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THE BIRD IN SENECA ARCHEOLOGY

by

CHARLES FOSTER WRAY

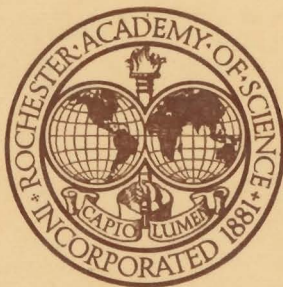
NOTES ON BIRD PHOTOGRAPHY

THE CHRISTMAS BIRD CENSUS IN ROCHESTER

by

RICHARD T. O'HARA

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Unless otherwise stated, the archeological evidence used in this paper is the result of the author's personal excavations conducted in the Genesee Country of Western New York during the last thirty years.

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INTRODUCTION

In colonial times as well as now, giving the white man the "bird" must have been the frustrated wish of the Seneca after some of their land-dealings with the "pale faces". With our interest in and appreciation of our feathered friends, it might be interesting to turn back the pages of time to see what relationship our predecessors in western New York, the Seneca Indians, had with the birds of this region.

The league of the Iroquois was probably formed sometime shortly before the 1550's and was composed of the Mohawks, Oneidas, Onondagas, Cayugas, and the Senecas. Later, in the first half of the 18th century, they were joined by the Tuscaroras, who migrated to New York State from North Carolina and were adopted by the Iroquois League. The Senecas were considered the younger brother in this confederacy. Despite this junior status, they equalled in population the remainder of the league. It has been estimated that at the height of their power Seneca population was between three and five thousand individuals (Snyderman, 1948, pp. 38-42). The Senecas lived in a restricted area, south of Rochester, bounded on the west by the Genesee River and the east by Seneca Lake. They most often lived in hilltop strongholds that usually were fortified by palisades. They had four or more villages that consisted of two large and two or more small towns. Until 1687, these communities were drifting northward from the vicinity of Livonia towards Rush and Victor, New York (Wray, 1953, p. 53). From 1687 to 1730 their villages were in the vicinity of Canandaigua and Geneva (Wray, 1963).

After 1730 they lived in scattered hamlets about the western Finger Lakes and the upper Genesee Valley. Frontier towns were established in Pennsylvania, Ohio, and Ontario. Following the American Revolution, a large group of the Seneca moved to the Grand River area in Canada. In 1814, the Seneca left their homes in the Genesee Valley and settled on permanent reservations in the vicinity of Buffalo and Salamanca, New York. One small group migrated to Oklahoma, while another went west to Wisconsin.

ETHNOLOGICAL EVIDENCE

LEGENDS, MYTHS, AND FOLK TALES

A great deal can be learned about people by studying their legends, myths and folk tales. From these stories we can learn of their beliefs, superstitions, fears, and perhaps even a bit of their past history. As stated by Parker (1923, p. XVIII): "Folklore is one of the most important mines of information that the ethnologist and historian may tap." The Indian lived close to nature and it is only natural

that he should be interested in his wild friends. Other than himself, animals and birds are the main characters in nearly all his legends and myths.

In analyzing Seneca stories, Parker (1923, pp. 29-32) has listed their main themes, incidents, and objects. Those that relate to birds are: a burning witchhead explodes sending forth a cloud of owls, a lonely bird sings for its mate, enchanted feathers or enchanted birds give special powers to the hero, and the wampum-covered eagle is indestructible to all except the hero. These stories could only be related during the long winter months. It was strictly taboo any other time of the year for fear that the birds might listen and forget to fly south, the squirrel to gather nuts, or a calamity befall the relator and listener.

It would be impractical to list or relate every myth, legend, or story that relates to birds. Therefore the following are only the more important Seneca bird tales and their literary sources:

In Canfield, *The Legends of the Iroquois*:

The Buzzards Covering

In Converse, *Myths and Legends of the New York Iroquois*:

The Animals and The Birds

O-SE-HA-DA-GAAR, The Dew Eagle (Parker's Origin of the Charm Holders Medicine Society)

GA-DO-JIH and SA-GO-DA-OH, The Golden Eagle and The Hunter Vulture

SGAH-AH-SO-WAH and GOT-GONT, The Witch Hawk and The Witch Bear Women

The Dream Fast, JIS-GO-GA, The Robin

In Curtin, *Seneca Indian Myths*:

A Bird in Search of a Mate

Grandfather and Grandson and an Eagle Woman

Bald Eagle sends Mud-Turtle to the Edge of the World

The Bird Medicine

The Adventures of Yellowbird

Partridge and Turtle and their Cousins Wolves

Swan's Daughters marry Earthquake's Son

Quail kills Cold Weather and The Thunder Family

Turkey's Brother goes in search of a Wife

The Wren

In Curtin and Hewitt, *Seneca, Fiction, Legends and Myths*:

The Origin of Pigeon Songs and Dances

OHOWA (The Owl) and the Two Sisters

In Parker, Seneca Myths and Folk Tales:

The Chickadee's Song
The Bird Woman
The Partridge's Song
The Wolf and the Raccoon and How the Birds were Painted

In Parker, Rumbling Wings and other Indian Tales:

How the Partridge got his Drum
Trust-to-Luck and the Talking Crow
Twent, the Lazy Boy

In Parker, Skunny Wundy and other Indian Tales:

Raccoon and the Three Roasting Geese
How the Wood Duck got his Red Eyes and Sojy had his Coat spoiled
How the Gobbler got his Warwhoop
The Owl's Big Eyes
The Mink and the Eagle
How the Blue Bird gained the Color of the Sky and the Gray Wolf gained and Lost It
The Buffalo's Hump and the Brown Birds
How Moose and Turkey Scalped the Giants
Weasel and Old Snowy Owl

CLANS

The Seneca had three of their eight clans named after birds—the heron, snipe, and hawk. These eight clans were divided into two divisions or moieties. The oldest and perhaps original four clans were the turtle, wolf, bear, and beaver (Beauchamp, 1905, p. 145). The second group consisted of the deer, heron, snipe, hawk, and perhaps the ball or potato. The heron clan has been claimed as belonging to the Seneca alone. The clan was a political group, a matrilinear family or group of families having a common symbol or totem by which they were identified (Parker, 1926, p. 61). Members of the same clan were considered relatives and could not intermarry, even if the clan member was in another village or tribe. The clan was the strong bond that held the rival and ambitious members of the league together. It was the clan symbol or totem that quite often stimulated the Indian artists in designing their tools, pipes, and ornaments.

