conserve hellbenders, the structure of their populations must be studied to determine the genetic diversity present. Microsatellite markers are a powerful tool used to study the genetic makeup of a population. Primers developed by Unger and Duvra for the Eastern Hellbender salamander will be used in this study. The primers will be used to amplify microsatellite regions of highly polymorphic loci of hellbender DNA. The optimal annealing temperatures of these primers will be determined using hellbender tissue samples collected from the Buffalo Zoo. Genotyping of these hellbenders will be conducted, which will show the genetic diversity among these hellbender samples. This genetic information will then be used for a parentage analysis on 50 hellbender samples from the Buffalo Zoo. Educational material will be developed for the Buffalo Zoo hellbender exhibit to spread an awareness of the importance of conservation genetics. In addition, a series of lesson plans will be developed to be used by biology teachers as an important application in the teaching of genetics to high school students. (Poster presentation.)

## INDUCING APOPTOSIS: A KINETIC STUDY COMPARING TIME AND CONCENTRATION OF STAUROSPORINE AND OKADAIC ACID ON HELA AND MCF10A CELLS.

Lisa Chute and Robert S. Greene, Ph.D., Academic Center for Integrated Science, Department of Biology, Niagara University, NY 14109.

A survey conducted by The American Cancer Society found that in 2007, nearly 12 million people in the United States had developed cancer. Cancer occurs in the body when cells proliferate without undergoing the cell death cycle known as apoptosis. Staurosporine and okadaic acid are two known agents that have been discovered to induce apoptosis. Both agents have been used as a control to test the effectiveness of new drugs on inducing apoptosis in cancer cell lines. In order to further understand the mechanisms that induce apoptosis using staurosporine and okadaic acid, a kinetic study was performed using different times and concentrations of

staurosporine and okadaic acid to induce apoptosis in the human epitheloid cervix carcinoma cell line (HeLa) and human breast epithelial cells MCF10A. It was hypothesized that increasing both variables would cause an increase in the number of apoptotic cells for both HeLa and MCF10A. Apoptosis was measured through flow cytometry, florescent microscopy, and enzyme-linked immunosorbent assay (ELISA) to determine apoptosis pathways in treated cells. The data suggested that both cell lines responded as predicted: increased concentrations and exposure to both agents caused increased apoptosis. The apoptotic pathways for each agent and cell line appeared to be different. By comparing the results of these studies, specific mechanisms for apoptosis can possibly be determined in each cell line with each type of drug. The results from this kinetic study will be helpful in future experiments where the effect of Vitamin D on potentiating apoptosis will be determined. (Poster presentation.)

## SEISMITE/TSUNAMIITE IN EURYPTERID-BEARING BEDS OF THE LATE SILURIAN BERTIE GROUP, NEW YORK AND ONTARIO, CANADA.

Samuel J. Ciurca, Jr., P.O. Box 10311, Rochester, NY 14610.

In 1976, Ciurca and Gartland described "An Upper Silurian brecciated water-lime unit bearing eurypterids, Niagara Peninsula of Ontario Canada" (GSA Abstract, 10th Ann. Meeting, V8, N4 p. 472). In subsequent years, the unit was traced across western New York State and described as the Ellicott Creek Breccia (ECB) as the uppermost member of the Fiddlers Green Formation with the type section at Ellicott Creek in Williamsville, NY.

The ECB, about 1.0–2.0 m thick, consists of eurypterid-bearing and stromatolitic waterlimes and fine-grained dolostone. Much or all of the ECB was deposited under hypersaline conditions as indicated by the abundance of salt hopper structures (some 12 inches on an edge) at many localities.

Because of the widespread occurrence of the ECB, from Hagersville in Ontario, Canada, east to the Finger Lakes Region of New York State, and the thinness of the unit, it is suggested that parts or all of the ECB were subjected to a strong earthquake/tsunami (hence, seismite/tsunamiite). What initiated the earthquake is not known and the widespread distribution of such brecciation as seen in the ECB could also be the result of a bolide (i.e. an extraterrestrial body that collides with Earth).

Examination of breccia beds north of LeRoy, NY and at Phelps and other sites reveals breccia with sharply defined fragments of sedimentary rock included, some perpendicular to the bedding. The origin of the clasts is not known, but many appear to represent the host rock—mostly waterlimes and finely crystalline dolostones. Clasts seen at Flint and Mud Creeks are pieces of stromatolites that have been observed in situ elsewhere (e.g. Ontario, Canada). Mineralization observed includes some chert, pyrite and sphalerite distributed through the beds.

The internal stratigraphy of the ECB remains to be worked out more thoroughly, including the distribution of the breccia beds within. At the type section, it is tripartite (A, B and C). The distribution of the stromatolite beds is under study. One particular morphotype, the topographic waterlime (for example), was found to comprise almost the entire ECB in one section studied with breccia forming the uppermost layer. (Poster presentation.)

## STRATIGRAPHIC STUDIES ALONG THE ONONDAGA ESCARPMENT—THE LATE SILURIAN BERTIE GROUP IN WESTERN NEW YORK.

Samuel J. Ciurca, Jr., Peabody Museum of Natural History, Yale University, 170 Whitney Ave, New Haven, CT; and Mark Wade, Rochester, NY

The Onondaga Escarpment is a well-known topographic feature across much of western New York. Occasionally, Late Silurian beds beneath are exposed and available for study if not in the escarpment itself, then in quarries in the Onondaga Limestone that have been excavated down (beneath unconformities) into the underlying dolomitic strata of the Bertie Group.

We have explored the escarpment from Indian Falls through Akron to Clarence. At Indian Falls are massive beds of the Victor Dolostone (Fiddlers Green Formation) with little evidence of overlying beds at the site, so a search was made for more stratigraphically complete sections. More complete sections were found to the west.

The lowest beds of the Bertie Group exposed at Clarence (Sanctuary) are thick massive beds of brown dolostone (lower Victor Member) with crinkly structure that suggests they are part of an extensive thrombolite complex. About 2 meters were measured and these dense beds form the base of the cliff, supporting everything above. The lowest (Victor) beds are not exposed.

A relatively abrupt transition takes place above these massive beds resulting in a sequence of thinly bedded waterlimes, some platy with characteristic black carbonaceous layers. Within this sequence are abundant brachiopod

'ghosts'—i.e., micritized Whitfieldella so prolific within many of the beds of the Victor Member (Fiddlers Green Formation) in upstate New York. Layers are bioturbated, but eurypterid remains (*Eurypterus remipes* Biozone) are found in the 'cleaner' layers of the waterlime. While this sequence is about 2.5 m thick, it is overlain by somewhat similar beds (2.3 m), some or all of which belong to the Victor Member. In such weathered sections, more detailed work needs to be done to elucidate the contact with the overlying Ellicott Creek Breccia (ECB).

The Ellicott Creek Breccia is recognizable and at least 1.4 m occur with stromatolite beds (topographic waterlime) at the top of the lower 1.0 m section. The uppermost ECB, about 40 cm, consists of brecciated, argillaceous, irregularly bedded dolostone where it is overlain by 85 cm of the Scajaquada Fm. in the section studied (the rest of the Scajaquada occurs higher in the cliff-face).

The most important observation made is noting the continued significance of microbialites (algal mats, stromatolites, thrombolites) during deposition of the entire Bertie Group—the group being well-known for the assemblages of eurypterids that occur throughout the sequence. It is hoped that further study will provide answers that explain the unusual variety of lithologies exhibited by the units now regarded as belonging to the Bertie Group. With a distribution of over 250 miles, the Group is a fertile subject for study. (Poster presentation.)

## ANALYSIS OF BIOCHEMICAL MARKERS AND THEIR RELATIONSHIP TO RISK OF DEVELOPING CORONARY ARTERY DISEASE.

Cory Clugston and Christopher S. Stoj, Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109.

According to the National Institutes of Health, more than half a million men and women die from coronary artery disease (CAD) in the United States, making it the leading cause of death. CAD results from the build-up of plaque in the arteries involving compounds released by fatty tissues at sites of arterial damage. As the atherosclerotic plaque builds up, the blood vessel narrows and blood flow to the heart is restricted. When the plaque in the vessel cracks, platelet aggregation causes angina and/or myocardial infarction. The severity of plaque formation has been shown to correlate with indicators of oxidative stress, such as the production of reactive oxygen species and damage to a cell's proteins, lipids, and DNA. Markers of oxidative stress can be detected in human plasma samples. The purpose of this study is to compare and analyze the relative levels of markers of oxidative stress in patients with CAD in order to aid in diagnosis. Additionally, genotypic studies are under way to corroborate and elucidate the underlying genetic basis of CAD. (Poster presentation.)

## AN INVESTIGATION OF PHOSPHORYLATION OF A SPLICING FACTOR, SR45, IN *ARABIDOPSIS THALIANA*.

Sinead Coleman, Jason Chien, and Xiao-Ning Zhang, St. Bonaventure University, Department of Biology, St. Bonaventure, NY 14778.

SR45 is an important splicing factor that is involved in multiple developmental processes in *Arabidopsis thaliana*. SR45 has two splicing isoforms, SR45.1 and SR45.2, that play distinct roles in root growth and flower development. SR45.1 has two predicted phosphorylation sites, threonine 218 (T218) and serine 219 (S219), that are missing in SR45.2. To further investigate the function of these two sites after phosphorylation, we substituted these amino acids in the existing SR45.1-GFP construct with aspartic acid (D) and glutamic acid (E) by site-direct mutagenesis. The resulting mutant genes were transformed into sr45–1 mutant plants to generate stable transgenic plants. The transgenic plant lines were screened by their resistance to herbicide and selected by the presence of the GFP signal. Our results show that the expression level of GFP and its sustainability are directly related to the effectiveness of the transgene. For the petal development, substitutions at either/both sites recovered the normal development to various degrees. For root growth, the double substitution resulted in overgrowth, while the substitution on T218 gave a better recovery than the substitution on S219. Therefore these data suggest that the phosphorylation of both T218 and S219 may not be necessary for the normal function of SR45.1 in both root and petal development. However, a phosphorylated T218, but not a phosphorylated S219, may be required for a fully functional SR45.1 in roots. (Poster presentation.)

## THE ROLE OF RAD52P ISOFORMS IN DIRECT REPEAT-MEDIATED DELETION EVENTS.

Bridget Cooney, Melissa Colon, Laura Pankowski, Kyle Walker, and Rey Sia, The College at Brockport, SUNY, Department of Biology, 350 New Campus Dr., Brockport, NY 14420.

The yeast, *Saccharomyces cerevisiae*, is a single-celled, facultatively anaerobic species of fungus that has been known since ancient times for its usefulness in both baking and brewing. Recently, it has served as an indispensable model organism in genetic and molecular studies. Like all eukaryotic organisms, S. cerevisiae contain mitochondria which are responsible for generating ATP molecules through oxidative phosphorylation. The proteins necessary for oxidative phosphorylation are encoded on mitochondrial DNA (mtDNA) located within the mitochondria. mtDNA is independent of the nuclear DNA. Similar to nuclear DNA, an accumulation of mutations in mtDNA can be detrimental. Often such mutations can lead to altered mitochondrial function which can cause diseases in higher organisms. Since yeast are facultative anaerobes they can survive in the absence of oxidative phosphorylation by undergoing fermentation to meet their energy needs. This enables the study of mtDNA mutations that would lead to inviability in other organisms.

Since mtDNA is important for ATP production it must be maintained and protected from damage. RAD52 is a nuclear gene that codes for a protein. Rad52p, which is important in homologous DNA recombination and double-strand break repair. It has been directly implicated in maintaining the integrity of nuclear DNA (1). The open reading frame contains a total of five potential start codons that may drive expression. A goal of the lab has been to determine whether one of the first three start codons is responsible for creating a Rad52p isoform that is localized to the mitochondria. This is being done through the creation of site-directed mutations of the different start codons. Cells with these mutations are then tested for their ability to undergo nuclear and mitochondrial direct repeat-mediated deletion events. (Poster presentation.)

## UREA IS A DYNAMIC POOL OF BIOAVAILABLE NITROGEN IN CORAL REEFS.

Jesse Crandall and Mark Teece, SUNY–ESF Department of Chemistry, 1 Forestry Drive, Syracuse NY 13210.

Urea may be an important source of nitrogen in low nutrient coral reef environments because corals and other organisms can assimilate it easily and it is found throughout ocean waters. We measured the distribution and concentrations of urea in seagrass beds, areas of schooling fish, coral formations and bottom sediments in the Upper Florida Keys Reef Tract. The flux of urea from bottom sediments was also measured. Ambient concentrations of urea in the offshore reefs were similar to concentrations of nitrate and ammonium. Seagrass beds, areas of schooling fish and coral formations had elevated concentrations of urea that were up to eight times higher than nitrate in the system. Numerous ephemeral hotspots of urea that were 8–20 times the ambient urea concentration existed in seagrass beds, areas of schooling fish, and above sediments. Coastal areas and inland canals had high urea concentrations where urban runoff and septic effluents were prevalent, but there was no anthropogenic influence in the offshore habitats. Urea concentrations above bottom sediments were not different from ambient concentrations and benthic flux chamber incubations showed biological activity in carbonaceous sediments but no net urea production. The decrease in urea concentrations from coasts and inland waterways to a consistent ambient concentration in the offshore reef system and ephemeral hotspots of high urea concentration suggest that urea is a dynamic pool of bioavailable nitrogen in the reefs of the Upper Florida Keys. (Oral presentation.)

## NON-HYDROLYTIC SOL-GEL SYNTHESIS AND CHARACTERIZATION OF $Ce_xHf_{1-x}O_2$ NANOCRYSTALS.

Nicholas D. Cultrara, Sean W. Depner, and Sarbajit Banerjee, University at Buffalo, SUNY, Department of Chemistry, Buffalo, NY 14260.

Mixed ceria ($CeO_2$) and hafnia ($HfO_2$) solid solutions have shown promise in applications for nuclear control rods, oxygen gas sensors, and solid electrolytes for fuel cells. In the bulk, pure $CeO_2$ crystallizes in the cubic phase and pure $HfO_2$ crystallizes in the monoclinic phase at room temperature. As $CeO_2$ is incorporated into the $HfO_2$ lattice, the phase changes from a monoclinic structure to a tetragonal structure (t'); as the concentration of $CeO_2$ is further increased, transformation to a second (t'') tetragonal phase is evidenced. When the solid-solution stoichiometry approaches a pure $CeO_2$ lattice, the cubic phase is observed. Scaling to finite size can alter the phase stabilities of transition metal oxides. Consequently, we have attempted to elucidate the nanoscale phase diagram of

the $CeO_2$-$HfO_2$ system. $Ce_XHf_{1-X}O_2$ nanocrystals have been synthesized using the non-hydrolytic sol-gel method, involving the condensation reaction of a metal halide and a metal alkoxide through a $S_N^1$ mechanism. Tri-n-octylphosphine oxide is used as a high-boiling solvent, leading to the formation of monodisperse, high-crystalline-quality nanoparticles. The prepared nanocrystals have been characterized using X-ray diffraction, Raman spectroscopy, and transmission electron microscopy. (Poster presentation.)

## DO AGE, SEX AND SIZE INFLUENCE THE LENGTH OF STAYS OF STRAY DOGS AT NO-KILL SHELTERS IN NEW YORK?

Janelle Davidson, William Brown, Marion Zuefle, Keuka College, 141 Central Ave, Keuka Park NY, 14478.

Very few animal shelters in the United States are "no-kill" shelters and few studies have been conducted on how long animals stay at such shelters before being adopted. To determine how age, sex, and size of dogs influence their length of stay (LOS), adoption records from the Tompkins County SPCA and the Yates County Humane Society—both no-kill shelters in New York State—were analyzed. The LOS in days was calculated for each dog adopted between 2008 and 2011 (n=707) by subtracting the adoption date from the intake date. LOS was regressed on age (years) to determine if older dogs had a greater LOS than younger dogs. The difference in LOS between the sexes was determined with a t-test. To examine the effect of size on LOS, individuals were separated into five categories ranging from XS (e.g., Chihuahua), S, M, L, to XL (e.g., Mastiff). The difference in LOS among size categories was examined with ANOVA. We found LOS increased linearly as age increased (LOS =1.84 * (age in years) + 35.3, DF=705, t=2.59, p=0.01, R2=0.01). Sex had no influence on LOS. Regarding size categories, M sized dogs had the greatest LOS (48.8 days); XS dogs had the shortest LOS (33.4). Although age influenced LOS, as others have noted, it did not explain much of the variation in this response. Contrary to other studies, we found no influence of sex on LOS. This is the only study that has determined the effect of size categories on LOS. (Poster presentation.)

## VALUE OF NATIVE AND INVASIVE FRUIT-BEARING SHRUBS FOR MIGRATING SONGBIRDS.

Samantha DeSando, Allyson Miller, and Susan Smith, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Drive, Rochester, NY 14623.

Invasive species can out-compete native plants and disrupt the natural ecosystem of an area. It is important to understand how an invasive plant affects an ecosystem, especially when considering implementing a management strategy for the species. Songbirds are organisms that may rely on these invasive species for food and shelter. The objective of this study was to determine whether migrating songbirds prefer and/or benefit from the use of native or invasive fruit-bearing shrubs. We conducted nutritional analyses on the fruits of three native and three invasive shrub species with a focus on fat, sugar and energy content of the fruits. Of the species analyzed, a positive correlation between fat and energy content of the fruits was found and native dogwoods had higher fat and energy content than all invasive species. Insect density supported by four different focal shrub species was measured during the spring of 2010. There was no clear pattern of insect density between native and invasive shrub species during the spring migration period. Results from a fruit consumption experiment started in fall 2011 will provide insight into fruit preference by migrating songbirds in relation to fruit nutritional content. The results to date suggest that fruits of native shrubs are of higher nutritional value to migrating songbirds than the fruits of invasive shrubs during fall migration. (Oral presentation.)

## BIOFILMS PROTECT *CRYPTOSPORIDIUM PARVUM* OOCYSTS AGAINST INFECTIVITY LOSSES FROM SOLAR RADIATION EXPOSURE.

Elizabeth Wolyniak DiCesare[1], Bruce Hargreaves, Kristen Jellison[2]; [1]Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Drive, Rochester, NY 14623; and [2]Lehigh University, Earth and Environmental Science, 1 West Packer Avenue, Bethlehem, PA 18015.

*Cryptosporidium parvum* infection can be fatal for immunocompromised people. Previous work has shown that ultraviolet (UV) disinfection inactivates oocysts in water supplies, and solar radiation reduces oocyst infectivity in the environment. The hypothesis that biofilms may provide a protective barrier against oocyst exposure to solar

radiation was tested. Natural microbial assemblages from a Pennsylvania stream were used to grow biofilms in laboratory microcosms; biofilms were inoculated with oocysts and exposed to solar radiation in a temperature-controlled water bath. Oocyst permeability was determined with DAPI/PI staining, and oocyst infectivity was determined using *in vitro* cell culture. Biofilm attachment was protective against solar UV exposure: less than 50% of solar UV radiation (compared to 82% of longer wavelengths) passed through the biofilm. The infectivity of oocysts attached at the biofilm surface (20%) was less than that of oocysts attached at the base of a 32-μm biofilm (39%) and not significantly different than the infectivity of oocysts suspended in water (19%). Sloughed oocysts were 56% less permeable, and subsequently more infectious (35%), than oocysts that had never been associated with a biofilm (19%). Disinfection efficacy of solar radiation for biofilm-associated oocysts is important because most oocysts will associate with potentially protective biofilm and/or fecal material in the environment. (Poster presentation.)

## CAGE OPENING/REARRANGEMENTS OF IODINATED CUBANE DERIVATIVES.

Christopher Dietz, Patrick Heaphy, Justin Griffiths, Danielle M. Raymond, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

Based on previous studies of cubane it was found that vinylcubane has a tendency to undergo cage opening/rearrangement. It was in this finding that a cubyl styrene derivative was proposed in order to deter the cage opening of the cubane and thus perform polymerization from a vinylcubane-based monomer. The goal of this research was to perform a novel synthesis of this cubyl styrene derivative and attempt polymerization of the molecule in order to study the cage opening/rearrangement due to the possible initial radical formation. In addition, an iodinated cubyl aldehyde was also examined and remarkably, benzyl benzoate was ultimately formed, suggesting an alternate fragmentation pathway. (Oral presentation.)

