Vol. 14 OCTOBER 1983 Nos. 3, 4, 5

PROCEEDINGS
OF THE
ROCHESTER ACADEMY OF SCIENCE, INC.

ABSTRACTS OF PAPERS

Published by the Academy
Rochester, New York

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE

ESTABLISHED 1881

Co-Editors for this Issue:

Lawrence J. King, F.R.A.S.
Melvin J. Wentland, F.R.A.S.

The pages of the RAS Proceedings are open primarily for publication of original, unpublished articles on any aspect of the natural sciences of western New York and adjacent areas; for the publication of articles by the scientists of the region; and for biographical articles on the scientists of this region or those who have contributed to our knowledge of the natural history of western New York. Other articles will be considered by the Publications Committee. The Proceedings will also publish significant news, notes and activities of the Academy, its sections and members.

Authors are requested to submit their papers in duplicate to any member of the Publications Committee. Tables and original line drawings should be neat, clear and camera-ready for direct reproduction or reduction to page size. Other illustrations should be 5x7 or 8x10 glossy photographs in black and white. There will be a charge of $10 per page to help cover costs of printing.

Authors of papers are given 25 issues of the Proceeding free of charge; authors of abstracts are given 1 copy free of charge. When papers are co-authored, the 25 issues will be sent to the senior author for sharing with the other authors. Authors desiring extra issues should request an estimated cost before printing is begun; the extra work should be ordered within two weeks after notification of the estimate. Senior authors will be billed as soon as final costs have been determined.

The Proceedings are published irregularly, but one volume of 4 to 6 numbers (about 300 pages) is produced every few years. Back issues can be obtained from the Librarian at the University of Rochester.

Correspondence concerning subscriptions, single numbers, missing issues, exchanges and back issues should be addressed to:

LIBRARIAN, Rochester Academy of Science
RUSH RHEES LIBRARY
Serials and Bindings Department
University of Rochester
Rochester, New York 14627

Rochester Academy of Science, Inc.
P.O. Box 15406, Rochester, New York 14615

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE, INC.
Vol. 14, No. 3, pp. 244 - 263 October, 1983

ROCHESTER ACADEMY OF SCIENCE

SIXTH ANNUAL SCIENTIFIC PAPER SESSION

COMMUNITY COLLEGE OF THE FINGER LAKES
CANANDAIGUA, NEW YORK

CHAIRMAN: BRUCE GILMAN

NOVEMBER 3, 1979

ABSTRACTS OF PAPERS

TABLE OF CONTENTS

Anthropology; Sociology; Science Education

Ecology

Ecology; Zoology

Physiology; Chemistry; Physics

Guest Lecturer

Concurrent Session No. 1
Anthropology; Sociology and Science Education
E. Pixley, presiding

ALBERT L. AREY (1850-1938), EARLY SCIENCE EDUCATOR AND FOUNDER OF THE NATURAL SCIENCE SUMMER CAMPS AT CANANDAIGUA AND KEUKA LAKES, N.Y. Lawrence J. King, Biology Department, State University College, Geneseo, N.Y.

Prof. Arey was from Whitewater, Wisconsin, and his parents were educators. He graduated in civil engineering from the University of Michigan in 1875 in the first engineering class. He was first employed as a surveyor, but later joined the staff of the Rochester, N.Y. Free Academy. He taught science there from 1885 to November 1900 - and also in the 1890's taught the first courses in elementary and advanced electricity, as well as chemistry, in the evening school of the Mechanics' Institute and Athenaeum (later, the Rochester Institute of Technology). During this period he was a member of the Rochester Academy of Science, and about 1887 was elected a Fellow of the American Association for the Advancement of Science.