## MYCORRHIZAE DISTRIBUTIONS BY DEPTH IN NORTHERN HARDWOOD ECOSYSTEMS.

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Mycorrhizae are mutualistic associations between plant roots and soil-inhabiting fungi. Arbuscular mycorrhizae (AM) contain fungal structures within the plant cells, while ectomycorrhizas (EM) form structures surrounding the plant root cells. We are investigating the distribution of AM and EM roots as a function of soil depth, stand age, and site fertility in New Hampshire northern hardwoods. Roots were picked from soil cores and screened under a dissecting microscope for EM features. EM root length was measured by a line-intercept technique. Non-EM roots were cleared and stained using chitin-specific staining and scored under a stereo compound scope to determine the proportion of root length colonized by AM fungi. Preliminary results show greater AM colonization in the shallow (<30cm) and organic soil horizons than at depth. Understanding the belowground community can illuminate the natural history of soil-inhabiting organisms and better inform forest management practices. (Poster presentation.)

## BELOWGROUND PRODUCTIVITY OF HYBRID CATTAIL (*TYPHA* X *GLAUCA*) AND PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*) IN A CENTRAL NEW YORK MARSH.

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*Typha* x *glauca* (Hybrid cattail) and *Lythrum salicaria* (Purple loosestrife) are dominant plants found in eastern North American freshwater wetlands. The prolific growth of these species has been linked to reductions in biodiversity and alteration of ecological processes in wetlands. Aboveground competition for light as well as profuse litter deposition are mechanisms by which *Typha* and *Lythrum* can outcompete neighboring vegetation. Prolific root growth can also pre-empt soil resources. We quantified root production during one growing season to better understand belowground dynamics in freshwater wetlands colonized by *Typha* and *Lythrum*. Root in-growth cores (length = 20.5 cm) were randomly placed in a *Typha*-dominated zone (n = 11) and a *Lythrum*-dominated zone (n = 9) in early June 2011. Cores contained root-free, native marsh soil. Cores were left in the ground for 106 days and harvested in September 2011 to determine root growth over time. Coarse roots were extracted from the cores, dried,

and weighed. We found that there was no difference in root belowground biomass between *Typha* and *Lythrum* plots (t-test; $p = 0.38$). The mean weight of coarse roots for the *Typha* plots was 172.36 mg $cm^{-3}$ while the mean for the *Lythrum* plots was 184.42 mg $cm^{-3}$. Average productivity during the study was 1.63 $mg^{-1}$ $cm^{3}$ $day^{-1}$ in the *Typha* plots and 1.74 $mg^{1}$ $cm^{-3}$ $day^{1}$ in the *Lythrum* plots. When extrapolated to broader scales, our data suggest the extent to which these species may change the structure and alter resource availability within wetland soils. (Poster presentation.)

## DREISSENID MUSSEL INVASION, COLONIZATION AND IMPACTS TO THE NUTRIENT BUDGET OF CANANDIAGUA LAKE.

Sarah N. Dresson, Paul J. Mysliwizc, Don B. Slentz, Kevin L. Olvany, and Bruce A. Gilman, Finger Lakes Community College, Department of Environmental Conservation and Horticulture, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Originating in eastern Europe and western Asia (the Black, Caspian and Aral Seas and the Ural River drainage), the dreissenid mussels have been introduced to North America through the discharge of freshwater international shipping ballast water. First found in the Great Lakes, they ultimately entered the Finger Lakes region of New York State. Their negative ecological and economic impacts are well documented from studies in many of the larger lakes.

Zebra mussels (*Dreissena polymorpha*) appeared in Canandaigua Lake around 1995 and quickly dominated the littoral zone attaching to hard, natural and artificial substrates. In 2001, population growth apparently surpassed planktonic food supply and massive quantities of dead zebra mussels appeared along the shoreline. Concurrently, large foam streaks occurred across the lake surface and total phosphorus concentrations in the water column nearly doubled. The next year, surviving zebra mussels recolonized, reaching densities of over 11,000/m2 during the summer of 2002.

Quagga mussels (*Dreissena rostriformis bugensis*) appeared in Canandaigua Lake around 2008 and quickly dominated the profundal zone and portions of the littoral zone. Dredges samples collected in 2011 at several sites and water depths revealed densities of nearly 40,000/m2. During their three years of colonization, total phosphorus levels reached historic lows for our 20 years of record. (Poster presentation.)

## GENETIC DIFFERENTIATION OF COMMON LOONS (*GAVIA IMMER*) FROM TWO REGIONS IN CANADA.

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Understanding relationships between geographically separated populations is important to understanding evolutionary dynamics in a species. Common Loons (*Gavia immer*) are large, long-lived piscivorous birds that spend the summer breeding season on northern North American lakes and migrate to coastal waters for the winter. Loons are territorial during the breeding season and tend to return to their natal region for breeding, which suggests that eastern and western birds may be on different evolutionary paths. Furthermore, loons from eastern Canada winter on the Atlantic Ocean whereas loons from western Canada winter on the Pacific. In this study, the focus was the degree of differentiation between populations of Common Loons in Alberta and Quebec. Microsatellite loci GimA12EPA, GimC11EPA, GimA9EPA, and GimC5EPA were analyzed for significance differences in genotypic and allelic frequencies between the populations. DNA from 50 freeze-dried blood samples from locations within each region was extracted and amplified using polymerase chain reaction (PCR) with locus-specific primers. All populations and loci were within Hardy Weinberg predictions except for the GimC11EPA locus in Alberta loons. Loci GimC11EPA and GimA12EPA had significant allelic population differentiation ($p = 0$ and 0.0231, respectively) as well as significant genotypic population differentiation ($p = 0$ and 0.0128, respectively). These results suggest that Common Loon populations from across North America are genetically distinct and may respond to evolutionary change in different ways. (Poster presentation.)

## CHARACTERIZING WETLAND VEGETATION USING HYPERSPECTRAL IMAGERY.

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Wetlands are important ecosystems that deliver numerous ecosystem services, including carbon sequestration, metal and pollutant removal, sediment trapping, and provision of habitat for many organisms, such as migratory birds. However, there has been a >50% decline of wetlands in the United States (U.S.) in the last 200 years. In an attempt to offset this loss creation of compensatory wetlands has been required in the U.S. since the late 1980's. The U.S. Army Corps of Engineers (Corps) requires vegetation monitoring of mitigated wetlands for five years following creation. However, wetland assessment is a time-consuming process that may also instigate disturbance to nascent plant communities. There is a need for approaches that minimize disturbance of these fragile ecosystems but still enable the collection of data over large portions of the landscape in a timely fashion. A potential method to quickly collect applicable ecosystem information with minimal impact to the environment is by combining remote sensing, typically hyperspectral imagery, and field data collection. Using spectral analysis techniques and training-validation based on field data, we will assess vegetation communities in natural reference wetlands and determine whether these same communities are present in in-kind mitigation wetlands. In July 2010, vegetation community composition, spectral signatures of individual plant species, canopy level spectral measurements, and an aerial hyperspectral imagery dataset were obtained from two natural and two mitigation wetlands on the Rochester Institute of Technology campus, Rochester, New York (NY). We are utilizing this data to develop a spectral library of common western NY wetland vegetation and plant communities. We will later extend our analyses to another regional mitigation site, High Acres Nature Area, in Penfield, NY to validate the model as a regionally appropriate assessment tool. This project will be presented at the 2011 Rochester Academy of Sciences meeting. (Oral presentation.)

## EFFECTS OF LIGHT AND FEEDING ON GROWTH OF THE CARIBBEAN CORAL *ACROPORA CERVICORNIS*.

Caresse Fernandez[1], Mark A. Teece[1], Kenneth Walz[1], Jesse Crandall[1], Crawford Drury[2], and Diego Lirman[2]; [1]SUNY College of Environmental Science and Forestry, 1 Forestry Drive Syracuse, NY 13210; and [2]Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway Miami, FL 33149.

Light and feeding are important in providing energy and nutrients for growth in reef building symbiotic corals. In shallow waters, light is abundant and corals rely on their photosynthetic symbionts for essential nutrients, whereas in deeper waters corals with lower light levels corals may rely on heterotrophic feeding to a greater extent. Therefore, both high light and availability of food resources such as zooplankton can have a positive effect on growth. To test these theories, we grew the Scleractinian coral, *Acropora cervicornis* under different combinations of high light, low light, feeding, and starved conditions. We observed that growth of *A. cervicornis* was enhanced by light but not by feeding, with starved corals growing faster than fed corals. Under high light conditions, higher amounts of coral tissue were produced and $\delta$13C values were enriched indicating higher rates of photosynthesis and production of organic matter in the symbiont. When deprived of food, coral actually increased their biomass, protein, zooxanthellae density, and chlorophyll content to obtain a greater amount of photosynthetically derived materials from its symbionts. Therefore, *A. cervicornis* relies heavily on its algal symbionts, preferring a survival based on autotrophy rather than heterotrophy. Past investigations studying the effects on light and feeding in other coral species has enabled us to conclude that light and feeding are both important in corals, however their effects can drastically differ from species to species. (Oral presentation.)

## NMR MICROSCOPY: APPLICATIONS IN BOTANY.

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High-resolution nuclear magnetic resonance (NMR) spectrometers with three-axis gradient systems can be used to produce magnetic resonance images of small objects less than 4.5 mm in diameter. As such, they operate as an NMR microscope producing, magnetic resonance images of the hydrogen NMR signal from the sample. Image contrast is achieved by having structures in the object with different water content as well as spin-lattice and/or spin-spin relaxation times. Various imaging parameters can be altered to optimize the signal-to-noise ratio (SNR),

resolution, and contrast in an image. The instrument and technique are well suited to image plant stems, small fish, insects, and biological specimens. In this poster the factors governing image contrast, SNR, and resolution will be presented. The utility of the NMR microscopy will be demonstrated on small fish and plant stems. We believe that its greatest utility will be in studies of dehydration stress, insect attack, mineral uptake, and structure in plant stems. Cross sectional images of several different plant stems are presented. (Poster presentation.)

## LOCALIZATION OF MELANIN-CONCENTRATING HORMONE RECEPTOR 1 TO CAVEOLAE CAN BE MODULATED BY OVEREXPRESSION OF ARRESTINS.

Lauren Field and Laurie B. Cook, The College at Brockport, SUNY, 217 Lennon Hall, 350 New Campus Drive, Brockport, NY 14420.

Melanin-concentrating hormone (MCH) is an important player in the regulation of appetite in higher order mammals, including humans; so much so that it is considered to be a pharmacological target in the treatment of obesity. G protein-coupled receptors for MCH are located in both the brain and peripheral tissues, and it has been shown that MCH signaling on adipocytes results in an increase in leptin transcription and secretion causing a central satiety signal. Presumably, improper desensitization of MCH signaling or an overactive pathway could result in an appetite disorder. Very little is known about how MCH signals are regulated and desensitized in cells, particularly in adipocytes. A few studies demonstrate the potential for this receptor to internalize in beta-arrestin or GRK overexpression systems. Our lab recently showed that when cells overexpressing arrestin are given MCH for 30 min about 40% of surface-localized MCHR1 internalizes using a cell-surface ELISA; whereas in control cells (–arrestin) only 15% of surface receptor internalized. This made us question the importance of clathrin-mediated endocytosis in certain cell types and we hypothesized that the extensive localization of MCHR1 to caveolae might play an important role in regulating its activity. We hypothesized that clathrin-mediated internalization of MCH-bound MCHR1 would have to be preceded by movement of receptors out of caveolae into non-caveolae membranes. We first verified the co-localization of MCHR1 with caveolin-1 on sucrose gradients from both cell lysates prepared by Triton-X-100 extraction and sodium carbonate extraction at pH11 and decided to continue with the latter method. In transfected BHK cells, MCH did not cause any visible change in the distribution of MCHR1 across the sucrose gradient, however when arrestins were also overexpressed MCHR1 was less localized to caveolae-containing fractions. This suggests that arrestins do have the potential to pull MCHR1 from caveolae membranes, even in a native, non-agonist bound conformation. Future experiments will continue to explore the role of caveolae in the regulation of endogenous MCHR1 signaling in 3T3-L1 pre- and post-adipocytes where caveolae accumulate during the differentiation process. (Oral presentation.)

## MULTI LOCUS SEQUENCE TYPING ANALYSIS OF STAPHYLOCOCCUS ISOLATES FROM WHITE TAILED DEER.

Kristina Foderaro[1] and Mark A. Gallo, Ph.D.[2]; [1]PO Box 0306, Niagara University, NY 14109; and [2]DePaul Hall, Niagara University, NY 14109.

The ever-growing threat of methicillin resistant *Staphylococcous aureus* (MRSA) requires fast and accurate typing methods for epidemiological surveillance of local and global populations. Conventional methods, such as pulsed field gel electrophoresis and observations of phenotypic characterizations, do not give unequivocal results due to the subjective nature of the data collection.

To combat this problem, the use of DNA sequence-based typing methods have been utilized to identify Staphylococcus isolates retrieved from the white tailed deer population of Western New York. It was determined by the investigators to amplify and sequence several genes around the chromosome to analyze genome heterogeneity. The genes, manganese-dependent superoxide dismutase gene (sodA), coagulase gene (coa), rpoB, which encodes for the beta subunit of RNA polymerase, heat shock protein 40 gene (dnaJ), Staphylococcus protein A gene (spa), and the heat shock protein 60 gene (hsp60), are general housekeeping genes and therefore should be found in different species of Staphylococcus. Specific primers for the genes were constructed and then used to analyze the isolates. (Poster presentation.)

## EXPRESSION OF FACT IN MAMMALIAN TISSUES SUGGESTS ITS ROLE IN MAINTAINING OF UNDIFFERENTIATED STATE OF CELLS.

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The Facilitates Chromatin Transcription (FACT) chromatin remodeling complex, comprised of two subunits, SSRP1 and SPT16, is involved in transcription, replication and DNA repair. We recently showed that curaxins, small molecules with anti-cancer activity, target FACT and kill tumor cells in a FACT-dependent manner. We also found that FACT is overexpressed in human and mouse tumors and that tumor cells are sensitive to FACT downregulation. To clarify the clinical potential of FACT inhibition, we were interested in physiological role(s) of FACT in multicellular organisms. We analyzed SSRP1 and SPT16 expression in different cells, tissues and conditions using Immunohistochemical (IHC) staining of mouse and human tissues and analysis of publicly available high-content gene expression datasets. Both approaches demonstrated coordinated expression of the two FACT subunits, which was primarily associated with the stage of cellular differentiation. Most cells of adult tissues do not have detectable protein level of FACT. High FACT expression was associated with stem or less-differentiated cells, while low FACT levels were seen in more differentiated cells. Experimental manipulation of cell differentiation and proliferation in vitro, as well as tissue staining for the Ki67 proliferation marker, showed that FACT expression is related more to differentiation than to proliferation. Thus, FACT may be part of a stem cell-like gene expression signature and play a role in maintaining cells in an undifferentiated state, which is consistent with its potential role as an anti-cancer target. (Poster presentation.)

## MACROPHYTE SURVEYS FOR HEMLOCK AND CANADICE LAKES.

Bruce A. Gilman, Finger Lakes Community College, Department of Environmental Conservation and Horticulture, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Macrophyte communities characterize the littoral zone of the Finger Lakes. These communities contain some aquatic plants that grow completely submerged in the water, others with leaves floating on the surface, and still others with leaves emerging from the water. High species richness in macrophyte communities often exists, but the taxonomy of several genera (e.g., *Myriophyllum, Najas, Potamogeton*) can be problematic. For these and other reasons, detailed compositional studies have been neglected in some of the lakes.

Macrophyte communities are an essential component of healthy aquatic ecosystems. Their anchoring structures help keep bottom substrates in place, reducing sediment re-suspension and minimizing shoreline turbidity and near-shore benthic deposition that might otherwise have undesirable effects on certain life stages of lake organisms, in particular, fish eggs. Macrophyte stems and leaves also reduce wave energy thereby protecting shorelines from erosion. On a daily basis, macrophytes enhance the dissolved oxygen supply in the water through their photosynthetic activity. Macrophytes also improve water quality as they help control algal abundance by competitively utilizing significant portions of a lake's nutrient budget. Most importantly, macrophytes are a critical habitat for many lake organisms, providing food, shelter and nesting materials.

System-wide macrophyte surveys are recommended every few years, especially to document the arrival of aquatic nuisance species and begin their management before they become widely established. A modern survey is especially timely for Canadice and Hemlock Lakes because of the recent New York State acquisition of the City of Rochester watershed lands, and the immediate work being undertaken to develop a Unit Management Plan for the new, permanently protected State holdings. Historical macrophyte information is generally lacking for the smaller Finger Lakes, with the early researchers concentrating their efforts on the larger lakes. After intensive herbaria searches and review of unpublished reports, a preliminary historical list for both lakes was developed. A modern inventory is desirable to improve knowledge about the biology of these lakes and to establish baseline data for future comparative studies. It is noteworthy that these lakes possess a character that is unique among the Finger Lakes (i.e., no shoreline development and stringent regulations on watershed and lake activities).

The aquatic plant community composition of both lakes was sampled first by snorkeling and, a month later, by macrophyte raking. Sample site location was recorded by GPS coordinates. The littoral zone was large at the north and south ends of the lakes, but was reduced to a narrow strip of vegetation along the eastern and western shorelines. Embayments along depositional points had moderate sized aquatic plant communities. Voucher specimens of all

plants were collected, pressed, mounted and placed into the Finger Lakes Herbarium at Finger Lakes Community College.

Most historical records were reconfirmed with modern collections. Many different species were encountered during the course of the study, including 31vascular plants and 2 macro-algae. Exceptionally dense growth of the native *Elodea* (*Elodea canadensis*) was noted at the south end of both lakes. Three species, brittle naiad (*Najas minor*), curly leaf pondweed (*Potamogeton crispus*) and Eurasian water milfoil (*Myriophyllum spicatum*), are exotic invaders. They were widely distributed in both lakes and often shared dominance in the community. This represents the first report of brittle naiad for the lakes. Native to Europe and western Asia, brittle naiad was first detected in Ohio in 1932, and has since spread to several northeastern states. It is a slender, annual plant with paired leaves and stems that profusely branch near the growing tips. The leaves are stiff, recurved and pointed, and have spines along the leaf margins. The growth form is usually compact and appears billowy. The plant earns its common name from its fragile nature, and is thought to spread by fragmentation as well as seed production. (Oral presentation.)