In the summer of 1890 he established a Natural Science Camp at Tichenor's Point, West Lake Road, Canandaigua Lake. A catalog for the third season of 1892 survives. In that year the camp period was July 5th to August 2nd for boys, and August 3rd to August 31st for girls. Arey was the director; S.P. Nordthrop, the commandant (there were 40 minutes of daily military drill); J. Gorsline (U. of R. '93), the quartermaster; Dr. L. Mezger, surgeon. Teachers in the boys' camp were: G. E. Wilkinson (Cornell), biology; R.H. Petit (Cornell), Entomology; geology (not named), as well as classes in photography and sports. The girls' camp provided: A.L. Arey (Rochester Free Academy), geology; C.W. Dodge (U. of R.), biology and practical physiology; Nancy F. Mc Cauley (Miss Lewis' School), botany; and classes in sketching, photography and sports. Early camps included about 40 students averaging 18 years of age - housed in tents. In 1905 the camp moved to Egleston's Point on the southeastern edge of Keuka Lake, where facilities were provided for some 150 students. In 1915 Prof. Arey retired and his daughter Mildred carried on until 1929.

Prof. Arey joined the science staff of the Girl's High School, Brooklyn, N.Y. in 1901 - eventually heading the department. He was the author of numerous textbooks for high schools and academies: Lessons in Chemistry (1888), Physics Laboratory Manual (1890), Physiography (1911, 1927), and Review Studies in Physiography (1928). He died Sept. 14, 1938 at age 88. A granddaughter, Constance Koegler Wilson, lives in Pittsford, N.Y. See, Daily Messenger (Canandaigua, N.Y.), Sept. 22, 1966.

COTTAGE INDUSTRY AND GUILD FORMATION IN A CLASSIC MAYA URBAN CENTER: COBA, QUINTANA ROO, MEXICO. Ellen R. Kintz, Department of Anthropology, State University of New York College at Geneseo, Geneseo, N. Y. 14454

A city may grow and its population thrive for a variety of reasons but certainly one of the most significant factors is its ability to produce economically-valued items for internal consumption and for trading purposes. The Classic Maya center, now known to be large and complex in form and function, must have had economic production as a major social activity as did their more prestigious neighbors in the highlands Much study has been done on the enigmatic Maya but little information has been compiled for an indepth study of the possible forms of economic production. On the basis of the form and distribution of nearly 6000 structures and features mapped and surveyed in the residential precincts of the Late Classic Mayan site of Coba, located on the eastern portion of the Yucatan Peninsula, it is hypothesized that these remains reflect two basic forms of economic production: cottage industries and guild organizations.

AN INVENTORY OF FARMLAND AND AGRICULTURAL LAND USE AT THE METROPOLITAN SCALE: THE EXAMPLE OF ERIE COUNTY, NEW YORK.
Elbridge A. Renning, Jr., Jon P. Amato, Department of Geography, State University College at Buffalo.

This paper outlines a methodology developed to collect agricultural information at the subcounty level for the purpose of analyzing rural/urban land use conflicts and land use changes at the metropolitan scale. A field questionnaire administered to 315 farm operators in Erie County, New York was designed to obtain information on the demographic characteristics of farmers, off-farm employment, type of farm operations, market outlets, current investments in farming and anticipated investment changes, perceived problems relating to suburban sprawl, and current and antici-

pated land use of individual parcels of land associated with each farm operation. The format within which the data will be processed and analyzed for academic research and land use planning is discussed.

OUT-MARRIAGE AND ETHNIC STRATIFICATION: A CASE FROM INDIAN OKLAHOMA. Sue N. Roark-Calnek, SUNY College of Arts and Science, Geneseo, N.Y.

This paper analyses Oklahoma Delaware genealogical and census data to show the transformation of Delaware marriage practice from preferential phratry exogamy and ethnic endogamy to phratry agamy and preferential ethnic exogamy. A model of spouse selection is advanced which describes this transformation as an adaptive response to the complex ethnic stratification of late 19th and early 20th century northeastern Oklahoma.

CASH CROPPING AND AUTONOMY IN A NEW GUINEA VILLAGE. M. F. Smith, Department of Anthropology, SUNY Geneseo.

Research on the factors influencing the intensity of cash cropping efforts among Papua New Guinea villagers indicates that although there is often sufficient labor power to expand production villagers may persist in organizing their activities in such a way as to preclude the possibility of applying unutilized manpower to production for the market. The problem can be seen as that of resistance to abandoning a typically sporadic and irregular pace and pattern of activity for the sustained and regular pattern of effort typical of productive activities in industrialized, market dominated societies. In 1975-76 the people of Koragur Village in Papua New Guinea's East Sepik Province were as yet only marginally involved in the market economy. But though many villagers expressed a strong interest in more successful involvement in the market sector they were also reluctant to adopt the more systematic modes of organizing activities that would have furthered more intensive production. They may well have been discouraged from such efforts by the falling market for their principal crop, copra. It is also the case that individuals who chose to reorganize their activity patterns would have found themselves isolated from the flow of community life. This paper examines another contributing factor of a different order. In comparative evaluations of particular activities and types of activities Koragur villagers pay close attention to attributes that are related to degrees of constraint placed upon the exercise of a particular form of the flexible and autonomous conduct of individuals.

Many observations of naturally occurring events reveal the same concerns. This preference for a mode of conduct incommensurate with the demands of more Western, industrial modes of productive activity is rooted in indigenous socio-political and socio-economic circumstances which are briefly described. The relevance of such an analysis for studies of economic development is pointed out in terms of the integral relationship between what are often isolated as cultural factors, forms of productive technology and wider patterns of social relations.

PROBLEM SOLVING PROCESSES

IN HIGH SCHOOL GEOMETRY.

S. West, Ph.D. University of Texas at Austin, 1979.

The theoretical basis for this investigation is drawn mainly from the information processing theories of human problem solving developed by Newell and Simon with the addition of ideas from Bernard on mathematical problem solving. Using a clinical paradigm, a descriptive study is made of the processes used by high school students while solving geometry proofs. Think aloud protocols for student solutions to specific problems are analyzed extensively and individual solution sequences are tabulated. The individual solution sequences are used to construct an Empirical Problem Space and the applicability of the search representation and the heuristic search methods to geometry problem solving is investigated. Regular patterns of analysis, synthesis, and heuristic usage are indicated. Existing relationships between Analysis-Synthesis-Heuristic Sequences heuristic usage, problem solving efficiency, and total solution time are discussed. Indications of the effectiveness of the early introduction of goal oriented heuristics and of optimal heuristic usage were found. Comments regarding possible applications to instruction in geometry problem solving and suggestions for additional research are included.

USE OF ENVIRONMENTAL CONCEPTS IN UNDERSTANDING AGING.

Christopher White, Ph.D.
Associate Professor
Conservation Department
Community College of the Finger Lakes
Canandaigua, New York 14424

A series of 2"x2" slides are used which illustrate environmental concepts of change, coupled with a discussion of these concepts relating them to the process of aging which affects us all. Introductory comments refer to change as fundamental not detrimental.

The circling of the seasons show the cyclical nature of change on an annual basis. This leads to the concept of nature recycling rather than the linier model we usually accept of birth-growth-death. This leads to geological aging showing typical "young" landscapes of rugged, active mountains, blending into the more rounded "older" hills of the east. Plains are basically "old" but show differences of erosive power in canyons and badlands. Sea coasts show aging in progression from rocky coasts to sandy, flat, emergent shores.

Succession, both of bodies of water through eutrophication, and land areas, is a fundamental concept of change. We even talk of the "death" of a pond, but the area continues to evolve in spite of the siltation. The term climax forest implies an ending, but a dynamic exists in the continuing community.

Changes in the rate of change may be affected by such things as beaver creating new ponds. Agents of change such as wind, water, ice and fire are discussed.

Finally, a brief development of man's role in environmental change through pollution and habitat destruction shows the subversion of the natural system that is possible and provides questions leading to discussion of the topic by the group.

Concurrent Session No. 2 - Ecology
F. Smith, presiding

AN ANALYSIS OF SOLAR RADIATION FOR UPSTATE NEW YORK.
C. Gillespie, B. Kanalley, R. Lougeay
Department of Geography, State University College, Geneseo, New York 14454

The annual pattern of solar radiation for Geneseo, New York is compared with insolation figures for various regions of the United States, and specific locations within upstate New York. The intensity of sunshine at Geneseo is shown to be generally lower than other regions of the United States. Within upstate New York, insolation received at Geneseo tends to be greater than at other recording stations. The degree of cloud cover, which corresponds with proximity to large water bodies and prevailing wind direction, appears to explain the spatial variation of insolation data. Sunshine data were statistically analyzed with the coefficient of variation, to illustrate the general effects of cloud cover.