## RESEARCH OPPORTUNITIES AT THE MULLER FIELD STATION OF FINGER LAKES COMMUNITY COLLEGE.

Bruce A. Gilman and Sasha J. MacKenzie, Finger Lakes Community College, Department of Environmental Conservation and Horticulture, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Located in the southern Honeoye Valley, the Muller Field Station is ideally centered in the western Finger Lakes and can offer residential scientific facilities for those conducting local, field-based research. Received as a gift from Florence Muller in December 1999, the field station's mission is multifaceted: (1) to serve as a learning and research center where people acquire knowledge and share information about the Finger Lakes region, (2) to promote understanding and appreciation of environmental issues and the unique natural resources of the Finger Lakes region and (3) to provide experiential education and scientific research opportunities for students and the community living in the Finger Lakes region. The 50-acre property has direct access to Honeoye Lake through the Inlet Channel. Canoes and kayaks are available on site, and a recently constructed concrete launch ramp is suited for small boats. Terrestrial trails lead from the field station lands to the immediately adjacent 2200 acre New York State Department of Environmental Conservation Honeoye Inlet Wildlife Management Area. Other nearby natural lands where field-based research might be conducted include: Conesus Inlet Fish and Wildlife Management Area (1120 acres) managed by the New York State Department of Environmental Conservation, Cumming Nature Center (900 acres) managed by the Rochester Museum and Science Center, Grimes Glen (32 acres) managed by Ontario County, Harriet Hollister Spencer State Recreation Area (1235 acres) managed by the New York State Office of Parks, Recreation and Historical Preservation, Hemlock-Canadice State Forest (6,684 acres) managed by the New York State Department of Environmental Conservation, High Tor Wildlife Management Area (6100 acres) managed by the New York State Department of Environmental Conservation, Honeoye Creek Wildlife Management Area (717 acres) managed by New York State Department of Environmental Conservation, Muller Camp (165 acres) managed by the Nature Conservancy, Rob's Trail (170 acres) managed by the Nature Conservancy, Warren Cutler Boy Scout Reservation (1200 acres) managed by the Seneca Waterways Council, Wesley Hill Nature Preserve (390 acres) managed by the Finger Lakes Land Trust, Taylor Marsh managed by the Bergen Swamp Preservation Society, and West Hill Nature Preserve (450 acres) managed by the Nature Conservancy. Numerous ecological habitats occur within these natural areas and complete land use and land cover maps, utilizing the New York State Natural Heritage Community Classification System are available for the entire watersheds of Canadice, Hemlock, Honeoye and Canandaigua Lakes. Surrounding the Muller Field Station, over 40 natural communities have been identified including linear assemblages like rocky, headwater streams, expansive cover types like Appalachian oak-hickory forest and silver maple-ash swamp, and small imbedded communities like vernal pools and shale talus slope woodlands. A biodiversity report for the southern Honeoye Valley identifies both rare and common species worthy of scientific investigation. Over 1200 species have been documented so far. There are at least 75 non-flowering plants, including lichens, mosses and ferns. The region is home to eleven conifers. By far the largest group of organisms identified has been the flowering plants with a total of 555 different species. With time, the number of insects will surpass the flowering plant total but at present the insect biodiversity is about 200 species. There have been 20 species of amphibians noted in the southern Honeoye Valley and 15 species of reptiles including three Heritage ranked species, the spiny soft-shell turtle, the timber rattlesnake and the coal skink. Twenty seven different types of fish are known from Honeoye Lake and its tributary streams. Most of the larger mammals have been inventoried, but smaller species are still being assessed. So far, 32 species of mammals are known to inhabit this

region. Black bear and fisher have naturally returned and river otter have been restored through a release program. Birds that migrate through or nest within the southern Honeoye Valley total 159 species. Conservation targets needing more scientific research have been recently identified by The Nature Conservancy during a series of workshops hosted at the Muller Field Station. Their targets are: woodland salamanders, melt water channels and till seepages, bedrock controlled systems, matrix forest systems, lacustrine systems, and low gradient and main-stem streams.

Research opportunities exist at many scales. The field station is less than one hour driving time from six Finger Lakes (Canadice, Canandaigua, Conesus, Hemlock, Honeoye and Keuka) and their biologically diverse watersheds. Field-based terrestrial succession studies and ecological investigations within many forest types are possible. Some cultural impacts on natural communities are known, others need creative scientific investigation. Many opportunities exist for study of individual species. Long term ecological monitoring to evaluate watershed remedial action programs is another desirable possibility in the conservation landscape of the western Finger Lakes. (Poster presentation.)

## REEF BUILDING CORALS RELY ON SYMBIONTS FOR ENERGY AND NUTRIENTS OVER A LARGE DEPTH RANGE.

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Corals living in shallow waters typically acquire their nutrients and energy from their photosynthetic symbiotic zooxanthellae, whereas deeper corals may rely to a lower extent on photosynthetic derived materials due to lower light levels. Whether these deeper corals feed to a greater extent is hotly debated within the community. We separately measured the stable carbon and nitrogen isotope signatures of the coral host and symbiotic zooxanthellae of three species of reef building corals (*Porites asteroides, Montastraea cavernosa,* and *Montastraea faveolata*) along a depth gradient (3–40m) of the Florida Reef Tract. The δ13C and δ15N values of the zooxanthellae and host tissue of all three species became progressively more depleted in 13C and 15N with depth. The lower δ15N values at depth suggest that feeding is actually less important at depth. Further, we found a strong correlation between the δ13C values of the host and their zooxanthellae at all depths, suggesting that even as photosynthetic rates decrease with depth, hosts continue to acquire most of their carbon from their symbionts and do not rely to any greater extent on feeding heterotrophically. (Poster presentation.)

## MELANIN-CONCENTRATING HORMONE RECEPTOR 1 PROTEIN LEVELS INCREASE WITH LONG-TERM MCH TREATMENT IN TRANSFECTED BHK CELLS.

Andrew Goodspeed and Laurie B. Cook, The College at Brockport, SUNY, 217 Lennon Hall, 350 New Campus Drive, Brockport, NY 14420.

Melanin-concentration hormone receptor 1 (MCHR1) knockout mice have limited incidence of diet-induced obesity. This makes MCHR1 a possible drug target to fight human obesity. MCHR1 is a G-protein coupled receptor that transfers information across cell membranes and activates signal transduction pathways. These receptors are often internalized to prevent overstimulation of the cell, however alternative desensitization mechanisms have been observed. Our lab has previously determined that less than 15% of surface-localized MCHR1 internalizes within 30 min of MCH treatment via a cell-based ELISA despite rapid ERK desensitization. This study investigates the possibility that long-term MCH treatment of cells promotes further downregulation of MCHR1 beyond that seen in previous studies. We utilized transfected BHK570 cells expressing VSVg-MCHR1 for our initial studies. We hypothesized that after continued exposure to MCH, MCHR1 would be slowly removed from the plasma membrane resulting in internal pools of receptor destined for lysosomal degradation. We observed a steady increase in MCHR1 protein levels up to 18 h MCH treatment with a steep decline at 24 h via Western blot. Surprisingly, when we quantified changes in individual band intensities using ImageJ, it was determined that MCHR1 protein increased by 59.4%. This was entirely unexpected and suggests that either an increase in transcription or an increase in protein stability occurs with MCH treatment. Because this is a transient-transfection model system, MCHR1 is not controlled by its native promoter and therefore the effects of MCH are most likely due to changes in protein stability of MCHR1. We are currently working hard to determine whether similar observations are found in 3T3-L1 pre- and post-adipocytes to which MCHR1 is endogenously expressed. (Poster presentation.)

## CLUSTERING OF DISARTICULATED REMAINS OF LARGE VERTEBRATES AT THE HISCOCK SITE.

Michael R. Grenier, Buffalo Museum of Science, Buffalo, NY.

Although virtually all specimens found at the Hiscock Site are found completely disarticulated, the clustering of these specimens has long been evident to the field researchers. The recent completion of a computer database of the field and laboratory records of all Hiscock Site specimens and artifacts enables spatial statistical analysis of the finds using Geographical Information System tools. In this paper, the statistical basis of specimen clustering of three species—*Mammut americanum, Cervus canadensis,* and *Odocoileus virginianus*—is demonstrated. For *Mammut* (in the Pleistocene deposits), a series of Nearest Neighbor Analyses yielded very low (negative) Z-scores, ranging from –7.77 to –9.01, indicating a very high degree of clustering. A series of High/Low Clustering (Getis-Ord General G) Analyses yielded very high Z-scores, ranging from 16.90 to 25.13, again indicating a very high degree of high-value clustering. For *Cervus* (in the Pleistocene deposits), High/Low Clustering Analysis yielded a Z-score of 5.01, indicating a high degree of clustering. For *Odocoileus* (Holocene), High/Low Clustering Analysis also yielded very high Z-scores, ranging from 16.90 to 25.13, again indicating a very high degree of clustering. (Oral presentation.)

## TREATMENT WITH MELANIN-CONCENTRATING HORMONE CAUSES β-ARRESTIN 2 RECRUITMENT TO THE PLASMA MEMBRANE AND RECEPTOR INTERNALIZATION.

Katrina M. Haude and Laurie B. Cook, The College at Brockport, SUNY, 217 Lennon Hall, 350 New Campus Drive, Brockport, NY 14420.

The obesity epidemic in the United States continues to worsen from year to year. It often results from the inability to control appetite, and poses serious health-related threats. Recent studies have found that melanin-concentrating hormone (MCH) signaling may be involved in appetite control and energy expenditure. A study was performed with leptin-deficient OB/OB mice, and when MCH receptor 1 (MCHR1) was depleted, the mice became lean and hyperactive. On the other hand, when MCHR1 was overexpressed, the mice became obese and lethargic. To discover the mechanism behind this, the signaling pathway of MCH must be studied. MCHR1 is a G protein-coupled receptor (GPCR). When MCH, an agonist, binds to MCHR1, this GPCR is phosphorylated at the C-terminus. Phosphorylation leads to the recruitment of β-arrestin, which prevents a signaling cascade from being triggered. From here, clathrin-coated pits are formed, and the receptor is removed from the plasma membrane. The receptor can then either be recycled back to the plasma membrane, or degraded in a lysosome. In this study, we want to see if β-arrestin 1 and 2 are recruited after cells are treated with MCH. First, BHK cells stably expressing VSVg-tagged MCHR1 will be transfected with GFP-tagged arrestin. The cells will be treated with MCH over a 30-minute time course, and fixed. Fluorescent microscopy will be used to view the cells. Secondly, BHK cells will be cotransfected with VSVg-tagged MCHR1 and GFP-tagged arrestin, and once again, fluorescent microscopy will be utilized. Lastly, BHK cells cotransfected with VSVg-tagged MCHR1 and GFP-tagged arrestin will be treated with MCH and monitored for 30 minutes using live microscopy. We will be able to see the effects of MCH on arrestin recruitment and receptor using these techniques. (Poster presentation.)

## VISUALIZATION OF NOVEL GUIDEPOST CELLS IN DROSOPHILA OLFACTORY MAP DEVELOPMENT.

Jay-Christian P. Helt, Emily R. Wexler, Ben I. Turkovitz, and Huey Hing, SUNY, The College at Brockport, Department of Biological Sciences, Lennon Hall, Room 204B, 350 New Campus Drive, Brockport, NY 14420.

Our ability to distinguish different smells depends on the systematic organization of olfactory sensory inputs in the olfactory bulb, also called the olfactory map. Understanding how the map is built during embryogenesis is therefore critical for understanding how our sense of smell develops. In the Drosophila antennal lobe, equivalent to our olfactory bulb, olfactory receptor axons target the dendrites of projection neuron to form a precise three-dimensional synaptic map. How the dendritic arbors become organized in the map is unknown. We found that the wnt5 gene is needed for the precise patterning of the map. The Wnt5 protein is expressed in restricted domains in the developing antennal lobe, and its loss severely disrupted the patterning of the dendritic arbors. The Wnt5 expression pattern may act as a template for the fly olfactory map. We propose the existence of novel guidepost cells that express the Wnt5 protein. To characterize these guidepost cells, we began the process of placing the Gal4 gene

under the control of the wnt5 promoter using the technique of gene targeting by homologous recombination. We have screened 243,332 flies of which 5 have been identified to be X-linked insertions. Currently we are characterizing these insertions and will be presenting our findings on the poster. (Poster presentation.)

## GENERATING INTEREST IN PLANT BIOLOGY AMONG PREDOMINANTLY PRE-MED UNDERGRADUATES USING A POPULAR SCIENCE BOOK.

Maryann A. B. Herman, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Many undergraduate pre-med students see little relevance of plant biology to their daily lives or future careers. I have developed assignments for a sophomore-level plant biology course that incorporate readings from *The Botany of Desire* by Michael Pollan. After reading a chapter students define botanical terms within the context of the book and write a response to several instructor-provided questions. Each chapter is integrated into a larger topic in class and students discussed relationships between topics in the novel and course content. For example, the fourth chapter discusses domestication and genetic manipulation of the potato. Students are asked to compare traditional Peruvian potatoes to those available in grocery stores and discuss the feasibility of growing a wide variety of potatoes on a large scale in the United States. In class, the chapter is used as a guide for learning about the creation of genetically modified (GM) crops where students compare genetic transformation to plant breeding, create a list of the pros and cons, discuss prior beliefs and formulate their own scientifically-based opinion on use of GM crops. The majority of students (85%) responded positively to the activities and most students said the book was applicable to class content and helped them relate to the material. (Poster presentation.)

## WHY IS THERE MUCH SCATTER IN PUBLISHED DATA FOR SURFACE TENSION AND CRITICAL AGGREGATION CONCENTRATION IN AQUEOUS SOLUTIONS OF SEVERAL IONIC LIQUIDS?

Markus Hoffmann and Joseph Russo, SUNY, The College at Brockport, Department of Chemistry, 350 New Campus Drive, Brockport, NY 14420.

The composition dependent surface tensions for aqueous solutions of several imidazolium based ionic liquids with aliphatic side chain lengths ranging from one to six carbons were measured. A number of conceivable impurities were purposely added to study how they affect measurement results. Our findings show that a combination of detergent and vacuum grease impurities is the most likely cause of large discrepancies in published literature data. Moreover, the aggregation process of ionic liquids in water is found to be gradual with increasing concentration of the studied ionic liquids, which necessitates measurements over a wide range of concentrations to properly determine critical aggregation concentrations. Finally, the meaningfulness of critical aggregation numbers is generally questionable for ionic liquids with short aliphatic side chains. (Oral presentation.)

## INFLUENCE OF WOODY PLANT ABUNDANCE ON THE RESPONSE OF SOIL MICROBIAL RESPIRATION TO PLANT ROOT EXUDATES.

Torri Ivancic and Daniel Potts, Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222.

Widespread and accelerating anthropogenic climate change and shifting patterns of land-use demand an improved understanding of terrestrial carbon cycling. As a major contributor to ecosystem $CO_2$ exchange, the potentially dynamic factors that control soil microbial respiration warrant close scrutiny. Historically, the soil surface has been viewed as the boundary between distinct above- and belowground components of a terrestrial ecosystem. A modern view suggests that plants mediate the activity of soil microbes through litter inputs (Wardle et al. 2004). We suggest extending this conceptual model to include the contribution of plant root exudates in mediating microbial respiration. Moreover, we predict that the influence of root exudates on microbial respiration varies across different plant communities. Specifically, we predict that an increase in woody plant abundance associated with old-field succession following agricultural abandonment will increase the sensitivity of microbial respiration to root exudates. To address our predictions, we propose an incubation experiment in which we will document the microbial respiration response to the addition of simulated root exudates in soils collected from plant communities along an old-field succession gradient. By improving understanding of the linkages between plant communities and soil microbial activity, our results should improve predictions of the carbon cycling consequences of changing land-use patterns associated with agricultural abandonment. (Poster presentation.)

## BLACK BEAR TRAILS AND SIGNS: A PRELIMINARY STUDY.

Alyssa Johnson and Dr. John Van Niel, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

The Black Bear Management class at Finger Lakes Community College studied a particular type of black bear (*Ursus americanus*) behavior during the 2010–11 school year. We were interested in better understanding the characteristics and potential purposes of trails left by black bears in which the bears step directly into the same footfalls each time. These trails, called ritual, hot foot or retread trials, consist of readily visible circular depressions. We found mention in popular and scientific literature of both grizzly (*Ursus arctos horribilis*) and black bears creating such trails, however we were unable to find any quantitative work regarding the characteristics and creation of the trails. In July, the class travelled to Massachusetts under a National Science Foundation grant to view an active trail. We noted the proliferation of associated sign along the trail including bites, scratches, rubs and straddle trees. Camera traps were deployed in order to record frequency and timing of use. We measured the stride and straddle of the trails and found that these trails did not conform to the measurements one would expect from a bear walking "normally", implying that these trails are formed while bears are employing a deliberately altered gait. (Oral presentation.)

## A 3-DIMENSIONAL ANGIOGENESIS ASSAY USING CALF PULMONARY ARTERY ENDOTHELIAL (CPAE) CELLS GROWN ON GELTREX.

Nur Sabrina Kamarulzaman, Siti Fatimah Sabran, Wahidatul Husna Zuldin and Irene M. Evans, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Drive, Rochester, NY 14623.

Calf Pulmonary Artery Endothelial (CPAE) cells are an endothelial cell line derived from the main stem pulmonary artery of a young cow (*Bos taurus*). Endothelial cells play a key role in angiogenesis, the development of new blood vessels from pre-existing vessels. Angiogenesis is a multi-step process that is important for both physiological and pathological development. During angiogenesis, endothelial cells become activated and matrix metalloproteinases enzymes (MMPs) are expressed. In response to environmental cues, endothelial cells secrete MMPs to degrade the vascular basement membrane. We are attempting to model this angiogenesis process using CPAE endothelial cells grown on Geltrex. We are testing whether the CPAE cells invade the Geltrex matrix and form a 3D branching vessel system. If invasion of the Geltrex matrix is observed, the successfully invading cells will be stained with fluorescence dye to detect the formation of a new capillary tube network. Three-D angiogenesis models may give new insights into developmental and pathological angiogenesis. (Poster presentation.)

## THE WARRIOR SUITOR OF MOKI: A LOOK INTO 19TH CENTURY ZUNI CULTURE THROUGH MYTH.

Chris Keegan, SUNY Geneseo, Department of Anthropology, 1 College Circle, Geneseo, NY 14454.

Myths and folklore are too often either forgotten about or regarded in the academic world as unreliable avenues of insight into a cultural perspective. In this presentation, I will use a method of analysis based on one pioneered by the well-known philosopher and anthropologist Claude Levi-Strauss to demonstrate that myths and folklore are rich in information and can be very useful for understanding their respective cultures. In particular, this presentation focuses on the problems of liminality and social place in the Zuni world around the turn of the last century, based on multiple myths collected by Frank Cushing, focusing in particular on "The Warrior Suitor of Moki." (Oral presentation.)

## PREVALENCE OF EPITHELIAL TO MESENCHYMAL TRANSITION (EMT) RESULTING FROM ULTRAPOTENT CORTICOSTEROID TREATMENT OF VULVAR DISEASE.

Choo-Hyun Kim, Arwen A. Tisdale and Jani E. Lewis (PI), SUNY Geneseo, Department of Biology, 1 College Circle, Geneseo, NY, 14454.

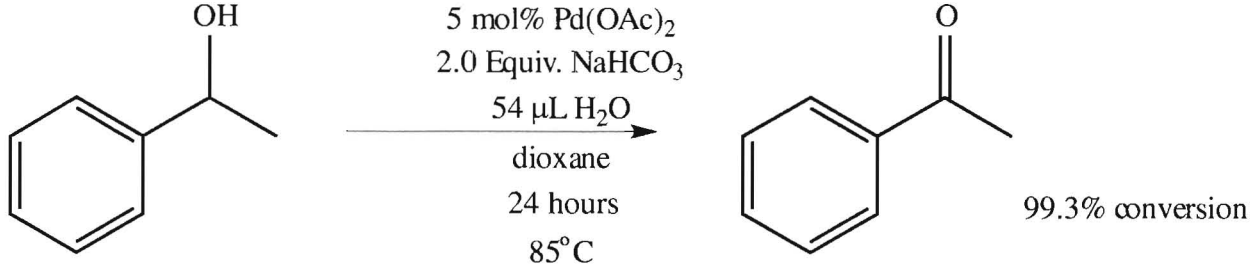
Cells that become tumorigenic undergo an epithelial-to-mesenchymal transition (EMT), which is often characterized by a loss in epithelial cadherin (E-cad) and a gain in vimentin expression. These changes are linked with a more aggressive cancer phenotype therefore E-cad and vimentin have become prominent markers in

determining the stage of some cancers. Our studies show treatment of the vulvar cancer cell line, A431, with either dexamethasone or clobetasol, results in loss of E-cad and gain of vimentin expression. This is of particular concern because clobetasol and other ultrapotent corticosteroids are commonly used in the treatment of the vulvar disease, lichen sclerosus. Our studies are now examining if the loss of E-cadherin and gain of vimentin expression are commonly seen in vulvar cancer from patients previously diagnosed with lichen sclerosus and treated with clobetasol. (Oral presentation.)

## PALLADIUM CATALYZED REACTIONS: A SEARCH FOR A GREENER OXIDATION PATHWAY.

Yoon-Kook Kim, Shannon Hritz, and Karen E. Torraca, Houghton College, Department of Chemistry, 1 Willard Avenue, Houghton, NY 14744.