A NEW SITE FOR TERATOLOGIC TRILLIUMS. Bruce Gilman, Department of Natural Resources Conservation, Community College of the Finger Lakes, Canandaigua, New York 14424.

Large flowered Trillium (Trillium grandiflorum (Michx.) Salisb.) has been shown to exhibit teratologic forms. These monstrous forms often include greening of the petals, formation of a petiole on the leaves and loss of basic flower parts. Slides are used to show examples of these unusual forms found growing in a typical beech-maple forest north of Newark, New York.

Probable causes are discussed, including a degenerative-regenerative life cycle theory influenced by a mycoplasma-like body.

A REFUGE FOR PRAIRIE GRASSES IN THE NIAGARA GORGE. Gary J. Pierce, Department of Biology, Niagara University, New York.

Several grass species that are important components of more western, prairie, vegetation are found growing on dry exposed rocky surfaces in the Niagara Gorge. These are, for the most part, modal in Wisconsin communities characterized as prairie by Curtis in 1959. All are C_4 plants that are reasonably common in New York. In fact, most were known to Day and reported by him in 1888. Uniquely they are often found, in the gorge, in "prairie like" communities. Included in this group are Andropogon gerardii, Andropogon scoparius, Sporobolus asper, Panicum virgatum, and Sorghastrum nutans.

THE TOXIC EFFECTS ON TWO PLANT BIOASSAY SYSTEMS USING EXTRACTED SOIL FROM THE HYDE PARK LANDFILL, NIAGARA FALLS, NEW YORK. Anthony M. Podraza, Department of Biology, Niagara University, New York.

The toxic effects of extracted soil from the Hyde Park Landfill, Niagara Falls, New York on two plant bioassay systems, hypocotyl elongation and seed germination were studied. Two solvents, methanol and petroleum ether were used to extract compounds with varying polarity. Both solvent fractions caused dose dependent increases in hypocotyl elongation in Cucumus sativa. Also there was a dramatic decrease in seed germination at high concentrations in the mung bean, alfalfa and radish using the methanol fraction. The hypocotyl results are similar to that expected with the herbicide 2,4-D and 2,4,5-T.

GERMINATION RESPONSE OF SELECTED OLD FIELD SPECIES TO GOLDENROD LEACHATES. A. Reid, Biology Department, SUNY College of Arts & Science, Geneseo, N.Y.

Selected old field species were tested for germinability in the presence of varying concentrations of goldenrod leachate (Solidago canadensis). A number of species including Daucus carota, Taraxacum officinale, and Ambrosia artemisifolia showed reduced rates of growth. Acer negundo and Asclepias syriaca showed mixed results, while Abutilon theophrasti, Rumex crispus showed no effects from the leachates. The trials were conducted in germination chambers at the Duke University Phytotron.

GROWTH RESPONSES OF SELECTED OLD FIELD SPECIES TO GOLDENROD LEACHATES. A. Reid, Biology Department, SUNY College of Arts & Science, Geneseo, N. Y.

Selected old field species were tested for the effects of goldenrod (Solidago canadensis) leachates on growth in height and dry weight production. Two techniques were used: some seeds were watered with an extract made from the plant parts while others were watered through several layers of litter. Of those watered with the leachate Xanthium spp., Asclepias syriaca, Daucus carota, Taraxacum officinale and Acer negundo gave indications of reduced growth. Abutilon theophrasti and Ambrosia artemisifolia were unaffected. Of those watered through litter, Acer negundo, Taraxacum officinale, Rumex crispus and Ambrosia artemisifolia showed reduced growth while Abutilon theophrasti and Xanthium spp. were unaffected. The trials were conducted in growth chambers at the Duke University Phytotron.