One of the standard reactions used to generate aldehydes and ketones is the direct oxidation of alcohols. Many current synthetic methods for completing these reactions have significant disadvantages for large-scale manufacture such as the use of stoichiometric amounts of heavy metals, hazardous reagents, and solvent-intense extractive work-ups. In light of this, our research is focused on developing a mild and green oxidation method that could be implemented at large scale. Our efforts focused on the oxidation of 1-phenylethanol to acetophenone. This research sought to minimize the formation of the side product ethyl benzene and attain high conversions consistently using palladium catalysis. Various amounts and types of reagents were tested for their effect. The most successful reaction conditions were:




High conversions were only achieved by blanketing the reaction with argon for an hour and then removing the argon hose to allow the reaction mixtures to vent. According to GC/MS, the reaction achieved 99.3% conversion and produced only trace amounts of the side product ethyl benzene. This reaction method was also applied to other alcohols. Future research will focus on understanding the mechanism of this reaction, further experimentation with different alcohols and development of a simple extractive work-up method. (Poster presentation.)

## A QUALITATIVE ANALYSIS OF THE NEW YORK FOOD & AGRICULTURAL RELATED INDUSTRY.

Robert N. King, Ph.D., Monroe Community College, Agriculture and Life Sciences Institute, 1000 East Henrietta Rd, Rochester, NY 14623.

This qualitative and descriptive study explores existing and future opportunities for agriculturally related economic development, training and education within and among MCC divisions and educational partners. Twenty-one self selected participants from 20 different food and agricultural businesses from upstate New York participated in a strengths, weaknesses, opportunities and threats analysis in order to identify, controllable and uncontrollable factors within the food and agricultural related industry. Discussion was recorded, transcribed and analyzed using NVivo 8 software. Factors identified include: quality and profitability, capacity to attract workers, education, public perceptions, government regulations, and supply and demand for New York products. The study concludes that involvement and coordination within and among the industry will be required to: 1) account for public misinformation, 2) attract a labor force with a broad range of skills, 3) educate youth about career opportunities, 4) establish an industry wide skill set inventory and 5) mitigate government regulations. An implication is that consumer demand and a strong natural resource bases suggests strong fundamentals for regional growth in the Rochester area. (Oral presentation.)

## INVESTIGATION OF THE LEWIS ACID CATALYTIC ABILITIES OF TUNGSTEN (IV) COMPOUNDS ON THE ESTERIFICATION OF FATTY ACIDS.

Molly Kingsley, Nazareth College of Rochester, 4245 East Ave, Rochester, NY 14618.

The use of fatty acid methyl esters (FAME), commonly known as biodiesel, as an alternative to traditional diesel fuel has grown tremendously and many researchers are investigating the use of low quality used cooking oils as a raw material for their production. However, these oils are often contaminated with high levels of free fatty acids (FFA) requiring conversion to esters before the conventional base catalyzed transesterification can be preformed. Often this is accomplished with sulfuric acid, which is highly corrosive and may lead to premature reaction vessel failure. We originally began investigating the catalytic abilities of tetrachloro[ethylenebis(diphenylphosphine)]tungsten(IV) as a replacement for sulfuric acid. However, the direction of the project has recently changed as an interest in the effect of how different ligands on tetrachlorobis(triphenylphosphine)tungsten(IV) changes the electron density at the metal center, and consequently its Lewis acid character. We have been replacing triphenylphosphine with triphenylphosphine species that have fluorine, chlorine and methoxy groups in the ortho position on the benzene ring. In order to determine the Lewis acidity of these compounds we have used them to catalyze the methylation of oleic acid. As in past work, the reaction progress was monitored via 1H NMR. Results to date indicate that the compound with the fluorine substituted benzene ring is the strongest Lewis acid due to its electron withdrawing nature while the non substituted compound is the weakest. (Oral presentation.)

## PHYLOGEOGRAPHIC STUDY OF *CTENOSAURA SIMILIS*.

Zoe Kostarellis[1], Kevin Keller[1], Larry Buckley[1], Stesha Pasachnik[2]; [1]Rochester Institute of Technology, School of Life Sciences, Rochester, NY 14623; and [2]Fundación Islas de la Bahía, Honduras.

This project is designed to ascertain the phylogeographic relationships of the large iguanid lizard species *Ctenosaura similis* throughout its entire range from Panama north to southern and eastern Mexico. Preliminary mitochondrial DNA data from the cytochrome b gene from population samples of 50+ populations have indicated significant genetic structure within and among populations. In order to test whether the mitochondrial haplotype structure is the result of ancestral polymorphism or current interbreeding among populations. We will be sequencing a nuclear gene locus (rhodopsin– ~900bp fragment) in addition to adding cytochrome b sequence from additional samples. Results from the rhodopsin data analysis can then be compared to those from the mitochondrial data and tests performed to resolve the genetic structure as a result of one of the two very different population dynamics. If the mitochondrial and nuclear data sets agree, there may be enough evidence to describe separate populations as newly recognized species, while discordance between the data sets can indicate current levels of gene exchange too high for taxonomic recognition of more than a single species. (Poster presentation.)

## CLU1P REGULATES MITOCHONDRIAL MORPHOLOGY AND MITOCHONDRIAL DNA STABILITY.

Luke Krembs and Rey A. Sia, The College at Brockport, SUNY, Department of Biology, 350 New Campus Dr., Brockport, NY 14420.

Mitochondria are cellular organelles that generate ATP via the process of respiration. They form reticular structures in actively growing yeast cells. Mitochondria have their own genome that encodes genes needed for the final stages of respiration. The mitochondrial DNA (mtDNA) is bound with proteins to form a structure called a nucleoid. These nucleoids are distributed within the mitochondrial structures. In humans, mutations in mtDNA lead to a variety of neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of Clu1p in maintaining mitochondrial morphology and mtDNA stability. Our studies support the altered mitochondrial morphology previously described in clu1Δ mutants. Additionally, we observed clu1Δ mutants to have wild-type nucleoid structures and segregation patterns. We show that clu1Δ cells have a higher frequency of respiration loss than wild-type. This may be a direct result of a 4-fold increase in spontaneous point mutations observed in clu1Δ mutants versus wild-type cells. Cells that are clu1Δ also display an increase in new non-respiring mutants subsequent to UV exposure, without a difference in viability relative to wild-type cells. We propose that modest alterations of the mitochondrial structure do not affect nucleoid structure or segregation, however, they do affect mitochondrial DNA replication and/or repair synthesis. (Poster presentation.)

## SYNTHESIZING OXIDATION-RESISTANT LIGANDS FOR C–H AMINATION CATALYSTS.

Sarah Kruidenier[1], Dr. Patrick Holland[2], Dr. Brian Edelbach[3], and Sarina Bellows[2]; [1]SUNY Geneseo College, 10 MacVittie Dr, Geneseo, NY 14454; [2]University of Rochester, Department of Chemistry, Rochester, NY 14623; and [3]Monroe Community College, Department of Chemistry and Geosciences, Rochester, NY 14623.

A variety of ligand syntheses were attempted using the same method. p-Toluenesulfonic acid monohydrate was used to activate 1,1,3,3-tetramethoxypropane, which was added to an aniline in a solution of toluene. This was followed by the work-up step of adding $Na_2CO_3$ to neutralize the solution, resulting in the formation of the desired compound, which could then be coordinated to iron to form the ligand. Attempted anilines included 2,6-dichloroaniline, which formed $LHCl_2H$ with a 16.5% yield and was then coordinated to iron bromide; 2,4,6-tri-tert-butyl-aniline, to form the product which was unable to be purified; and 9-aminoanthracene, which resulted in no reaction. (Poster presentation.)

## SPATIOTEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE MICHIGAN SPOTTAIL SHINER *Notropis hudsonius*.

Josh LaFountain[1], Jacques Rinchard[1], Sergiusz Czesny[2], Tomas Höök[3], Gabriel Bowen[4], John Janssen[5], and Harvey Bootsma[5]; [1]SUNY, The College at Brockport, Department of Environmental Science and Biology, 350 New Campus Drive, Brockport, NY 14420; [2]Illinois Natural History Survey, University of Illinois, 400 17th Street, Zion, IL 60099; [3]Department of Forestry and Natural Resources, Purdue University, 195 Marsteller Drive, West Lafayette, IN 47907; [4]Department of Earth and Atmospheric Sciences, Purdue University, 550 Stadium Mall Drive, West Lafayette, IN 47907; and [5]Great Lakes Water Institute, University of Wisconsin–Milwaukee, 600 E. Greenfield Avenue, Milwaukee, WI 53204

The pelagic food web of Lake Michigan has been the main focal point of ecological studies because of the importance of commercial and sport fisheries in this oligotrophic system. However, recent introductions of non-native species, mainly dreissenid mussels (zebra mussel *Dreissena polymorha* and quagga mussel *Dreissena rostrisformis*) and round gobies (*Neogobius melanostomus*), have altered trophic ecology directing more attention to the coastal (nearshore) areas. Still these coastal zones have been understudied, especially the assemblage of the recently altered nearshore food web. To better understand the resulting changes to the nearshore trophic structure in Lake Michigan, fatty acid signatures (FAS) of spottail shiner *Notropis hudsonius*, a prey fish for many fish species, were analyzed from eleven sites around Lake Michigan (Wisconsin, Illinois, Indiana, and Michigan) pertaining to two habitats (rocky or sandy) and three seasons (spring, summer, and fall). Unlike diet analysis of stomach contents, FAS provide insights into longer term feeding habits of consumers based on the degree of similarity between their FAS and those of their prey. Using multivariate statistics, we found differences in FAS among groups demonstrating the heterogeneous character of spottail shiner feeding throughout Lake Michigan and the importance of FAS analysis as a tool to explore feeding ecology of freshwater fish. (Poster presentation.)

## FREQUENCY AND CHARACTERISTICS OF LAKE BREEZE CIRCULATIONS IN THE GREAT LAKES REGION.

Neil Laird, Hobart & William Smith Colleges, Department of Geoscience, 300 Pulteney St., Geneva, NY 14456.

Great Lakes lake-breeze circulations, which occur most often during the spring and summer months, can have large economic, societal, and climatic impacts on coastal regions. Although lake breezes are mesoscale weather phenomena, they can significantly modify the summer climatic conditions in the Great Lakes coastal regions by frequently providing cooler temperatures several 10s of kilometers inland from lake shorelines and have been found to be important contributors to initiating severe thunderstorms. Lake breezes have also been shown to influence the dispersion of atmospheric pollutants in lake coastal regions and the local transport of nuisance airborne biota between the shoreline and inland agricultural areas.

An objective method was developed to identify the occurrence of lake-breeze events in the Great Lakes region using surface climatological data. The method also demonstrated the important ability to distinguish non-lake-breeze events; a problem experienced by previous studies. For this presentation, the lake-breeze climatology in the vicinity of Lake Michigan will be discussed. The Lake Michigan climatological analyses indicated that lake breezes tended

to occur more frequently along the eastern shore of Lake Michigan than along the western shore. On average, a maximum number of lake-breeze events occurred during August at each location. This maximum is most closely associated with weaker monthly average wind speeds. Even though the air–lake temperature difference, $\Delta T$, provides the local forcing for the development of the lake-breeze circulation, large temperature differences are not required. Nearly 70% of all events occurred with a daytime maximum $\Delta T \leq 12°C$. In addition, noteworthy differences in the position of synoptic-scale sea-level pressure and wind fields with respect to Lake Michigan were found to occur during eastern, western, and both-shore lake-breeze events. Results and methods used for this study will be shown and discussed during the presentation. (Oral presentation.)

## METHYL ESTER PRODUCTION OF OLEIC ACID CATALYZED BY TIN(II) BROMIDE.

Briana Laubacker, Nazareth College, Department of Chemistry, Rochester, NY 14618.

Biodiesel can be produced from a variety of oils including virgin and used cooking oil. Transesterification is typically employed to process virgin oils, but for used oils an acid catalyzed pre-esterification reaction needs to be performed in order to convert the free fatty acids that are present. This reaction is usually catalyzed with a strong Bronsted base like sulfuric acid but, Lewis acids, such as the tin(II) halides can also effect this transformation. The catalytic ability of these compounds is being investigated to determine if there is a trend depending on which halogen is present. In this research the efficiency of tin(II) bromide as a catalyst was studied. Reactions were run at different temperatures, and the rate of methyl ester formation was determined using 1H NMR. Using this data, the activation energy of the reaction catalyzed by tin(II) bromide was determined to be 68.9 kJ/mol. (Poster presentation.)

## FERROXIDASE ACTIVITY OF THE MULTICOPPER OXIDASE FET5 FROM *S. CEREVISIAE.*

AnneMarie Laurri, Amanda Oldacre, Juliana Sledziewski, Shella Dargout, and Christopher S. Stoj, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

A significant link has been established between the regulation of iron homeostasis and a class of metalloenzymes known as multicopper oxidases. This research seeks to develop a deeper understanding of metallobiochemistry through the purification and characterization of the multicopper oxidase Fet5p from the baker's yeast Saccharomyces cerevisiae. Fet5p is directly involved in the oxidation of iron(II) and thereby the mobilization of iron stores from the yeast vacuole. A new strategy has been implemented incorporating the plasma membrane ferroxidase Fet3p, a paralog to Fet5p, which has been truncated to secrete from the yeast cell. An expression vector containing an inactive form of FET3 fused to FET5 allowed for the successful secretion of functional Fet5p. Currently, attempts to separate the fusion and obtain purified Fet5p are underway as well as kinetic characterization of the intact chimera. (Poster presentation.)

## POSSIBLE TREATMENT OF TYPE II DIABETES USING S-SUBSTITUTED-N,N-DIMETHYLDITHIOCARBONATES.

John Leistner, Christopher Stoj, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

Diabetes is a disease that affects 25 million Americans. Approximately 90–95% of these cases are type II diabetes. It has been found that this disease is directly linked to an over activity of protein tyrosine phosphatase 1B (PTP1B), which dephosphorylates the multiple tyrosine residues within the insulin receptor (IR) protein. This dephosphorylation prevents insulin from binding to the receptor site, thus ultimately increasing the blood glucose levels. Current treatments for this disease focus on decreasing the glucose concentration in the blood, but do not directly address the underlying problem. Through previous research within our lab, it has been concluded that S-substituted-N,N-dimethyldithiocarbonate molecules may inhibit the PTP1B enzyme, further controlling diabetes. Thus far, we have synthesized a few such compounds, some of which have been sent to CSIRO in Australia to attempt a co-crystallization with the PTP1B enzyme. All new compounds will be evaluated as inhibitors of the PTP1B in-house. (Poster presentation.)

## GLUTATHIONE PEROXIDASE AS A RISK FACTOR IN CORONARY ARTERY DISEASE.

Deborah A. Leonard, Mary C. Gallo1, and Michael Merhige, Biology Department, Academic Center for Integrated Sciences, Niagara University, NY 14109, and The Heart Center of Niagara, 571 Tenth St., Niagara Falls, NY 14302.

Oxidative stress plays a central role in the pathogenesis of atherosclerosis. Antioxidant enzymes like glutathione peroxidase (GPX1) are essential for protection against oxidative stress. A polymorphism in the gene that encodes GPX1 (rs1050450) results in a proline>leucine amino acid substitution that may affect the activity of the variant proteins. We hypothesize that GPX1 genotype is a major determinant of enzyme activity in whole blood and that enzyme activity is correlated with risk for coronary heart disease. Study participants were recruited from patients undergoing clinically indicated PET-MPI to measure cardiac perfusion. Genomic DNA was isolated from whole blood using the Maxwell 16 robotic system. Analysis of genotypes was conducted through PCR amplification of the target GPX1 gene, restriction digest of the gene and gel electrophoresis. Patient genotype was compared with disease state and other clinical risk factors for coronary artery disease. Future work will determine the effect of genotype on enzyme activity. (Poster presentation.)

## PLANETARY ECCENTRICITY INCREASE WITH DISTANCE AND TIME.

Ingo H. Leubner, Ph.D., Rochester Institute for Fundamental Research, 35 Hillcrest Drive, Penfield, NY 14526.

Beyond Neptune the eccentricity of orbital objects significantly increases with distance (2009 RASNY Fall Meeting). The eccentricity eventually reaches the critical value of 1.0 at about 300AU (4.6E+10 Km), where the elliptic orbits will change to hyperbolas. This observation predicts that planets leave the Solar system when they reach the limiting distance. In this presentation, this observation is quantitatively modeled and a physical explanation for the increase of eccentricity with increasing planetary orbits is suggested.

The model is based on the interaction of the gravitational fields of the Sun and the Milky Way galaxy. Previously a quantitative model was presented for the rate of the decrease of the solar gravitational field with time. This loss is caused by solar mass and gravity loss by radiation and solar wind.

With time the solar gravitational field decreases relative to the gravitational attraction of planets by the Milky Way. It is shown that the increasing power of the galactic gravitation is expanding planetary orbits near the galaxy, which eventually breaks the adhesion of the planets from the solar system. On the opposite side of the Sun, the gravitational forces of the Sun and the galaxy combine to enhance the planetary adhesion. The result is an increase of ellipticity of planetary orbits which increases with distance from the Sun.

The experimental and model results preclude the existence of an Oort cloud beyond the limiting escape distance. (Oral presentation.)

## MOLECULAR PHYLOGENETIC RECONSTRUCTION OF THE NEOTROPICAL CUCUMBER GENUS *GURANIA*.

Adam Longwich[1], Marty Condon[2], and Susan Swensen[1]; [1]Ithaca College, Biology, 953 Danby Road, Ithaca, NY 14850; and [2]Cornell College, Biology, 600 First Street SW, Mount Vernon, IA 52314.

*Gurania* are a genus of monoecious flowering Neotropical vines that are found in Central and South America. Early in their life, vines produce male flowers and climb into the rainforest canopy. Once they reach a certain size and age, vines begin to produce female flowers in pendulous inflorescences. *Gurania* serve as hosts to fruit flies in the genus *Blepharoneura* where as many as seven different species of flies may parasitize a single species of *Gurania*. Because of the specificity of *Blepharoneura* flies to their host plant, it is likely that diversification of the plant hosts influences the diversification of the flies. Currently, there is no clear picture of host plant phylogeny. Taxonomic revision based on morphology of hosts has been attempted, but geographical variation within species has led to difficulties in species definitions and no phylogenetic analysis has been completed. Our work is aimed at reconstructing a phylogeny of the genus *Gurania* based on molecular data. Preliminary comparison among chloroplast DNA regions has indicated little divergence suggesting that *Gurania* species are closely related. As a result, phylogenetic reconstructions require the analysis of multiple, rapidly evolving gene regions. Our work is geared toward the identification of useful gene regions for phylogenetic reconstruction in *Gurania*. We are testing eight chloroplast intergenic spacers that have proven useful in phylogenetic reconstruction of *Gurania*'s sister genus,

*Psiguria*, as well as a low-copy nuclear marker. Using leaf samples collected in the field, we have extracted, amplified, and sequenced seven chloroplast intergenic spacers: rpoB-trnC, trnS-trnG, ndhF-rpl32, psbE-petL, ndhC-trnV, psbM-trnD, and psbZ-trnM; and one low-copy nuclear marker: serine/ threonine phosphatase (s/t phos). Pairwise comparisons of these sequences reveal 0.22–2.26% sequence divergence among the *Gurania* species suggesting that while *Gurania* are closely related, sufficient variation exists for phylogeny reconstruction. Parsimony and maximum likelihood-based phylogenetic analysis of chloroplast intergenic spacers from multiple species of *Gurania* will be presented. (Oral presentation.)

## MULTIDIMENSIONAL FLUORESCENCE AND CHEMOMETRIC ANALYSIS OF THE PHENOLIC CONTENT OF HUMIC MATERIAL.

James Macisco, Ryan Spector, Morgan Bida, Annemarie D. Ross, Susan B. Smith, A. Christy Tyler, and Todd Pagano, Rochester Institute of Technology, Laboratory Science Technology Program, National Technical Institute for the Deaf, 52 Lomb Memorial Drive, Rochester, NY 14623.

Dissolved Organic Carbon (DOC), a component of humic material, is a natural pollutant that has been shown to be increasing in natural waters. Under conditions of climate change, the phenolic portion of the humic material may be increasing at an even faster rate. DOC, and specifically its phenolic content, can be a concern for the chlorination of natural waters for drinking water. Such treatment can produce potentially dangerous disinfection byproducts via reactions from the DOC/phenol. The primary goal of this project is to characterize the DOC in natural waters in regard to its phenolic components. To this end, multidimensional fluorescence spectroscopy with chemometric analysis has been applied to humic samples. Parallel factor analysis (PARAFAC) has been employed to characterize the phenolic portion of the DOC and correlate characteristic components to phenol structure. (Poster presentation.)

## DETERMINATION OF THE EFFECTS OF ENDOSULFANE-ALPHA ON TRANSCRIPTS KNOWN TO REGULATE PRIMORDIAL GERM CELL MIGRATION IN ZEBRAFISH.

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Various compounds found in the environment have been shown to alter normal endocrine function by disrupting cellular signaling pathways; these compounds are collectively called Endocrine Disrupting Compounds (EDCs). Many substances, from plastics to pesticides, are thought to have endocrine disrupting capabilities that often target developing embryos, specifically the nervous and reproductive systems. Because of the high level of conservation of genes and proteins across animals from the Chordate phylum, Zebrafish have been used for these studies. In vertebrates, Primordial Germ Cells (PGCs) develop during embryogenesis, migrate to and take up residence in the position of the future gonad, and eventually give rise to the future gametes. PGCs have specific and specialized behaviors with regards to cell fate specification, differentiation, and migration. PGC control over RNA transcription regulates these behaviors making them an attractive target in elucidating the mechanisms associated with EDC exposure and altered PGC migration in the Zebrafish. Specifically, when Zebrafish embryos are exposed to endosulfane-alpha during the first 24 hours after fertilization the normal migration pattern of PGCs is altered. However, the underlying changes that result from endosulfane-alpha exposure are unknown. Therefore, the effects of endosulfane-alpha on deadend, staufen 2,and cxcr-4 were examined by exposing Zebrafish embryos (2-2.5 hours-post-fertilization [hpf] to 24 hpf) to 0.1 μM endosulfane-alpha. Total RNA was isolated from Zebrafish embryos, converted to cDNA, and transcript levels for deadend, staufen 2, and cxcr-4 were determined using Real-Time PCR. Results demonstrated that environmentally relevant doses of endosulfane-alpha reduces deadend to 81.7% while it increases cxcr-4 to 116% of control values; results for staufen 2 remain inconclusive due to a problem in the real-time PCR amplification. The alteration in PGC transcript levels may begin to explain the mechanism(s) that underlies altered PGC migration in Zebrafish embryos following early endosulfane-alpha exposure. (Poster presentation.)

## THE EFFECTS OF LAKE MICHIGAN ON MATURE MESOSCALE CONVECTIVE SYSTEMS.

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Mesoscale convective systems (MCSs), or organized regions of thunderstorms that produce widespread severe wind and rainfall, are ubiquitous features across the central and eastern United States during the warm season (April–September). Many of these MCSs traverse the Great Lakes and pose an important forecasting issue. Conventional wisdom suggests that mature MCSs might dissipate upon crossing lake waters that are typically cooler than the surrounding land. However, observational evidence reveals that MCSs can persist or even intensify upon crossing these relatively cool lake waters. This presentation will document environmental and lake conditions associated with warm-season MCSs that cross Lake Michigan to ascertain the spectrum of conditions under which lake-crossing MCSs persist and dissipate.

Of the 110 coherent MCSs that crossed Lake Michigan during the warm seasons of 2002–2007, 47 (43%) persisted, while 63 (57%) dissipated. Persistence was favored during July and August, when Lake Michigan was warmer and during the evening and overnight, when the low-level jet stream was most intense. However, a number of MCSs also persisted during the early warm season when the Lake Michigan water temperature was cooler than the surrounding land. In addition, MCSs often persisted in the equatorward-entrance region of a strong upper-level jet stream and in association with large amounts of Convective Available Potential Energy immediately downstream of Lake Michigan.

Numerical simulations were conducted for representative case studies with Lake Michigan included (control) and removed (noLM). These studies showed that the aforementioned synoptic-scale environmental conditions were the main control on MCS persistence and dissipation. Within a favorable synoptic-scale environment, both persisting and dissipating noLM MCS simulations produced up to 50 mm of additional precipitation in conjunction with increased convection and instability. However, once the synoptic-scale environment became unfavorable, both control and noLM simulated MCSs dissipated simultaneously. (Oral presentation.)

## IDENTIFICATION AND CHARACTERIZATION OF L,L-DIAMINOPIMELATE AMINOTRANSFERASE (DAPL) IN *VERRUCOMICROBIUM SPINOSUM* DSM 4136.

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*Verrucomicrobium spinosum* is a recently identified bacterium belonging to the new division of bacteria Verrucomicrobia. The bacterial phylum Verrucomicrobia is of growing interest due to its widespread distribution and unusual host associations. *Verrucomicrobium spinosum* sequences have been identified in aquatic and soil habitats along with the gastrointestinal tract of humans. The bacterial genome of *V. spinosum* has recently been sequenced. A close and specific relationship between *V. spinosum* and chlamydiae in both phylogenetic trees and uniquely shared inserts in protein sequences is highly suggestive that Verrucomicrobia may be the closest free-living relatives of the parasitic chlamydiae, the organism responsible for the common sexually transmitted disease Chlamydia. (Griffiths, 2007). Here we propose that based on highly conserved sequencing contained within its genome, *V. spinosum* utilizes the L,L- diaminopimelate aminotransferase (DapL ) pathway for DAP/lysine biosynthesis. The enzyme catalyzes the formation of L,L-diaminopimelate (L,L-DAP) from L-2,3,4,5-tetrahydrodipicolinate (THDPA) in one step. Since the DAP/lysine biosynthesis pathway is used to make lysine along with peptidoglycan, which is used to form the mesh-like structure in cell wall, it follows that inhibition of DapL would result in bacterial death. Given the fact bacteria often develop resistance to commonly used antibiotics overtime, the search for novel anti-bacterial targets and medicines is always of keen interest. (Poster presentation.)

## NUMBER CURVES; A NEW WAY TO DO ARITHMETIC.

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Motivation: As a physics teacher I see a mismatch between the arithmetic and calculus that we use to analyze physical events (exact, almost crystalline) and the physical events themselves (shaggy, frictional, complicated flexing shapes, etc.). Scientists and engineers solve this mismatch by using simplified models to smooth out the real world events to fit the mathematical techniques. Can we instead make the arithmetic more "adjustable" or

"compliant" so that 2+2 need not always equal exactly 4 but instead adjusts to fit the event? Could this yield a different way to analyze physical problems? Arithmetic and the natural numbers are intuitively obvious. Is this blinding us to a more general form of arithmetic? I hope that this effort might lead to a generalization of arithmetic somewhat similar to the development of non-Euclidean in geometry in the early 1800's.

Number Curves: Addition of real numbers may be viewed as a geometrical operation on a number line constructed with straightedge and compass. Points associated with the integers are evenly spaced along the line using the compass. Points for rational numbers are identified using geometric constructions. The operation C=A+B identifies the point of intersection of the number line and the circle centered at the point for A of radius equal to the distance from points 0 to B. Why not use this same geometrical operation for number curves that don't follow a straightedge, or that have the numbers associated with the points in some other way? I use the symbol "&" for this operation. Unlike probabilistic techniques, number curves yield exact solutions.

Number curves have some well behaved properties: 0 is always the identity element for the "&" operation on any number curve. The "&" operation always has a solution which is commutative and associative for all numbers whenever the curve is a straight line or a circle.

And some not-so-well-behaved properties: Depending on the shape of the curve, C=A&B can have multiple solutions, or no solution at all. I've demonstrated that the "&" operation is never commutative nor associative for all numbers if the curve is not a straight line nor a circle. I've got algorithms to determine exact solutions to A&B for several special cases but they are all difficult to solve explicitly.

Big goal: I'm hoping that number curves might generalize arithmetic in much the way that geometry was generalized to its non-Euclidean form in the early 1800s. This might lead to new methods of analyzing physical events whereby the math can adjust to accommodate the event instead of the event being simplified to accommodate the math. (Oral presentation.)

## ESTERIFICATION OF FREE FATTY ACIDS IN OLEIC ACID FOR BIODIESEL SYNTHESIS USING LEWIS ACID TIN (II) IODIDE.

Kristin Nichols, Nazareth College, Department of Chemistry, Rochester, NY 14618.

Biodiesel is a commonly used alternative fuel source and is readily produced from renewable resources such as used cooking oil. Biodiesel can be synthesized through esterification of free fatty acids (FFA) or transesterification of triglycerides. Because used oils are often contaminated with FFA's we have chosen oleic acid as a model system for investigating reactions that convert FFA into methyl esters. An acid catalyst is used to treat the FFA's and create fatty acid methyl esters (FAME). Tin halides are common Lewis acid catalysts and are readily available. We tested the effectiveness of the tin (II) halides (F, Cl, Br, and I) to determine which is the best catalyst to use in biodiesel synthesis and monitored the reaction progress using 1H NMR. This poster will present my methods and results on the use of Tin (II) Iodide to catalyze the methylation of oleic acid. (Poster presentation.)

## CHO-K1 CELL EXPOSURE TO 'ENVIRONMENTALLY SAFE' SIMPLE GREEN AND 2-BUTOXYETHANOL HAS AN ALARMING EFFECT IN CELL VIABILITY

Austin Olek, Matthew Morasco, Casey Donovan, Andrew Goodspeed and Laurie B. Cook, The College at Brockport, SUNY, Department of Biology Sciences, 217 Lennon Hall, 350 New Campus Drive, Brockport, NY 14420.

Simple Green is a cleaning product used primarily in the household and claims to be environmentally safe. 2-Butoxyethanol is the only listed chemical in Simple Green with an established exposure limit. The question at hand is how environmentally safe is Simple Green, what effects does it have on cultured cells? Chinese hamster ovary cells of the K-1 strain (CHO-K1) in multi-well plates were exposed to 0%, 0.1%, 1.0% or 10% Simple Green for 10 minutes, and were kept at a temperature of 37°C and a pH of 7.2. A measure of cell viability was taken using a crystal violet assay to bind the DNA of live cells and a spectrophotometer was utilized to measure absorbency at 570nm. Cell viability followed a linear path as the concentration of Simple Green was increased. We observed: 2.4% viability at [10%], 49.5% at [1.0%], and 77.1% at [0.1%] when compared to the control culture. According to the data received when plated on mammalian tissue cells, even a 1:100 dilution of Simple Green caused 97.6% of cells to die when compared to control treatments. Sunshine Makers Inc.'s claim to be environmentally safe is not supported by the data observed and this raises the question of 'What effect does this "environmentally safe" product have on other cells and microorganisms?' (Poster presentation.)

## DIMERIZATION OF BENZYLAMINE WITH SULFUR MONOCHLORIDE.

Bryce Paolella and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

The direct dimerization of primary amines to form secondary amines has yet to be reported. We have developed a novel process by which benzylamine reacts with sulfur monochloride to initial form the dibenzylamino disulfide, which subsequently fragments and dimerizes to form N-benzylidenebenzyl-amine. Reacting the imine with $NaBH_4$ yields the dibenzylamine final product. In addition, we have begun to react the imine with various carbanions to make unsymmetrical disubstituted amines. (Poster presentation.)

## SYNTHESIS OF ISOFLAVONE DERIVATIVES USING A NOVEL METHODOLOGY.

James M. Papia, Kyle F. Biegasiewicz, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

Isoflavones are a class of organic compounds that act primarily as antioxidants. Isoflavones are produced almost exclusively by the members of the bean family including soybeans, tofu, peanuts, chickpeas, and alfalfa. The antioxidant characteristics that isoflavones exhibit help hinder the progressions of certain cancers, primarily breast, prostate, and colon cancer. This research is based on a three/four step synthesis to complete a library of isoflavone derivatives. The synthesis involves an enamine addition, a ring closure and halogenation, a Suzuki coupling, and finally a demethylation to obtain the isoflavone of interest. This synthesis shows the efficiency and effectiveness of the pathway used in producing the desired isoflavone. (Poster presentation.)

## DESCRIPTION OF A JUVENILE SPECIMEN OF *DEINONYCHUS ANTIRRHOPUS* (THEROPODA, DROMAEOSAURIDAE) WITH COMMENTS ON ONTOGENETIC VARIABLE CHARACTERS WITHIN THIS TAXON AND OTHER RELATED FORMS.

William Parsons and Kristen Parsons, Buffalo Museum of Science, Buffalo, NY.

After a comparative study of all available material of *Deinonychus antirrhopus* in the AMNH, MCZ, MOR, and YPM collections, we refer the small theropod specimen MCZ 8791 to this taxon. It is a juvenile based on the presence of only a single line of arrested growth (LAG) in the left radius, the decreased interdigitation on the sutural edge of coracoids, the remnant of a layer of highly vascularized cortical bone on the lateral surface of the centrum of a caudal vertebra, the articular surfaces of the centrum of the proximal caudal vertebrae being perforated by numerous small foramina, only partially ossified parapophysis, and incomplete development of cortical bone on the articular. As to cranial characters, the maxillary tooth count of MCZ 8791 is higher than that in the more mature specimen YPM 5232; other possibly pertinent, diagnostic, juvenile, cranial characters observed in the course of this study include characters in perinate specimens of other members of related taxa such as the posterolateral expansion of the frontal, and a rod-like lacrimal. Relative to the measurements taken from comparable limb elements on the more mature specimens as well as anticipated proportions that might have been estimated from simple extrapolations from the larger specimens, the measurements of the medial/lateral widths of some of these juvenile limb elements are relatively smaller than would have been expected. The resulting effect of such proportional differences indicates a more gracile body form relative to that of individuals within later growth stages. Compared with homologous YPM skeletal elements, the forelimbs are elongate and the coracoids are disproportionately robust. Some of these characters are present only at an early growth stage or have transformed into a differing state as this taxon approaches maturity. These characters have been designated as age variable characters (AVC). After observing the condition of some of these AVCs in *Bambiraptor*, the presence and morphological state of these AVCs may not only help to determine the maturity of a given specimen within this taxon but may also have some application to the determination of the growth stages of specimens within other closely related taxa. (Oral presentation.)

## TRANSCRIPTIONAL PROFILING OF [PSI+] CELLS UNDER STRESSFUL ENVIRONMENTAL CONDITIONS.

Prashanti Patil, Jacqualyn Schulman, Margaret Barlow, Thomas Di Benedetto, Brandy L. Dennis, and Irene M. Evans, Rochester Institute of Technology, School Of Life Sciences, Rochester, NY 14623.

Prions are infectious, self-propagating, aggregated particles devoid of nucleic acid which are composed entirely of abnormally folded proteins. They are examples of epigenetic protein inheritance. Mammalian prions cause fatal neurodegenerative diseases like Creutzfeldt–Jakob disease (humans) and bovine spongiform encephalopathy (cattle).

Yeast prions model some aspects of mammalian prions and allow for extensive studies of basic mechanisms involving prion-cell interactions. We are using the [PSI+] yeast prion which is a epigenetic modifier of translation termination fidelity resulting in nonsense suppression. [PSI+] is a self-perpetuating amyloid-forming conformation of the eRF3 protein and is coded for by the Sup35 gene.

The overall goal is to determine whether the presence of a prion protein in a cell affects the mRNA types and levels present in the cell. Transcriptional (mRNA) profiles were obtained using microarrays. Previous work had not shown large (2x) changes in mRNA when the cells were grown in rich YPD media. Studies by others have shown that the presence of the [PSI+] prion modulates colony morphology and survivability in a variety of (stressful) growth conditions. Our studies were done in minimal medium containing ornithine, a poor nitrogen source, in an attempt to induce stress in the cells. Microarrays done comparing the transcriptional profile of [PSI+] growing in YPD versus ornithine minimal media showed many transcriptional changes many of which were 2x or greater. When the transcriptional profiles of [PSI+] growing in ornithine minimal medium was compared with that of [psi-], several significant two-fold mRNA changes were observed. These results suggest that the effects of a prion protein on a cell's transcriptional profile may be manifested more in stressful medium conditions. The observed mRNA transcriptional differences may help answer what effect a yeast prion protein has on a cell. (Poster presentation.)

## SEQUENCE AND CHARACTERIZATION OF THE *MANDUCA SEXTA* NADPH TRANSHYDROGENASE.

Matthew Pelletier, Laura Leigh French, Stephen Trinidad, and Kurt Vandock, Houghton College, Department of Biology, One Willard Avenue, Houghton, NY 14744.

Many insects require the hormone 20-hydroxyecdysone for molting. This hormone is synthesized by a P450 enzyme which requires NADPH. A potential source for the production of NADPH is the mitochondrial transhydrogenase that catalyzes the following reaction:

$$NADPH + NAD^+ \leftrightarrow NADP^+ + NADH$$

We report here the sequencing of the transhydrogenase gene from the model insect *Manduca sexta.* The coding region of the gene spans a region of about 16 kb and encodes a protein with high homology to transhydrogenase enzymes from a number of species. (Poster presentation.)

## ILLUSTRATED KEY TO THE ISOPODS OF NEW YORK.

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We are developing an illustrated key to the isopods of New York State. Our approach contrasts with the dichotomous, text-based couplets of existing keys by using an illustrated diagnostic pathway to identify isopod species. Drawings prepared by the senior author illustrate differences in structure, body form, and pattern. (Poster presentation.)

## A STUDY OF THE ATMOSPHERIC COMPONENTS OF A WETLAND'S WATER BUDGET: WOODLAWN BEACH STATE PARK, NEW YORK.

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As part of an ongoing hydrologic characterization study of a 15-acre wetland within Woodlawn Beach State Park, just south of Buffalo, NY, this study focuses on the atmospheric inputs and outputs of a wetland's water budget. Properly representing the atmospheric output of evapotranspiration is a key component in the balancing of a wetland's dynamic water budget. However, the methods to calculate evapotranspiration vary considerably. This research seeks to compare these various methods, from the basic to the complex, with the goal to determine if long, elaborate calculations are really necessary, or if simple approaches produce agreeable results. Using an assemblage of collected meteorological data from on site weather stations, numerous evapotranspirational equations were calculated for the 2010 and 2011 spring, summer, and early fall seasons. In addition, two in-field physical instruments, a Class A pan and an atmometer, were also used to mimic evaporation rates and were compared to the calculations. In addition to examining evaporational measurements, this study also investigates the atmospheric input of precipitation and how it, combined with evapotranspiration, influences the balancing of a water budget. Precipitation is further explored through the monitoring of rainfall pH and the exploration of the potential impacts acid rain within the system. (Poster presentation.)

## X-RAY PHOTON CORRELATION SPECTROSCOPY FROM METAL SURFACES

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X-ray Photon Correlation Spectroscopy(XPCS), the extension of dynamic light scattering from optical to x-ray regimes, has provided a marvelous tool for examining nature on the nano-scale. XPCS has been successfully used in the past to study surface dynamics, and recently been extended to structures as small as surface reconstructions and atomic terraces. However, the extreme requirements of both high coherence and surface diffraction seriously constrain current study to high Z surfaces with relatively slow dynamics on the scale of $1-10^{\wedge 4}$ seconds. We will discuss, in broad terms, some of the current experiments near and at this signal to noise boundary. Some of the experiments have proven successful, such as observing step-flow motion on Pt (001) [1] or dynamics of the lifting of the Au (001) surface reconstruction at high temperature [2], while other applications have proven elusive with current light sources. Once this border is relaxed, study will shift to a much wider range of surfaces and materials that can exhibit faster timescale dynamics. In particular, future possibilities of XPCS from surfaces will include real environments, such as materials synthesis, catalysis, and phase transitions.

References:

[1] M.S. Pierce, et al. Applied Physics Letters 99, 121910 (2011).

[2] M.S. Pierce, et al. Physical Review Letters 103, 165501 (2009). (Oral presentation.)

## RATES OF DEUTERIUM EXCHANGE OF AN ACIDIC C–H SULFONE.

Maddison Pollina, James Papia, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

The exchangeability of acidic protons with deuterium atoms is a well known phenomenon. This is typically associated with alcohols, amines, and carboxylic acids. However, depending if a lowered pKa exists, it is possible to exchange a C–H to C–D. With our system, we examined the exchangeability of methylene protons which are alpha to both a benzenesulfone and a carboxylic acid. The rate of exchange was examined in different solvents, and we have also shown that substituents on the benzenesulfone can alter the rate of exchange. (Poster presentation.)