TREE REPRODUCTION AT THE CUMMING NATURE CENTER OF THE ROCHESTER MUSEUM AND SCIENCE CENTER. Seischab, F.K., J. J. Pasquale and R. A. Wattengel. Rochester Institute of Technology.

Size class distributions of the major arboreal species of the Cumming Nature Center were used as a means of determining tree species reproduction.

Size class distributions will be presented for tree species in plots dominated by northern red oak, sugar maple, red maple, American beech, eastern hemlock, white ash and quaking aspen.

Analysis indicates that red oak, red maple, sugar maple, beech and hemlock are maintaining themselves in stands which they dominate. Red maple appears to be out-reproducing red oak in red oak stands. Quaking aspen and white ash are not maintaining themselves in their own stands.

A DRY FOREST CONTINUUM IN THE BRISTOL HILLS. Denise Trout and Bruce Gilman, Department of Natural Resources Conservation, Community College of the Finger Lakes, Canandaigua, New York 14424.

The idea that forest communities form from continuously varying sequences of trees spaced along major environmental gradients was experimentally tested on the Davis Mountain Campus. The campus, owned and operated by Roberts Wesleyan College, consists of 1000 acres of natural forest land on High Point Hill. Forest diversity was analyzed on the basis of compositional similarities among thirty five sample quadrats.

Quadrats were located along elevational transects with various compass exposures. Data was collected by CCFL students during the Spring of 1976.

Continuum index numbers were assigned to each quadrat on the basis of forest tree importance value and adaptation to site conditions. A one dimensional display of overlapping species tolerances from a dry, sunlit environment to a moist, shaded environment was generated. Discussion will center on causes of tree distribution at the mountain campus. Specific comment will be made on the apparent ecology of chestnut oak (Quercus prinus L.), white pine (Pinus strobus L.) and beech (Fagus grandifolia Ehrh.).

Concurrent Session No. 3 - Ecology and Zoology

B. Gilman, presiding

HABITAT UTILIZATION OF BROWN TROUT (Salmo trutta L.) IN UPPER GRIMES CREEK. Frank Chiappone, A. Ognissanti, F.W. Smith. Community College of the Finger Lakes, Canandaigua, New York 14424.

This study was part of a ecological survey, of upper Grimes Creek in south western Ontario County, conducted by CCFL students during the summer of 1979. The objective of this part of the study was to determine the number and size of brown trout (Salmo trutta L.) utilizing the various habitats of the stream. In addition, data on stream condition was obtained including, surface, velocity, food grade and size, type and frequency of pools.

A total of 46 brown trout were observed using standard stream shocking procedures. The fish ranged in total length from 7.5 to 12 inches and in girth from 4 to 6.5 inches. Trout utilized four different habitats with 71.7 percent inhabitating undercut banks.

ENERGETICS OF ACCELERATION IN RAINBOW TROUT. Lawrence W. Lee and Clyde F. Herreid II. Dept. of Biological Sciences, SUNY/Buffalo, N. Y. 14260.

Fish have been shown to be capable of brief but very high acceleration rates during the performance of fast starts. Hatchery reared rainbow trout (Salmo gairdneri) ranging from 500-800 g. were placed in the first of two flow-through respirometers and allowed to acclimate for at least 18 hours. Oxygen consumption and hydrogen ion concentration were continuously monitored using a YSI model 57 oxygen meter and an Orion 901 Ionalyser respectively. At the end of the acclimation period, doors to a second respirometer are opened followed by the application of a 50 V. stimulus which initiates the fast start. The event is recorded by a 35 mm. SLR camera utilizing a 250 msec. exposure while a high intenisity strobe light is flashed at 100 Hz. The door of the second respirometer was closed immediately after entry of the fish and monitoring begun. Maximum oxygen consumption was seen six to nine minutes following the event and measured in the area of 700% of the resting rate. Oxygen consumption returned to the resting rate approximately 90 min. after the event. Hydrogen ion production largely paralleled oxygen consumption and is largely accountable by CO_2 production. During very high oxygen consumptions, H^+ outstrips that predicted by oxygen consumption and is seen as evidence of acid-base compensation. Also to be discussed are metabolic cost and acceleration performance characteristics.