## PSEUDO-POLYELECTROLYTES: MULTILAYERS AND APPLICATIONS.

Ronny Priefer, Ph.D., Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

The use of weak polyelectrolytes in multilayer polymer systems provides a means of altering the physico-chemical properties of these thin films. We have examined the limits of the polyanions by incorporating the pseudo-polyelectrolytes (pPE), poly(4-vinylphenol) (PVPh), into multilayer systems with either the weak polyelectrolyte (WPE), poly(allylamine hydrochloride) (PAH) and the strong polyelectrolyte (SPE), poly(diallyldimethylammonium chloride) (PDADMAC) from dilute aqueous media. Since PVPh exhibits moderate antimicrobial ability, we tested these newly developed multilayered systems to determine their ability to act as antimicrobial surface coatings. For the PDADMAC/PVPh multilayered coatings, >70% inhibition of growth of *S. epidermidis* was observed at an assembly pH of 10.5 and 11.0. In addition, we have been able to exploit the lowered pKa of the alcohol, poly(norbornenyl hexafluoroisopropylmethyl alcohol) (HFIPA), and successfully multilayer with both PAH and PDADMAC. These films are remarkable thick and are considered board-line superhydrophobic. (Oral presentation.)

## TRANSITORY REGIME OF FERROFLUID ELECTROSPRAYS.

Dennis Quill, Joshua Primrose, Christopher Wahl, and Adrian Ieta, SUNY at Oswego, Department of Physics, Oswego, NY.

Although electrospray is much investigated, particularly in relation to its use in mass spectrometry, the electrospray of ferrofluids is hardly ever mentioned in the literature. We investigate here a transitory regime of oil-based ferrofluids. The fluid contains superparamagnetic ferric oxide (10 nm nominal size) particulates. Ferrofluids are electrosprayed in air at atmospheric pressure in a needle-plate configuration. Spray patterns offering a visual spatial distribution of the spray droplets were observed at the grounded counter-electrode under positive polarity. Under certain electrospray parameters the ferrofluid generates lobes in a sequential form. Transitions from one lobe to another are taking place spontaneously due to instabilities in the spray. The pure liquid carrier of the ferrofluid was also electrosprayed for comparison but the patterns observed do not match those of the ferrofluid. The reported lobe regime was so far observed only on the oil-based ferrofluids, although water-based ones were also tested. (Poster presentation.)

## THE DETERMINATION OF THE MICROENVIRONMENT WITHIN A BIODEGRADABLE POLYMER FILM USING COUMARIN C153.

K. Rappaport, L. Tan, E. Carroll, and L. Vernarelli, Rochester Institute of Technology, Department of Chemistry, 85 Lomb Memorial Drive, Rochester, NY 14623.

Biodegradable polymers (BPs) are used extensively in the medical field for surgical sutures, reconstructive implants and drug delivery. With respect to drug delivery, it is important to know the potential microenvironment surrounding BP encapsulated drugs. This surrounding microenvironment could have negative effects, such as denaturation, and render the drug ineffective. The purpose of this experiment is to determine the microenvironment surrounding Coumarin (C153) as a function of BP formulation composition. C153, a fluorescent reporter molecule, acts as our 'model drug' and is encapsulated in BP blends of Poly (L-Lactic Acid) (PLLA) and Pluronic P104. Using fluorescence spectroscopy, BP thin films doped with C153 are analyzed. It was determined as the PLLA molecular weight is increased the C153 emission intensity increases. This result indicates higher levels of fluorophore encapsulation in formulations of higher PLLA molecular weight. In addition, the C153 emission maxima shifts blue as PLLA concentration increases within the blends. This blue shift indicates that C153 is sensing a more polar microenvironment. From these results we can determine that levels of drug loading are dependent on polymer molecular weight. Furthermore, there is a direct relationship with microenvironment polarity and formulation composition. The results from this work can aid in the development of custom tailored BP platforms for use in controlled drug delivery applications. (Poster presentation.)

## A SPITZER VIEW OF THE GIANT MOLECULAR CLOUD MON OB1/NGC 2264.

Valerie Rapson[1], J. L. Pipher[2], R. A. Gutermuth[3], S. T. Megeath[4], and T. Allen[4]; [1]Rochester Institute of Technology, Rochester, NY; [2]University of Rochester, Rochester, NY; [3]Smith College, Northampton, MA; and [4]University of Toledo, Toledo, OH.

We present Spitzer mid-infrared and far-infrared images of the Mon OB1 giant molecular cloud, which contains the young star forming region NGC 2264 and several sub-clusters of young stellar objects (YSOs). With the Spitzer data, along with 2MASS photometry, we classify YSOs in the entire Mon OB1 giant molecular cloud (GMC) by their infrared-excess emission and study their distribution with respect to cloud material. We find that in regions with higher spatial YSO and molecular gas density there is a strong correlation between local surface density of YSOs and density of molecular gas as traced by dust. This correlation is roughly described as a power law in these quantities. We use a number counting technique to determine the fraction of cloud members which are YSOs for different portions of the cloud that have differing average extinctions. We find that this disk fraction differs between the NGC 2264 region alone and the other regions of the Mon OB1 GMC. We compare these results with other molecular clouds and contrast our results for the NGC 2264 region with other estimates in the literature which use a different YSO classification approach. (Oral presentation.)

## NOVEL PSEUDO-POLYELECTROLYTES IN MULTILAYERED THIN FILMS.

Chelsea Recor, Maria Albano, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

Multilayering with a pseudo-polyelectrolyte (pPE) changes the chemical interactions within the system more so then those made from weak polyelectrolytes (WPE) or strong polyelectrolytes (SPE). To date, there are only two known pPE's that have been multilayered. We have been able introduce another pPE into this blossoming field, poly(4-vinylbenzene boronic acid) (PVBBA). As with previously reported pPE's, only a very narrow range of assembly pHs were accessible when multilayered with both the WPE, poly(allylamine hydrochloride) (PAH), and the SPE, poly(diallydimethylammonium chloride) (PDADMAC). In addition, we have begun to examine the WPE, poly(4-vinylbenzoic acid) (PVBA). Multilayered systems for PVBA were produced at pHs 6, 7, 8, 9, 10, and 11 and a linear growth in absorbance readings with increasing layer number was observed. This latter system will help us understand multilayered films created with our newly developed pPE, poly(4-vinylperbenzoic acid) (PVPBA); in which the systems has the potential of producing a strongly antimicrobial surface. (Poster presentation.)

## pH AND TEMPERATURE DEPENDENCE OF DIFFUSION THROUGH A SOL-GEL MATRIX: A STUDY UTILIZING ETHYL-VIOLET DYE REVERSIBILITY.

Jisu Ryu, Jocelin Kalish, Dan Mark, and Kazushige Yokoyama, SUNY Geneseo, Department of Chemistry, Geneseo, NY 14454.

Sol-Gel matrices have multiple applications, including thermal insulation, biochemical sensing and membrane simulation. With the intention of studying the pH and temperature effects of diffusion across a membrane, sol-gel was utilized as a medium for this study. Addition of ethyl-violet dye to the matrix provided a UV-visible light emission that could be analyzed by ultraviolet-visible spectroscopy. Its pH-dependent color reversibility made ethyl-violet ideal. Under basic conditions (pH 10), ethyl-violet is violet in color, while under acidic conditions (pH 2), it is light blue in color. Initially, the sol-gel sample was exposed to an acidic buffer solution (pH 2) for a period of one hour, during which the absorption was analyzed by Ultraviolet-Visible spectroscopy in five-minute intervals. Afterward, the same process was repeated with a basic buffer solution (pH 10). From the acquired data, the diffusion rates of acid and base through the matrix were determined. The diffusion of base was found to be higher than acidic diffusion at temperatures above 25°C. Diffusion of acid was observed to be independent of temperature (constant), whereas diffusion of base was dependent. The activation energy for acid penetration was determined to be 0 kJ/mol, while the activation energy for the base penetration was 34.2 kJ/mol. (Poster presentation.)

## TEMPERATURE AND pH DEPENDENCE OF DIFFUSION THROUGH A SOL-GEL MATRIX; A STUDY UTILIZING ETHYL-VIOLET DYe REVERSIBILITY.

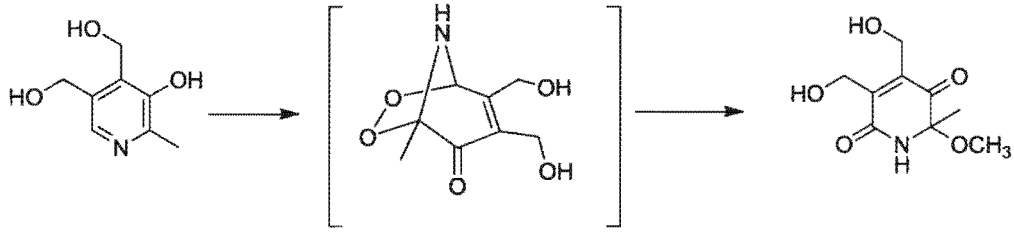
Jisu Ryu, Kazushige Yokoyama, Dan J. Mark, and Jocelin M. Kalish, SUNY Geneseo, Department of Chemistry, Geneseo, NY 14454.

The ethyl-violet dye encapsulated sol-gel was studied for biochemical sensing and membrane simulation. Under basic conditions (pH 10) ethyl-violet is violet in color, while it is light blue in color under acidic conditions (pH 1). Initially, the sol-gel sample was exposed to an acid buffer solution (pH 2) for a period of one hour, during which the absorption was analyzed by ultraviolet-visible spectroscopy in 5-minute intervals. Afterward, the same process was repeated with a basic buffer solution (pH 10). From the acquired data, the diffusion rates of acid and base through the matrix were determined. The diffusion of base was found to be higher at temperatures above 25 C. Diffusion of acid was observed to be independent of temperature (constant), whereas diffusion of base was dependent. The activation energy for acid penetration was determined to be 0 kJ/mol, while the activation energy for the base penetration was 34.2 kJ/mol. (Poster presentation.)

## NMR CHARACTERIZATION AND MECHANISTIC IMPLICATIONS OF SINGLET OXYGEN ADDITION TO THE VITAMIN B6 RING.

David Samuel, Kirsten Norrell, Mark Ghassibi, and David G. Hilmey, St. Bonaventure University, Department of Chemistry, St. Bonaventure, NY 14778.

Vitamin B6 is a group of interconvertible vitamers that are versatile cofactors in biological systems. Recently, vitamin B6 was also shown to have a secondary, protective effect against singlet oxygen. As an antioxidant, it quenches cellular reactive oxygen species that have been implicated in neurodegeneration and aging. Although vitamin B6 is well defined as a cofactor, its antioxidant mechanism still remains poorly understood. In a series of time-course NMR experiments, we observed novel intermediates and products of B6 oxidation. Using the photosensitizer Rose Bengal, we generated singlet oxygen to replicate pyridoxine-dependent quenching in phosphate buffered solutions. Periodic 1D and 2D NMR show the formation of two stable intermediates and a well-characterized, isolatable product. A low temperature study of the same reaction in methanol also revealed an unstable bicyclic endoperoxide intermediate that converted to a 2,5-dipyridone upon warming. The oxidation of other B6 vitamers; pyridoxal and pyridoxal-5-phosphate were similarly characterized in aqueous buffer by time-course NMR directly from reaction mixtures. Compared to other 3-hydroxypyridines, these oxidations appear to be unique to the B6 vitamer family. The oxidation mechanisms of pyridoxine and other B6 vitamers will be discussed.




(Oral presentation.)

## COMPARISON OF METHODS DETERMINING NITRATE CONCENTRATION IN STREAM WATER.

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This study sought to compare three tests used to determine nitrate concentration in stream water samples. The methods explored included nitrate reduction, using the YSI 9500 field photometer and Perkins-Elmer Lambda 25 lab spectrometer, and the ultraviolet spectroscopy screening method. The average variance, standard error, and range were calculated for each method. In addition, the calibration curves were compared to determine which had the most linear correlation, in accordance with Beer's Law. The exact accuracy of the methods could not be determined due

to any variation there may have been between the actual and expected concentration of the standards. However, inferences could be made about the accuracy. In addition, the variability of the measurements between four duplicates allowed the determination of the relative precision of the methods. (Poster presentation.)

## ANALYSIS OF CYTOTOXICITY IN HEPG2 CELLS.

Robert Scardino and Christopher S. Stoj, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

The hepatocellular carcinoma cell line HepG2 often used as a model system to study liver cell toxicity upon exposure to various xenobiotics. This poster describes our progress in two distinct areas of study: cytotoxic effects of alcohol and the cytotoxic effects of cantharidin analogs. Currently, the nature of cytotoxicity in liver cells exposed to ethanol is unclear as well as the proposed 'health benefits' associated with the components of red wine, particularly resveratrol. While the link between alcoholism and liver dysfunction is well established, this study aims to more closely examine the molecular basis of the effects of ethanol within liver cells. Secondly, we have evaluated the cytotoxicity of canatharidin, a known anticancer agent, as well the effects of several cantharidin analogs. (Poster presentation.)

## ION-PAIRING OF THE IONIC LIQUID 1-HEXYL-3-METHYLIMIDAZOLIUM BIS(TRIFYL)AMIDE IN CHLOROFORM.

Nathan Scharf and Markus Hoffmann, SUNY, The College at Brockport, Department of Chemistry, 350 New Campus Drive, Brockport, NY 14420.

In prior research, long-lived ion-pairing of the Ionic Liquid (IL) 1-ethyl-3-methyl-imidazolium bis(trifyl)amide (1) has been observed in chloroform at dilute concentrations as evidenced by two sets of resonances in the 1H spectrum (J. Sol. Chem. Vol. 33, 2004, 381–394). This study focuses on 1-hexyl-3-methylimidazolium bis(trifyl)amide (2) that contains a longer side chain (hexyl versus ethyl) and does not exhibit two resonance sets. The objective of this study was to determine if ion pairing was still present in chloroform solutions of (2) despite only having one 1H NMR resonance set. Therefore, we explored the effect of temperature and concentration on the self-diffusion coefficients of cation and anion measured by 1H and 19F Diffusion Ordered Spectroscopy (DOSY). Viscosity measurements are also obtained to use the Stokes-Einstein relation to determine the effects of temperature and concentration on the effective radius size of the species in solution. Experimental results clearly indicate the formation of ion-pairs and higher aggregates. (Poster presentation.)

## WATER QUALITY ASSESSMENT OF TWENTY-EIGHT STREAMS IN THE CATSKILLS BASED ON BENTHIC MACROINVERTEBRATES.

Jennifer Scobie and Dr. William Hallahan, Nazareth College, 4245 East Ave, Rochester, NY 14618.

During the years 1972 to 2002, the New York State Department of Environmental Conservation (DEC) sampled numerous streams and rivers in an effort to determine and record the water quality in locations throughout the state. The information available is based on macroinvertebrate data collected at over 1,500 sites across the state. This allowed for some temporal trend analysis showing that levels of impairment decreased over time. This research project was conducted to determine how the water quality of 28 specific sites within the Delaware drainage basin has changed within the past nine years since the DEC data was published. Following the methods of the DEC, the travelling-kick sample method was used to collect macroinvertebrates for identification and counting. The data was then used to prepare a Biotic Index, EPT index, and PMA index for each sample site. The research demonstrates that, overall, impairment levels of the sample sites have increased. (Poster presentation.)

## MACROPHAGE APOPTOSIS IN ADVANCED ATHEROSCLEROTIC LESIONS INDUCED BY 7-KETOCHOLESTEROL AND IRON ASCORBATE.

Ashley Scofield, Robert Greene, Ph.D., and Deborah Leonard, Ph.D., Academic Center for Integrated Science, Biology Dept., Niagara University, NY 14109.

Cardiovascular diseases are the cause of 38 percent of deaths in North America and are predicted to be the primary cause of death globally within the next 15 years. The progression of atherosclerotic lesions is due to

inflammatory stimuli, subsequent release of various cytokines, smooth muscle cell proliferation, connective tissue matrix synthesis, and the accumulation of macrophages and lipid. Monocytes that are recruited to the sites of early lesions differentiate into macrophages due to the presence of lipoproteins in the extracellular matrix. The buildup of apoptotic macrophages eventually leads to secondary necrosis causing the accumulation of cellular debris, the promotion of inflammation, plaque instability, acute thrombosis and myocardial infarction in coronary artery disease. We hypothesize that two pro-inflammatory components of advanced lesions, 7-ketocholesterol and free iron, both promote macrophage apoptosis. The human acute monocytic leukemia cell line THP-1 was used as a model system to study the role of redox-active iron and 7-ketocholesterol in macrophage apoptosis. Apoptosis induced by 7-ketocholesterol and iron ascorbate in THP-1 monocytes and macrophages was measured by flow cytometry and enzyme-linked immunosorbent assay (ELISA). Expression of genes that function in apoptosis was measured by quantitative real-time PCR. The results suggest that both 7-ketocholesterol and iron ascorbate cause apoptosis in differentiated THP-1 macrophages in a concentration and time dependent manner. However preliminary results suggest that the apoptotic pathways may be different. Future experiments will investigate the expression of interleukins and other apoptotic markers to clarify the mechanisms of iron- and oxysterol-induced apoptosis. (Poster presentation.)

## NITROGEN AND PHOSPHORUS RESORPTION EFFICIENCY RATIOS VARY WITH STAND AGE IN NORTHERN HARDWOODS.

Craig See, Braulio Quintero, and Ruth Yanai, SUNY–ESF, 105 Marshall Hall, 1 Forestry Drive, Syracuse, NY 13210.

Trees mobilize and reabsorb nutrients from leaves prior to senescence, which is an important mechanism of nutrient conservation. Traditionally, terrestrial systems have been thought to be primarily nitrogen limited, but recently observation and theory have indicated co-limitation by multiple elements. In 2009 we sampled leaves in August and leaf litter in October at the Bartlett Experimental Forest in northern New Hampshire (American beech, sugar maple, yellow birch, white birch, red maple). We studied three stands in each of three age classes: 21–26, 33–36, and >100 years. Phosphorus resorption efficiencies tended to be higher in older stands than younger stands. We analyzed the ratio of N:P resorption, which controls for variation in mass loss during senescence. Phosphorus resorption relative to nitrogen was significantly greater in older stands for white birch ($p = .004$), red maple ($p = 0.01$), and American beech ($p = 0.06$). The fact that old stands are resorbing higher proportions of P than N suggests greater limitation by P in older stands. (Poster presentation.)

## "A STEPPINGSTONE OF CIVILIZATION": THE HOJACK SWING BRIDGE AND STRUCTURES OF POWER IN MONROE COUNTY, NY.

Kyle Somerville[1] and Christopher P. Barton[2]; [1]University at Buffalo, Department of Anthropology, 380 MFAC Buffalo, NY 14261; and [2]Temple University, Department of Anthropology, Gladfelter Hall, 2nd Floor, 1114 West Berks Street, Philadelphia, PA 19122.

This paper examines the Hojack Swing Bridge, the 1905 railroad swing bridge at Charlotte, and its role in the creation and mediation of structures of power in the region. We first discuss the general design and mechanics of swing bridges, the history of the Hojack railroad in the region, and the effect of the railroad on industrial development in the region. We then demonstrate how the very location and design of the Hojack Swing Bridge was the result of competing power relations between the railroad company and other interests. We close with a brief discussion of the bridge today and its uncertain future, an uncertainty linked to competing power relations in the present. (Oral presentation.)

## AVOIDANCE OF HEAVY METALS BY TERRESTRIAL ISOPODS.

Harshita Sood and F. Harvey Pough, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Drive, Rochester, NY 14623.

Isopods are sensitive to organic and inorganic pollutants, and might be useful species for bioassays. Laboratory trials have shown that a terrestrial isopod (*Porcellio scaber*) avoids soil to which copper sulfate has been added. Those trials did not address the question of whether the isopods were detecting $Cu^{2+}$ ions or an organocopper complex formed by a reaction between organic chemicals in the soil and the copper that was added. That distinction

is critical for evaluating the potential of isopods for use in bioassays. because different soils will form different organocopper complexes. We tested the ability of *Porcellio* sp. to differentiate between filter paper moistened with solutions of copper sulfate and filter paper with sodium chloride of the same osmolal concentrations. The isopods avoided the copper solutions, indicating that they are able to detect $Cu^{2+}$ ions. (Oral presentation.)

## DISRUPTION OF BACTERIAL SIGNALING BY BEEHIVE PLANT RESINS.

Ryan Sorensen and Michael A. Savka, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Dr., A350 Gosnell Hall, Rochester, NY 14623.