A BIOLOGICAL SURVEY OF A SALINIZED STREAM IN WYOMING COUNTY, NEW YORK. Bernard A. Marcus, Herman S. Forest, Kenneth J. Koerndorfer, Environmental Resource Center, Geneseo, N.Y., Ronald Cole, Genesee Community College, Batavia, N.Y. and Brian Shero, Medaille College, Buffalo, N.Y.

Wolf Creek in Wyoming County, for practical purposes a perennial stream, is laden with salt from a point near its source in Silver Springs to its mouth in Letchworth State Park. Reports from investigations conducted in the 1920's noted that freshwater organisms were almost totally absent from the stream; a brackish water community dominated by a few halophilic algae and vascular

plants existed instead. The stream has been virtually ignored since then. During the spring and summer of 1979, an investigation of the stream was conducted, in part to develop an environmental impact statement relating to the construction of a sewage treatment plant in Castille. As a result, it was determined that the brackish water community no longer exists. The organisms now extant in the stream are typical of freshwater however organism diversity is low. Wolf Creek was found to contain an unusually high amount of salt however the levels encountered were below that of brackish water. The poor diversity of aquatic organisms is thought to be due to factors other than salinity of the water.

LOCOMOTOR ENERGETICS OF COCKROACHES: COST OF TRANSPORT.
David A. Prawel, Robert J. Full and Clyde F. Herreid II
SUNY/Buffalo, N.Y. 14260, Dept. of Biological Sciences.

Oxygen consumption, resting metabolic rate, cost of transport and oxygen debt were evaluated for the adult male cockroach Gromphadorhina portentosa during locomotion. Animals were run on a miniature latex treadmill enclosed in a Lucite chamber with an externalized motor. Excurrent gasses were drawn into a S3A Applied Electrochemistry oxygen analyzer for one hour initially, during 20 minute exercise bouts, and during a one hour recovery period. The mean weight of 10 animals was 5.2 g.

The average resting metabolic rate was recorded as .16 ml O_2/g hr. Oxygen consumption varied as a linear function of running velocity, $\dot{V}_{O_2} = .38 + [(4.1) \times (\text{velocity})]$. The cost of transport was estimated as the slope of the above relationship or 4.1 ml O_2/g km. Brief oxygen debts were also demonstrated and varied as a direct function of running velocity, their values being .044, .176 and .231 ml O_2/min. for speeds of .02, .08 and .13 km/hr respectively.

The estimated cost of transport is remarkably similar to the value predicted for quadraped vertebrate animals of a similar weight (4.4 ml O_2/g km). The $\dot{V}_{O_2}$ predicted for resting cockroaches based on the above equation is 2.4 times higher than the actual resting metabolic rate (.16 ml O_2/g hr). Similar elevated metabolic rates during exercise have also been reported for many vertebrates.

AQUATIC BIOLOGICAL SAMPLING DURING THE WINTER SEASON AT RG & E's GINNA SITE. Paul M. Sawyko, Rochester Gas and Electric Corporation, 89 East Avenue, Rochester, New York 14649.

Rochester Gas and Electric Corporation (RG & E) began conducting aquatic monitoring programs at its Ginna Station in 1968. Since that time a variety of biological, chemical and physical surveys have been conducted by RG & E at their various sites on Lake Ontario and the Genesee River. While all programs have been based on regulatory requirements, some additional areas have been developed as Research and Development and attempt to answer scientific questions put forth by regulatory agencies and the scientific community in general. This direction has lead to such programs as the winter gill netting studies, TV monitoring, fish cold-shocking experiments and others, which utilize new or modified techniques to study aquatic biological communities. A film presentation will depict the various aspects of these sampling programs with the emphasis on the winter sampling program at Ginna. This film was made during the months of January, February and March, 1979 and clearly shows the intensive and hazardous working conditions under which the sampling was conducted in order to research the behavioral patterns of Lake Ontario fish (especially salmonids) during the winter season.