Propolis, also known as 'bee hive sealant,' is a natural product of honeybees used to seal cracks and openings and provide some immune defense in the hive. Humans have also used propolis for centuries to treat disease, protect wounds, and boost the immune system. Our laboratory has recently shown that propolis has an inhibitory effect on bacterial quorum sensing (QS) systems, a chemically based communication system used by many pathogenic bacteria to coordinate population wide phenotypic changes including virulence. The goal of this project is to measure the effects of twelve geographically different propolis samples (collected from U.S.A., Brazil, Turkey, and Hungary) using bacterial bioreporters in a multi-well plate format that can measure the QS regulated phenotype in biosensors strains along with the cell density. Our data is consistent with and further supports our previous studies that propolis contains compounds that disrupt bacterial QS. Since pathogenic bacteria use QS to regulate virulence traits, propolis can be used in future investigations to isolate anti-QS compounds. Such compounds can be used as anti-pathogenic molecules to control diseases caused by bacteria. (Poster presentation.)

## SURVEY OF BACTERIA IN LAKE ONTARIO.

Aaron N. Spacher and Maryann A.B. Herman, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Monthly water samples were collected from six different locations in Lake Ontario over the summer of 2011 to isolate and characterize antibiotic resistant bacteria. Samples were taken from near a treated sewage outflow pipe and where the Genesee River enters the lake. Water temperature and clarity were measured for each sample location. Water samples were filtered to collect bacteria and the resulting filtrate was grown on R2A medium. Bacterial colonies were isolated and pure cultures frozen and stored for future analysis. Subsequent research will evaluate the gram character and antibiotic resistance to five clinically–relevant antibiotics of the isolated bacteria. (Poster presentation.)

## PUTTING ZEBRA MUSSELS TO THE TEST. CAN THIS INVASIVE SPECIES BE EXPLOITED FOR GOOD?

Joseph M. Spulick, Felicia L. Lenzo, Michael V. Keck, and Timothy W. Sellers, Keuka College, Center for Aquatic Research, Keuka Park NY, 14478.

Zebra Mussels (*Dreisenna polymorpha*) are an abundant and problematic invasive species that are prevalent in our freshwater lakes. These small bivalves have the capacity to be very efficient water column filters, and this ability can in principle be harnessed in water treatment facilities as "green" biological filters because they have the ability to trap small particles and expel them as pseudo-feces. Our experiments were used to determine the percent survival of treated zebra mussels in different concentrations of detergents/surfactants and salts both at critical micelle concentration and below. The combination of salts and surfactants has the potential to trap small toxins in these micelles, which could also be expelled as pseudo-feces. Our results demonstrate the conditions that mussels cannot tolerate in both the detergent and the salt treatments independently. Triton X-100 and SDS caused adverse effects in the mussels when the concentration was high. The detergents reacted with their internal membranes and caused massive cell membrane damage, causing them to die. The higher concentrations of the two magnesium salt treatments also caused the mussels to die. This may be due to the metal ions interference with the osmoregulation of the mussel. In conclusion, these treatments provide a baseline for tolerance for the different concentrations of detergents and salts. (Poster presentation.)

## THERMOLYTIC FRAGMENTATION OF SUBSTITUTED DIBENZYLOXY DISULFIDES.

Eric Stoutenburg, Anne Palermo and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

Dialkoxy disulfide derivatives have been shown to undergo thermolytic decay. The rate of degradation of para-substituted benzyloxy disulfide molecules seems to differ according to the substitutions they possess. The decomposition of these molecules has been shown to follow Swain and Lupton's constant. We took a more in depth look at why these molecules behave the way they do under thermolytic conditions. We investigated the thermo-stability of these molecules in the presence of electron withdrawing and electron donating groups. They were synthesized and subjected to heat using the TGA and DSC. (Poster presentation.)

## AGGREGATION PHEROMONES OF ISOPODS.

Michelle Tabisz and F. Harvey Pough, Rochester Institute of Technology, School of Life Sciences, 85 Lomb Memorial Drive, Rochester, NY 14623.

Pheromones are chemicals that are released by an organism and affect the social behavior of another organism of the same species. *Oniscus asellus*, a terrestrial isopod, is normally found in groups. We tested the hypothesis that pheromones play a role in this aggregation, and compared the responses of male and females to pheromones from individuals of the same sex and the opposite sex. We placed single isopods in Petri dishes that contained two shelters, one resting on clean filter paper and the other on pheromone-impregnated filter paper, and recorded the location of the isopod after 12, 24, 36, and 48 hours. We tested four combinations of pheromone source and isopod sex: Female pheromone x female isopod, female pheromone x male isopod, male pheromone x female isopod, and male pheromone x male isopod. In all of those combinations isopods selected the shelter with the pheromone-impregnated paper ($p < 0.003$ in all cases, binomial test with the probability of selecting the pheromone-impregnated paper set at 0.5). (Oral presentation.)

## STEROLS AS MOLECULAR BIOMARKERS FOR FEEDING STRATEGIES IN REEF BUILDING SCLERACTINIAN CORALS

Mark Teece, Katy Austin, Michael Kolis, Collene Groneman, Timothy Harris, and Valerie Stefani, SUNY College of Environmental Science and Forestry, Chemistry Department, Syracuse, NY 13210.

Scleractinian corals build the carbonate framework of coral reefs, and are critical to the ecology and health of reef ecosystems. These reef building corals obtain nutrients through feeding on zooplankton and also from their symbiotic photosynthetic zooxanthellae. Global climate change, ocean acidification, and human impacts are all stressing these fragile coral ecosystems and many corals may not be able to adapt to these rapid environmental changes. We are developing molecular biomarkers as tools to determine the feeding strategies of individual coral colonies in different environments, and as the chemistry and temperature of the ocean continues to change, corals may adjust their feeding strategies to obtain enough nutrients, and energy to survive. We measured the abundance of specific organic molecules, namely sterols, to establish the feeding behaviors of corals by comparing their relative abundances in the coral host with that in their symbionts. We analyzed two coral species, *Montastraea faveolata* (*M. fav*) and *Porites astreoides* (*P. ast)*, from a range of depths and reef habitats in the Florida Keys. We measured significant differences in sterol composition between the two coral species that may be related to differences in production or genetic variability. The sterol distribution of *M. fav* colonies growing in deeper waters did not reflect the composition of zooxanthellae suggesting a greater reliance on feeding to obtain their sterols. This molecular level approach to understanding feeding strategies now allows us to follow adaptations of reef building corals as the oceans change. (Poster presentation.)

## FOOD NUTRITION IMPACTS FITNESS OF *DAPHNIA* SPP. (FRESHWATER MICROCRUSTACEAN) EXPOSED TO ACUTE UV-A (320–400NM) RADIATION.

M. S. Tobias and S. J. Connelly, Rochester Institute of Technology, School of Biological and Medical Sciences, Rochester, NY 14623.

In nearly all of Earth's ecosystems, organisms are being forced to develop mechanisms that will increase their fitness (survival and reproduction) in response to global climate change. Studies of the physiological and behavioral

responses of freshwater organisms to temperature and solar ultraviolet (UV) radiation are highly variable (species, conditions, extremes of stressors, etc.). It is well known that UV can induce significant stress in some organisms, including direct DNA damage, reduced reproduction rates, and death. Organisms in freshwater systems such as lakes and ponds are faced with high levels of UV exposures due to the clear water. *Daphnia*, a freshwater microcrustacean, is found in many freshwater ecosystems in nearly all climates thus making it a model organism for understanding the effects of UV radiation on a freshwater population.

The fitness response to acute UV-A exposure was studied in the model freshwater microcrustacean, *Daphnia* spp. Various species of *Daphnia* are raised on different food sources and then exposed to UV-A. This provided a picture of how nutrition and UV radiation play a role in survivorship and reproduction in *Daphnia* populations. Some species of *Daphnia* and a sister species, *Ceriodaphnia dubia*, tolerated UV-A radiation and different food sources and had high levels of survivorship and reproduction. Other species were negatively affected by different food sources and in addition, UV-A radiation leading to poor survivorship and reproduction.

Analysis of food sources may provide a better understanding of how organisms can cope with environmental stressors (improved nutrition), despite the rapid changes that can occur in their habitats. These findings can be extended to other populations and should be taken in to consideration for climate change models. (Poster presentation.)

## SELF ASSEMBLY OF AMYLOID BETA PEPTIDE OVER DISULFIDE FUNCTIONALIZED NANO GOLD COLLOIDAL PARTICLES.

Amy Tran and Kazushige Yokoyama, SUNY Geneseo, Department of Chemistry, 1 College Cir, Geneseo, NY 14454.

A key step in fibrillogenesis of amyloid β protein (Aβ) causing Alzheimer's disease is a formation of an oligomer intermediate under a reversible process. While it is challenging to extract this oligomer form, the Aβ coated gold nanoparticles were found to prepare this oligomer form with a help of a specific nanosurface potential. In order to further clarify the role of nanoscale surface, the surface of gold colloid was functionalized with a series of dialkoxy disulfides and self-assembly of Aβ1–40 peptide was investigated under a collaboration with Dr. Priefer at Niagara University. As pH was externally altered between pH 4 and 10, phenyl-bezyilic dialkoxy disulfide functionalized gold exhibited a quasi reversible color change, implying that it has a great potential of controlling a reversible self-assembly process. However, no reversible colour changes were observed for nitro-, chloro-bezyilic dialkoxy disulfide functionalized gold colloids. (Poster presentation.)

## MODELING FROST LINE SOIL PENETRATION USING FREEZING DEGREE-DAY RATES, DAY-LENGTH, AND SUN-ANGLE.

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Seasonal soil freezing depth varies from year to year and knowledge of frost line depth and progression is critical to a number of applications. Frost depth was measured using a CRREL-Gandahi frost tube over a period of three years (2008–2011). The frost tubes provided a measure of frost depth to verify model outputs, and were installed at two locations: Buffalo, NY (Buffalo State College) and in a residential yard in North Tonawanda, NY. With the exception of one set of frost tubes, the area around each frost tube was routinely cleared of snow. Freezing degree-days were calculated from nearby weather stations. A model was developed to forecast the progression and depth of the frost line based on freezing degree-day rates (FDD/day), with adjustments for day-length and sun-angle. The frost line model proved itself a simple-to-use model that required easily obtained inputs, and provides excellent agreement with measured values. The model is best used to predict frost depths in areas and times where snow cover is absent, or when potential frost depth maximums are to be determined. (Oral presentation.)

## EYE-TRACKING NOVICE AND EXPERT GEOLOGIST GROUPS IN THE FIELD AND LABORATORY.

Julia Voronov[1], Rory D. Cottrell[1], Karen M. Evans[2], Robert A. Jacobs[3], Brandon B. May[2], Jeff B. Pelz[2], and John A. Tarduno[1]; [1]University of Rochester, Dept. of Earth and Environmental Sciences, Rochester,

NY; [2]Rochester Institute of Technology, Carlson Center for Imaging Science, Rochester, NY; and [3]University of Rochester, Brain and Cognitive Science, Rochester, NY.

Experience in the field is a fundamental aspect of geologic training, however, there have been only a few quantitative studies based on large data collection efforts to investigate how geologists learn in the field. We are using an Active Vision approach to learn how novices and expert geologists acquire visual information in the field. The Active Vision approach emphasizes that visual perception is an active process wherein new information is acquired about a particular environment through exploratory eye movements. Eye movements are not only influenced by physical stimuli, but are also strongly influenced by high-level perceptual and cognitive processes. Eye-tracking data were collected on ten novices (undergraduate geology students) and 3 experts during a 10-day field trip across California focused on active tectonics. In addition, high-resolution panoramic images were captured at each key locality for use in a semi-immersive laboratory environment. Examples of each data type will be presented. The number of observers will be increased in subsequent field trips, but expert/novice differences are already apparent in the first set of individual eye-tracking records, including gaze time, gaze pattern and object recognition. We will review efforts to quantify these patterns, and development of semi-immersive environments to display geologic scenes. The research is a collaborative effort between Earth scientists, Cognitive scientists and Imaging scientists at the University of Rochester and the Rochester Institute of Technology and with funding from the National Science Foundation. (Poster presentation.)

## THE PHOTOPROTECTIVE PROPERTIES OF VITAMIN D3: A BIOCHEMICAL STUDY OF VITAMIN D UPTAKE BY *DAPHNIA* (MICROCRUSTACEAN).

Kelly Walling and Sandra Connelly, Rochester Institute of Technology, 85 Lomb Memorial Drive 08-1284, Rochester, NY 14623.

Environmental variability can have significant impacts on natural populations to the point that some organisms may have difficulty adapting. Increased levels of ultraviolet radiation (UVR) on the earth's surface have been shown to have a wide range of effects on organisms, from no impact to lethality. Recent studies have shown benefits of vitamin D to individuals, primarily vertebrates, exposed to increased levels of solar radiation. *Daphnia* spp. are especially sensitive to environmental stressors, particularly UVR, and their rapid adaptation to these stressors is crucial. It is known that Vitamin D can increase the fitness (survival and reproduction) of *Daphnia* spp. This research focuses on the impact of UVR on freshwater microcrustacean, *Daphnia* spp., and the potential protective properties of vitamin D3 in this genus. It is hypothesized that vitamin D3, or its primary metabolite (25-hydroxyvitamin(OH)D3,) will also have photoprotective properties in the *Daphnia*. Juvenile (pre-reproductive) *Daphnia* spp. were exposed to vitamin D3 (0, 5, or 10mg / 100mL) and UV-A (320–400nm; 6.912 kJ/ m2) for 72 hours, methanol extracted, and analyzed using High Performance Liquid Chromatography (HPLC) to quantify vitamin D3 and 25(OH)D3 in the *Daphnia*, the algae (*Selenastrum capricornutum*), and the freshwater synthetic growth media. The quantity of vitamin D3 and 25(OH)D3 in the *Daphnia* were then correlated to their overall fitness (survival and total reproduction) in a separate experiment. Increased concentrations of vitamin D3 directly correlate with increased survival of *Daphnia* spp. with UV-A exposure, but not clearly with reproduction. Studies continue to determine if other vitamin D3 metabolites may play a greater role in the fitness of the *Daphnia* spp. with changes in UVR. Further, food web studies of various algae and *Daphnia* spp. are being investigated to determine the photosensitivity and photoprotective properties of the vitamin D3 in natural systems. (Oral presentation.)

## EVALUATION OF ENDOTOXIN REMOVAL TECHNOLOGIES.

Giulia Weissenberger, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Endotoxins are very stable molecules that are resistant to high temperature and extreme pH levels and easily invade media and reagents such as water, saline and buffers. In the NBC/PPA Mid-Scale Production group, protein requests are increasingly made requiring lower and lower endotoxin amounts (measured in EU/mg protein) for use in in-vivo pre-clinical studies. Endotoxin level was measured throughout a typical antibody manufacturing process, and various commercially available technologies were evaluated at different steps of protein purification with the goal of identifying a recommended technology to remove the contaminant. Endotoxins, small molecules present in bacterial membranes, pose a risk of contamination in biological products. If not cleared during the manufacturing process, tissue injury, fever, septic shock or death can occur if injected into mammals. With both clinical and commercial manufacturing, steps and technologies must be developed to clear this impurity from pharmaceutical

products. Here, commercially available technologies are evaluated and compared for pre-clinical protein production. (Poster presentation.)

## DETECTING PATHOGEN POPULATIONS IN THE RHIZOSPHERE COMMUNITIES OF TOMATO PLANTS.

Augusta Williams[1,2], Carly Summers[2], and Christine D. Smart[2]; [1]Hobart and William Smith Colleges, 300 Pulteney St., Geneva, NY 14456; and [2]Cornell University, New York State Agricultural Experiment Station, Geneva, NY 14456.

In an aim to improve soil-borne disease management in an organic agricultural system, mixed-species cover crops were tested to see their effect on pathogen prevalence in the tomato rhizosphere. Several different species of cover crops have been shown to suppress disease, but suppression has not been tested in mixed-species. This mixed species study covers three states (NY, MD, and OH) and three cover crop mixtures were used: hairy vetch with rye, clover with rye, and turnip with rye. Rye alone and no cover crop were used as the two controls. Plants were harvested, and the height and the fresh weight of each plant was recorded. DNA isolation and soil analyses were completed. Macroarrays, used to detect plant pathogens, are pre-spotted with oligonucleotides which hybridize with complementary PCR-amplified DNA labeled with a chemiluminescent reporter. The fungal and oomycete specific oligonucleotide sequences used will hybridize to the membrane when the same sequences are present. The macroarrays used in our lab can detect over forty tomato pathogens. My project focused on macroarrays from the state of Maryland that were collected in a single season. Nineteen oligomers, representing 7 pathogens were identified in the 59 samples tested. In the future, the type and frequency of pathogen will then be related to the type of cover crop for each sample, to determine if there are any cover crop effects. (Poster presentation.)

## ANALYSIS OF DRINKING WATER FOR TRIHALOMETHANES BY MEMBRANE-INTRODUCTION-GC-MS.

Carissa Williams and Michael A. Brown, SUNY, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Chlorination is one of the most widely used drinking water disinfection process in the world, however it forms halogenated disinfection by-products (DBPs), such as trihalomethanes (THMs). The concentration of THMs is regulated by the USEPA because it is a suspected carcinogen. Currently the maximum contaminant level concentration for THMs is 80 $\mu g\ L^{-1}$. The USEPA has four GC-based methods for the detection of THMs in drinking water. These methods provide acceptable results however they require organic solvent and expensive sampling equipment. This research involved automating an alternative membrane-based GC-MS method, which was solvent free for the extraction of THMs. The sampling apparatus used in this research is comprised of a membrane sampling device coupled to a two position injection valve fitted with a 250mL sample loop contained in a heated enclosure interfaced to a typical GC-MS. Several parameters, such as purge time and injection port temperature were optimized. Studies were also performed to determine a suitable internal standard for the developed method. Drinking water samples collected at The College at Brockport, SUNY contained total THM concentrations between 50 to 60 $\mu g\ L^{-1}$. (Poster presentation.)

## BIOMONITORING OF ELLICOTT CREEK.

James M. Wolfe and Jonathon Mikolin, Houghton College, Department of Biology, One Willard Avenue, Houghton, NY 14744.

Ellicott Creek is a significant drainage for the northern suburbs of Buffalo and has been impacted by human activities. A 2001 NYSDEC survey showed moderate to slight impacts. We report on a summer 2011 survey we conducted collecting data for macro-invertebrates, as well as chemical and physical parameters (temperature, oxygen, ANC, conductivity, and total phosphorus). Our results confirm that Ellicott Creek shows some slight impacts in the Williamsville region, consistent with the NYSDEC data. (Poster presentation.)

## INHIBITION TESTING OF *PSEUDOMONAS* SPP. "K/W" AGAINST *PYTHIUM APHANADURAMTUM* PA5 ON *CUCUMIS SATIVUS.*

Matthew Yacobucci and Timothy Braun, SUNY at Oswego, Department of Biological Sciences, Oswego, NY 13126.

*Pseudomonas* spp. have been studied as biological control agents for plant pathogenic soil fungi and bacteria, due to the production of antibiotic compounds such as 2-4-diacetylphloroglucinol (DAPG). *Pseudomonas* spp. strain "K/W" was isolated on the SUNY Oswego campus and has been found to inhibit growth of plant pathogenic fungi: *Pythium aphanidermatum* Pa5 and *Pythophthora caprici* on Potato Dextrose agar. K/W was also able to inhibit Gram-positive bacteria, such as *Staphylococcus aureus* and *Bacillus cereus*, but shows no inhibition for Gram-negative bacteria, such as *E. coli*. A mutant strain, CA-B, was generated by transposon mutagenesis and mapped to the phlD gene (which produces 2-4-diacetylphloroglucinol (DAPG)). This mutation renders CA-B incapable of inhibiting growth of bacteria or fungi. To study direct interspecific competition between the K/W strain and *Pythium*, a bioassay was developed using *Cucumis sativus* seeds, to quantitate the ability of the K/W strain to inhibit the pathogenicity of *Pythium*. Results of the bioassay are presented. (Poster presentation.)

## ECOSYSTEM BUDGETS HAVE NO ERROR: A PROGRESS REPORT ON QUANTIFYING UNCERTAINTY IN FOREST ECOSYSTEM STUDIES (QUEST).

Ruth Yanai[1], Carrie Levine[1], Mark Green[2], and John Campbell[3]; [1]SUNY College of Environmental Science and Forestry, Department of Forest and Natural Resources, 106 Marshall Hall, 1 Forestry Dr., Syracuse, NY 13210; [2]Plymouth State University, Center for the Environment, MSC 63, 17 High St., Plymouth, NH 03264; and [3]US Forest Service, Northern Research Station, 271 Mast Rd., Durham, NH 03824.

Nutrient budgets for forested ecosystems have rarely included error analysis, in spite of the importance of uncertainty to interpretation and extrapolation of the results. We describe recent progress in quantifying uncertainty in biomass, soils, and hydrologic inputs and outputs, using examples from the Hubbard Brook Experimental Forest, NH, USA. Uncertainty derives from natural spatial and temporal variation and also from knowledge uncertainty in measurement and models. For example, when estimating forest biomass, researchers commonly report sampling uncertainty but rarely propagate the uncertainty in allometric equations used to estimate biomass, much less the uncertainty in the choice of which allometric equations to use. Change over time may have less uncertainty than a single measurement, if measures are consistently biased, as by the use of inaccurate allometric equations or soil sampling techniques. Promoting quantification of uncertainty in ecosystem studies is the mission of QUEST (quantifyinguncertainty.org). (Poster presentation.)

## ELECTRON MICROSCOPY STUDY OF THE AMYLOID BETA PROTEIN ON THE SURFACE OF COLLOIDAL NANOPARTICLES.

Dr. Kazushige Yokoyama[1], Makaía Papasergi[2], and Jeffery Ma[3]; [1]ISC 326F, 1 College Circle, Geneseo, NY 14454; [2]Box 4110, 10 MacVittie Circle, Geneseo, NY 14454; and [3]Box 1721, 10 MacVittie Circle, Geneseo, NY 14454.

Our research involves the investigation of the nanoscale aggregation of the Amyloid Beta Protein (A-β1-40) under interfacial conditions. A-β1-40 is involved in the process of fibrillogenesis, a known characteristic of Alzheimer's disease. Through research of the reversibility of the A-β1-40 aggregated conformation, it may be possible to find a process to reverse Alzheimer's disease in its early stages. We succeeded in characterizing microscale properties of A-β1-40 coated 20 nm gold and silver colloids by using Transmission Electron Microscopy (TEM) for various pH conditions. This study enabled us to determine the behavior of A-β1-40 as seen through its interaction with colloid nanoparticles. (Poster presentation.)

## THE IMPACT OF THE LIGAND ON PALLADIUM-CATALYZED HYDRODECHLORINATION OF ARYL CHLORIDES.

Daniel T. Zdanowski and Margaret E. Logan, The College at Brockport, SUNY, Department of Chemistry, 350 New Campus Drive, Brockport, NY 14420.

Efficient hydrodechlorination of aryl chlorides is of interest both for its potential application to removing chlorine substituents from environmental pollutants such as polychlorinated biphenyl compounds (PCB's) and for its utility in synthetic organic chemistry. The past ten years have seen the development of new, commercially available and air-stable ligands for palladium to give catalysts that readily react with aryl chlorides in the presence of nucleophiles, resulting in replacement of the chlorine by the nucleophile. The work described here builds on previous work in which a palladium catalyst prepared from one of these ligands, a dialkylphospinobiphenyl compound, was used with formate ion, a hydride source, to efficiently and effectively hydrodechlorinate aryl chlorides in refluxing methanol. In the current work, the same reactions were performed using recently published, more sterically encumbered ligands and precatalysts prepared from them, to determine which were more effective catalysts for the hydrodechlorination of aryl chlorides. Dialkylphospinobiphenyl ligands in which the alkyl group was the cyclohexyl and the tert-butyl were compared in this work. The reactions were monitored by gas chromatography to determine both the extent and rate of hydrodechlorination. Studies were also conducted to determine the impact of temperature and mole ratio of the reactants on the hydrodechlorination reaction. (Poster presentation.)

## PRODUCTION AND CHARACTERIZATION OF POLY-3-HYDROXYBUTYRATE FROM BIODIESEL-GLYCEROL BY *BURKHOLDERIA CEPACIA* ATCC 17759.

C. Zhu, W. Pan, J. A. Perrotta, and J. P. Nakas, SUNY College of Environmental Science and Forestry, Department of Environmental and Forest Biology, Syracuse, NY 13210.

Glycerol, a byproduct of the biodiesel industry, can be used by bacteria as an inexpensive carbon source for the production of value-added biodegradable polyhydroxyalkanoates (PHAs). *Burkholderia cepacia* ATCC 17759 synthesized poly-3-hydroxybutyrate (PHB) from glycerol concentrations ranging from 3% to 9% (v/v). Increasing the glycerol concentration resulted in a gradual reduction of biomass, PHA yield and molecular mass (Mn and Mw) of PHB. The molecular mass of PHB produced utilizing xylose as a carbon source is also decreased by the addition of glycerol as a secondary carbon source dependent upon the time and concentration of the addition. 1H-NMR revealed that molecular masses decreased due to the esterification of glycerol with PHB resulting in chain termination (end capping). However, melting temperature and glass transition temperature of the end-capped polymers showed no significant difference when compared to the xylose-based PHB. The fermentation was successfully scaled up to 200 L for PHB production and the yield of dry biomass and PHB were 23.6 g/L and 7.4 g/L, respectively. (Oral presentation.)

## USE OF MICROWAVE IRRADIATION AND SOLID SUPPORT REAGENTS IN FRIEDEL-CRAFTS ALKYLATION REACTIONS.

Laurine Zupp, Veronica Campanella, and Ronny Priefer, Department of Chemistry, Biochemistry, and Physics, Niagara University, NY 14109.

Microwave chemistry is a popular method in organic synthesis to achieve higher yields in shorter reaction times. The theory behind the technique is that the radiation given from the microwave is converted into heat, allowing it to produce a "superheating" site where reactions can be performed in a matter of seconds/minutes compared to hours. Another relatively recent technique used in organic chemistry is solid support reagents. The benefits of this approach is that upon completion of a reaction, a simple filtration can be performed which expediates the work-up and produces less organic waste. Friedel-Crafts alkylation has been explored using microwave chemistry as well as solid-support bound reagents, however never in combination. We have begun to evaluate the use of varying alkylation reagents with both $AlCl_3$ and Si-$AlCl_x$ as the catalysts under microwave irradiation. These reactions conventionally take 24 hours, but they went to completion in only 5 minutes when placed in the microwave. (Poster presentation.)

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# RECENTLY ELECTED FELLOWS

## MATTHEW P. SINACOLA
## FELLOW
## 2003

Matt Sinacola joined the Astronomy Section of the Rochester Academy of Science in 1986, shortly after arriving in Rochester with a B.A. degree from Clark University. He immediately became engaged in serving the Section. He volunteered to assist and then direct the public viewing through the telescope atop the Strasenburgh Planetarium. Soon he was elected the Astronomy Section's Vice-Chair, serving two terms between 1988 and 1990, and another term in 1993. These years were pivotal for the club as restructuring took place, membership grew, and land for a permanent observing site was acquired in Ionia. Matt's contributions were integral to these changes. He helped write the Section By-Laws, designed a new Astronomy Section logo, and shared his surveying and civil engineering expertise to help develop the land into what has become a first-rate astronomy club observation site. Many hours of his time were devoted to fieldwork, drawing site plans, acquiring town approvals, and helping construct the main building. He continued his involvement with planning and building as site improvements were made. By then, between 1994 and 1996, Matt had been elected to three terms as Astronomy Section Chair.

Matt is currently President of the Rochester Academy of Science and has served steadfastly since his first term in 1997–1998. His mindful attention to Academy affairs has the respect and gratitude of the Board of Directors and the general membership.

Since the beginning of his association with the Astronomy Section, Matt has participated in public outreach programs and activities. You can find him at a public star party sharing his enthusiasm for the night sky, or presenting astronomy topics to groups of children or adults. Many people have had their knowledge enriched through Matt's efforts.

Artistically talented, Matt has spent countless pleasurable hours drawing details of the lunar surface or other heavenly objects as seen through a telescope. His sketches have graced the covers of the *Rochester Astronomer* and have been published in *Nightwatch* and *The Backyard Astronomer's Guide* by T. Dickenson. He has maintained an observational log that contains sketches and notations recorded for over twenty years. Matt is active in a community art group and his artistic endeavors have been recognized by several awards.

In recognition of these contributions we welcome Matthew P. Sinacola as a Fellow of the Rochester Academy of Science.

## DOMINIC F. SHERONY
## FELLOW
## 2003

Dominic Sherony is a native of Illinois. He is a graduate of the Illinois Institute of Technology with a Ph.D. in Chemical Engineering. He came to this area in 1969 to work for Xerox Corporation. At Xerox he worked in Supplies Product Development, which included assignments in development system design, fuser technology and carrier coating. He managed both the Technical Services Section and the Toner/Development Section before retiring from Xerox in 1999.

Dominic's interest in birds started in 1970 with lunch breaks in Webster Park with birders from Xerox. He saw a Rose-breasted Grosbeak and was hooked on ornithology. Moving on from lunchtime and backyard birding, Dominic joined the Genesee Ornithological Society in 1976 and was a regular on their field trips. He became an expert in bird identification, specializing in shorebirds, jaegers and waterfowl. More recently he has written and published articles in the *Kingbird*, *Birding*, the *Journal of Field Ornithology* and the *Crescent Trail News*. With Brett M. Ewald, he published "A Summary of the Hamlin Beach Lakewatch Fall and Winter Waterbird Migration Data, 1993–1999".

Dominic has been a speaker at GOS monthly meetings, giving a number of informative programs. He has a large collection of bird photographs, which he presents each year as part of our annual Members' Night. He is a Section Leader on the Rochester Christmas Bird Count. He leads several field trips each year and is a regular contributor to the monthly noteworthy records published in the *Goshawk*. He is presently a Regional Coordinator for the New York State Breeding Bird Atlas and a member of the New York State Avian Records Committee.

For his scientific contributions in the field of ornithology, for sharing his expertise of bird identification and outstanding photographs of North American birds with others, and for his support to the Genesee Ornithological Society, we are pleased to welcome Dominic F. Sherony as a Fellow of the Rochester Academy of Science.

## ELIZABETH W. BROOKS
## FELLOW
## 2003

Elizabeth (Betsy) Brooks is a native of Pennsylvania and grew up in Havertown. She is a graduate of Ohio Wesleyan University with a degree in religion. She came to Alfred in 1966 when her husband accepted a teaching position at Alfred University. She is active in the Allegany County Bird Club and was its president for several years. Her interest in bird banding originated in Alfred as a sub-permittee of Don Clark. She later did banding with Clay Taylor of Braddock Bay Raptor Research, who encouraged her to try banding passerines in the area that is now the Kaiser-Manitou Banding Station.

Betsy has operated the Kaiser-Manitou Banding Station since 1985, amassing data on the spring and fall migration of songbirds. Betsy, along with volunteers and interns from the local birding community, has banded over 95,000 birds since 1985. The Braddock Bay Bird Observatory was incorporated in 1995 as a not-for-profit organization dedicated to ornithological research, education and conservation. Over the years Betsy has shared her experiences and enthusiasm for songbird banding, providing the results of her work at ornithology club meetings and in an annual report in the *Goshawk*.

In addition to her local ornithological accomplishments, she is a longtime member of the Eastern Bird Banding Association and is a former president and currently 3rd vice-president. She represents the Eastern Bird Banding Association as a delegate to the North American Birding Council, an organization founded to promote sound bird-banding practices. She is a certified Bander Trainer for the Council. For the Eastern Bird Banding Association she is the coordinator of the Atlantic Flyway Review, a reporting network of bird banding stations and observatories across North America.

For her contributions in the field of ornithology, specifically in documenting spring and fall migration of songbirds on the Lake Ontario plain, in the implementation of a banding training program at the banding station, and in the education of students and visitors in conservation and habitat enhancement important to wildlife preservation, we are pleased to welcome Elizabeth Brooks as a Fellow of the Rochester Academy of Science.

## JAMES R. SEIDEWAND
## FELLOW
## 2004

Jim Seidewand is a Rochester native, born in 1949 and educated at McQuaid Jesuit High School and the Massachusetts Institute of Technology. In 1969 he and his wife Margie opened The Aqua Shop, initially selling tropical fish and expanding their product lines in the 1970's to become Pet World. Pet World is a long-time member of the Pet Industry Joint Advisory Council, and Jim has served PIJAC as a Director since 1993. That year he also joined the Rochester Academy of Science as a member of the Astronomy Section.

Jim served the Astronomy Section as an elected Director in 2000, 2001 and 2002, and has been Outreach Director since 2000. He organizes public star parties in all but the snowbound months, as well as for special astronomical events such as the Leonid meteor storm, Mars Mania, and the Venus Transit. He publicizes community events, and maintains the web site event schedule, insuring current information is available to members and the general public alike.

Jim often gives informal "sidewalk astronomy" programs at sites throughout the Rochester area, including Charlotte Beach and High Falls. He does numerous astronomy presentations each year to local schools, scouting and civil organizations. Jim is a Project Scope mentor, a Mees Observatory tour guide, and a Strasenburgh Planetarium's observatory operator. He is a fixture at Section activities, a major contributor to construction of the Section's roll-off observatory, and manager of the "pop fund" and "silent auction" fundraisers.

Jim is a willing coach to anyone taking their first steps in astronomy. Many members' first memories of the Section include Jim's resonant voice describing some distant island universe, accompanied by Oreo cookies. By sharing his enthusiasm and knowledge of astronomy, by taking a personal interest in potential new amateur astronomers, Jim has recruited many new members and is, in large part, responsible for the 64% growth in Section membership during his tenure as Outreach Director.

It is for his dedication to the education of the general public in the knowledge and enjoyment of the wonders of the universe, and to furthering the understanding of astronomy in Rochester that we are honored to bestow the title of Fellow of the Rochester Academy of Science to Jim Seidewand.

## DAVID BISHOP
## FELLOW
## 2006

David Bishop served the Astronomy Section as Chairman or President from 1999 to 2002, as Past President 2003 to 2005, and remains active as Program Chair. Under his leadership, Section membership grew 48%, meeting attendance reached its peak, and the Wolk Observatory expanded to include two permanent observatories.

Dave Bishop has made a significant contribution to supernova research. In early 1996, Dave Bishop created a web site for reporting, updating and archiving reports of supernova discoveries. Since 1996, Dave's supernova web site, now part of the Astronomy Section web site, has become the international clearinghouse for supernova discoveries.

Dave starts with International Astronomical Union Circulars (IAUC) and Central Bureau Electronic Telegrams (CBET) discovery notifications. He adds background information and brightness updates, as well as links to discovery, confirmation and subsequent images from a wide variety of sources.

His web site logged a record 366 supernova discoveries in 2005, received the Griffith Observatory Star Award for web sites that promote public awareness of astronomy, and has been referenced in several

articles in *Sky and Telescope*. It's clear that the vast majority of the 730,000+ monthly hits to the Astronomy Section web site were for supernova information, from over 42 country-specific domains.

For his leadership of the Astronomy Section, his active involvement in Section public program and his contribution to supernova research, we are honored to bestow the title of Fellow of the Rochester Academy of Science to David Bishop.

## JOHN C. HANDLEY, Ph.D.
## FELLOW
## 2011

When John Handley joined the Fossil Section of the Rochester Academy of Science in 1998, he came with a professional background in math and a Ph.D. in imaging science. He had written numerous journal articles and held a number of patents in his field of study. John brought these professional strengths, along with an enthusiasm for paleontology, to the Fossil Section. He soon became Vice President of that section in 2003, and since then has led the section in that capacity or as President. He built an excellent speaker program, as well as giving presentations himself. The Fossil Section has flourished under his tutelage.

Elected as Vice President to the Rochester Academy of Science in 2010, John contributed to the success of the Larry King Memorial Lecture and the Spring Lecture by obtaining noteworthy speakers, and helping to organize and advertise these events.

John has participated in numerous community outreach activities that educate children and adults about paleontology while promoting the Fossil Section. These activities include presenting at a student bioscience camp, setting up educational library exhibits, and talking to the public over fossil displays.

Contributing his expertise in statistics and knowledge to the field of paleontology, John has co-authored a number of professional abstracts and journal articles in *Paleobiology* and *Palaios*, and he has presented at professional geology conferences. John currently serves on the Paleontological Research Institution Board of Trustees where he promotes paleontology through that institution and at the Museum of the Earth in Ithaca, NY.

In recognition of these contributions, we welcome Dr. John C. Handley as a Fellow of the Rochester Academy of Science.

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2.Behar-Horenstein, Linda S., Johnson, Melissa L. "Enticing Students to Enter Into Undergraduate Research: The Instrumentality of an Undergraduate Course." *Journal of College Science Teaching* 39.3 (2010): 62–70. (Oral presentation.)

## RIDING THE CELL CYCLE—DRIVER OR PASSENGER?

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The study of proteins involved in the regulation of the cell cycle is very important both for understanding the basic mechanisms of life, as well as for getting more insight into the molecular processes that cause malignant transformation and cancer progression. Recent studies identified three protein complexes involved in cytokinesis, the last stage of the cell cycle that concludes with the complete separation daughter cells. The first complex contains the microtubule-associated proteins PRC1 and KIF4. The second, called "the central spindilin complex" contains the CYK-4 and MKLP1 proteins. The third complex has been called "the chromosome passenger complex", and its main components are the INCENP, aurora B kinase and survivin proteins. This last complex was proved to have a critical role in cell septation and a defect in its integrity will prevent cytokinesis. The microscopy and biochemical results presented will offer insights into the functioning of this protein complex and the possibility that more proteins transiently associate with it at various stages of the cell cycle. (Oral presentation.)

## ION PAIRING OF 1-ETHYL-3-METHYLIMIDAZOLIUM BIS-TRIFLUOROMETHANESULFONYLAMIDE IN LOW DIELECTRIC MEDIA.

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The study of ionic liquids is a developing field in which fundamental research still needs to be attained. This study is based on unusual findings from prior work that could be of potential fundamental importance. The ionic liquid, 1-ethyl-3-methylimidazolium bis-trifluoromethanesulfonylamide ([emim][$NTf_2$]), in low dielectric media, was observed to exhibit two resonance sets in the proton nuclear magnetic resonance ($^1$HNMR) spectrum. These two resonance sets were assigned to be the paired ions and dissociated cation in equilibrium. In this work, we further confirmed the identity the two species using $^{19}$F- and $^1$H-diffusion ordered spectroscopy (DOSY), to obtain diffusion coefficients of both the anion and the cation, respectively. Additional viscosity measurements allowed for the calculation of the radii of the present species using the Stokes-Einstein equation. Further analysis of the data is underway to discern why the contact ion pair is somewhat larger than expected. (Poster presentation.)

## MELANIN-CONCENTRATING HORMONE RECEPTOR–1 IS POST TRANSLATIONALLY MODIFIED: GLYCOSYLATION, UBIQUITINATION, AND PHOSPHORYLATION.

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G protein-coupled receptors act to transmit a wide variety of signals across the plasma membrane of multiple cell types. Melanin-concentrating hormone receptor -1 (MCHR-1) is a GPCR found in the plasma membrane of mammalian neural, adipose, and pancreatic cells. Through past research, there is genetic evidence to suggest that MCHR-1 aids in the regulation of feeding behavior and energy metabolism in humans. It is well known that many GPCRs are post-translationally modified and that these modifications alter receptor function. Studies suggest that MCHR-1 is glycosylated and phosphorylated, however no direct evidence of these post-translational modifications have been found. The objective of this research was to determine the extent to which MCHR- 1 is modified by complex carbohydrates, phosphates, and ubiquitin, and the regulatory effect of each modification. The model system used was BHK-570 cells transiently expressing MCHR-1. Plasma membrane fractions isolated in a stepwise crude sub-cellular fractionation experiment were shown to contain significant quantities of MCHR-1 via Western blot. Glycosylated receptors isolated on wheat germ agglutinin agarose were detected as a high MW smear and low MW