OBSERVATIONS ON THE STRUCTURE OF A CESTODE AS SEEN BY TRANSMISSION AND SCANNING ELECTRON MICROSCOPY. Clinton J. Tallman, Genesee Community College, Batavia and Edward Ritter, Department of Biology, SUC at Geneseo, N.Y.

A comparison of the integumentary region of the proteocephalid tapeworm *Corallotaenia minutia* as seen by transmission and scanning electron microscopy shows microtriches covering the entire surface of the worm, including the scolex; lappets clearly below the level of the acetabular suckers; an apical sulcus; and proglottid surface relationships.

Concurrent Session No. 4 - Physiology; Chemistry; Physics
E. Pixley, presiding

JAMES CLERK MAXWELL: SCIENTIFIC GENIUS: FOUNDER OF THE CAVENDISH LABORATORY. Donald S. Allen, Professor Emeritus, Eisenhower College, Seneca Falls, N.Y.

Monday, November 5 marks the 100th anniversary of the death of James Clerk Maxwell, one of the great theoretical physicists of the 19th century, and indeed, of all time. His name is often mentioned along with those of Isaac Newton and Antoine Lavoisier. Someone has remarked that his intuition was almost infallible when dealing with physical questions.

This paper traces Maxwell's life from his boyhood on the family estate of Glenlair in southwestern Scotland, to his youth in Edinburgh and his university days at Trinity College, Cambridge University. There is a brief summary of his wide-ranging published papers --color vision, kinetic theory of gases, pioneering work in statistical mechanics, prediction of electromagnetic waves and equations of the electromagnetic field, and finally his editing of the previously unpublished electrical researches of that eccentric chemist, Henry Cavendish.

The discussion concludes with consideration of some of the reforms initiated at Cambridge University by Queen Victoria's husband, Prince Albert, when he served as Chancellor, and how these eventually led to the establishment of a laboratory of experimental physics. Maxwell did the preliminary planning for the building and facilities, and set forth the basic objectives of this now world-famous Cavendish Laboratory of Cambridge University which was officially opened in 1874. His death on November 5, 1879 brought to a close one of the most brilliant scientific careers of the century.

COMPUTER ASSISTED INSTRUCTION IN QUANTUM CHEMISTRY. III. THE H_2^+ AND H_2 SYSTEMS. Bhairav D. Joshi, Bryan E. White, and Stephen E. LaGrou, Chemistry Department, State University College, Geneseo, NY 14454; and James E. Eylers, Chemistry Department, State University College, Brockport, NY 14420.

Computer assisted instruction has become a valuable tool for teaching chemistry at various levels of undergraduate curriculum, particularly in physical chemistry. Computer assisted 'experiments' have also been successfully tried in teaching physical chemistry. We are synthesizing these two ideas in creating a quantum chemistry 'experimental' system (qces) primarily for use by undergraduates in physical chemistry and quantum chemistry courses. The qces package is expected to be a valuable pedagogic tool in helping students get a better understanding of the concepts and techniques in quantum chemistry. The highly mathematical nature of quantum chemistry can thus be circumvented by the student so that he can focus his attention on the principles and their consequences. The qces will consist of model computer 'experiments' and drills designed to teach all important aspects of introductory quantum chemistry. The nature of qces will be illustrated by two classic examples of bonding: (a) the one-electron bond in the hydrogen molecular ion, and (b) the normal two-electron covalent bond in the hydrogen molecule. Emphasis will be placed in learning concepts and methodology of bonding via interactive computer programs.

This work was supported by a grant from State University of New York Research Foundation, Grant No. 125-4006B.

EFFECTS OF ACETYLCHOLINE ON HISTAMINE INDUCED RESPONSES IN ISOLATED GUINEA-PIG ATRIA.

Shawn P. O'Neil, Russell M. Gardner
Department of Biology
Rochester Institute of Technology
Rochester, New York

Studies were designed to examine the effects of acetylcholine on histamine-stimulated increases in the force of contractions and intrinsic rate of contraction (beats per minute) in isolated guinea pig atria. Histamine increased the force and rate of atrial contractions in a dose dependant manner. Maximal histamine effects were observed at 3×10^{-6}M. The dose of histamine that produced half maximal increases in force and rate of contraction (ED50) was 4.90×10^{-7}M and 6.50×10^{-7}M respectively. Maximal histamine responses occurred within 180 seconds after hormone administration.

Acetylcholine (10^{-7}M) reduced the force and rate of atrial contractions. Maximal acetylcholine effects were observed 60 seconds after administration. The negative inotropic effect of acetylcholine was blocked by the muscarinic cholinergic antagonist atropine (10^{-5}M). When histamine (10^{-6}M) was administered in the presence of acetylcholine, the histamine induced increases in atrial force of contractions decreased as acetylcholine concentrations increased. Acetylcholine had no significant effect on histamine induced increases in the rate of atrial contractions. Further investigations are in progress to determine if the effect of acetylcholine on histamine-stimulated responses in isolated guinea pig atria are mediated by cyclic GMP.

INDUCTION OF CHROMOSOME ABBERATIONS AND SISTER CHROMATID EXCHANGE BY THE INDIRECT MUTAGEN (CYCLOPHOSPHAMIDE) IN HUMAN AND CHINESE HAMSTER CELLS. IN VITRO ACTIVATION BY LIVER MICROSOMES IN DIFFUSION CHAMBERS. J.R. Pantano and S.R. Sirianni, Department of Biology, Niagara University, Niagara University, New York 14109.

A liver homogenate mediated assay for identifying mutagenic or carcinogenic potential of a suspected compound was developed. It involves the incubation of diffusion chambers (DC) filled with rat liver extract (S-9 fraction), enzyme cofactors and a compound under test with human lymphoid cell line B35M or the chinese hamster cell line V79 or CHO. The induction of chromosome aberrations (CA) or sister chromatid exchanges (SCE) were used as indicators for assessing the mutagenicity or carcinogenicity of a compound. To evaluate this system, the well known indirect mutagen cyclophosphamide (CPP) was used. A dose related increase of CA over a dose range of 250 to 2000 ug/DC/20ml of cell suspension was observed in B35M cells treated with CPP. A similar dose dependent increase in SCE was observed in this cell line but with a dose range 20 to 40 times less than that used for CA studies. For the chinese hamster cell lines the frequency of SCE increased in a similiar dose related manner.

This system takes into account rates of activation or deactivation of a substance sensitivity, economy in time and cost and most importantly human relevance.

THE MONGOLIAN GERBIL - ITS HEMATOLOGIC RESPONSE TO METHYLCELLULOSE. R. Rosa, C. Glomski, Dept. Anat. Sci., SUNY at Buffalo

Methylcellulose-induced splenomegaly associated with a hemolytic anemia and leukocytic alterations is readily reproducible in rats. This technique devised by Palmer, et al.(2.5% aqueous methylcellulose, IP 2x/week for 15 weeks) was applied to the gerbil (0.8 ml/injection 2x/week for 15 weeks) in order to compare the hematologic manifestations observed in these two species of laboratory rodents. A total of 27 experimental and 15 control male gerbils were studied. Hematologic analyses were performed at the onset of the study, every 4 weeks, and prior to sacrifice. These included erythrocyte and leukocyte counts, erythrocyte indices, hematocrit and hemoglobin levels, all determined with a Coulter counter. Differential counts and manual platelet counts were also included. Following the 15 week injection period, the erythrocyte survival was determined by Cr^{51} labeling of autologous erythrocytes and monitoring them over the following month. The animals were sacrificed at the end of the red cell survival study. The organs were weighed, fixed and embedded in paraffin. Hematoxylin and Eosin stained sections were prepared. Prussian Blue and Periodic Acid-Schiff reactions were also applied. Bone marrow differential counts were performed; the opposite femur in each animal served as a source of marrow for sectioning.

The spleens of experimental gerbils were slightly to moderately increased in weight. Tissue studies demonstrated accumulations of foam cells presumably containing the injected polymer in the glomeruli of the kidney, the phagocytic cells of the liver and spleen, as well as other tissues. Further tissue studies, derivation of erythrocyte survival times, statistical and other evaluations are in process.

AUTHOR INDEX