DANCES AND CEREMONIAL EQUIPMENT

One of the most popular Seneca dances was the *Great Feather Dance*. It was performed at every one of the seasonal festivals. It was a

religious dance. The purpose of the dance was not curative but rather an opportunity to give thanks to the Great Spirit for all benefits received (Kurath, 1951, p. 125). The Great Feather Dance was a costumed dance primarily for men, with music performed by two singers representing the two moieties. Rhythm was provided by two turtle shell rattles.

The dance itself was a two step brush with heel bumps, raising of the knees, pivoting, swaying, and whoops of ecstasy. The arms were waved in wing fashion while the dancers charge in fencing style. The Great Feather Dance belongs to the war dance category.

The *Dew Eagle Dance* was a curative dance performed to bring health to mid-winter worshippers. The dance was performed by four young men lined up in front of the singers. The performers hopped across the room in a deep crouch. "They lunge and tremble and shiver rattles and wands in extended arms, while the chanters vibrate the drum and horn rattle". . . . "Experts can pick up objects from the floor with their teeth"—bird fashion (Kurath, 1951, p. 123). The Dew Eagle was a mythical bird that carried a pound of dew on his back which he sprinkled over the earth at night to revive it for the new day (Witthoft, 1953, p. 22).

The *Pigeon Dance* was a stomp dance performed to celebrate the return of the pigeons—a harbinger of spring. The performers walk around counter clockwise with men and women alternating down the line. The cadence was slow. The wheeling, rotating sequence resembles the passenger pigeon in flight. The double column of dancers represented the mass of pigeons in migration (Fenton, 1955, pp. 4-6).

Of the many types of false-face masks, only one represents a bird. The one reported by Fenton (1940, p. 410) represents the Dew Eagle or Giant Raven. It is pictured as fetching in his bill, the bloody scalp of the Good Hunter—one of the origin legends of the Little Water Society. In this legend, the Good Hunter is ambushed and killed by enemies. The animals and birds find his body and each of them contribute some integral part of their body to make a magical medicine to revive him (Witthoft, 1953, p. 22).

The Seneca had eleven medicine societies. One of these was the Eagle Society (Speck, 1954, p. 86). The eagle was a sacred bird, a bird of power; it was Manitou, Wakon, Orenda, and mighty medicine (Parker, 1928, p. 248). The Thunder Bird of the central and western states Indians was the Sky Eagle of the Iroquois. The Seneca considered the Sky Eagle to be capable of being both human and bird at will.

In a letter to Ritchie (1954, p. 67), Fenton says: "Great Horned

Owl is one of the tutelaries of The Medicine Society (Parker's Society of Mystic Animals). . . . A number of songs are addressed to him or mimic his activities. . . . Owl is a witch!, Screech Owl particularly, and the lore of the Loughouse People is filled with scare stories of men who transformed into owls to frighten people. There is one such incident in The Dekanawidah Legend of The Founding of the League. Suits of owl feathers are sometimes mentioned."

BIRD-CATCHING EQUIPMENT

Birds may not have been the Seneca's main source of food but they did serve as an important addition to their diet during certain seasons. In order to catch birds several methods were used. Perhaps the most ingenious device was a simple small bird trap made with a strip of bark about eight inches long and four inches wide, with an eye cut in one end (Morgan, 1901, vol. 2, pp. 24-25). A strip of bark twine with a noose at one end was attached to one end of the trap with the noose about the hole cut in the opposite end. Grain or seed was sprinkled inside the eye. When a bird pecked at the seed his neck feathers would take up the noose and the harder the bird struggled the tighter became the noose. This device was said to be very effective.

Bows and arrows and blow guns were used in shooting mature birds. Nets made from elm bark twine were used to trap birds, especially quail and pigeon. Long poles were used to drive squabs out of their nests high up in the trees. They even chopped down the nesting trees to be able to get at the squabs. These pigeon hatcheries were not molested until the squabs were ready to leave the nests (Fenton, 1955, pp. 5-6). Everyone took part in the annual spring pigeon catching. The birds were killed by knocking them on the head with a stick, pinching the head at the temples between the thumb and forefinger, wringing their necks, or by biting the head just back of the eyes (Fenton, 1955, p. 5).

Blow guns were used by the Iroquois in New York and Pennsylvania, and as far south as the Carolinas where the Cherokee were experts with it (Witthoft, 1946, p. 374). The blow gun was made from an eight to fourteen foot piece of cane which had been bored and smoothed inside. To keep it from warping, it was always hung vertically by one end when not in use. Darts for the blow gun were made of hickory or of the stems of the bush clover. They were wrapped with thistle down and bound with thread at the end. An expert could kill a bird the size of a robin at a distance of forty feet. Reference to the blow gun is made in the Seneca legend Niagwahe, the Monster Bear. In this legend the hero kills the bear by shooting him with a blow gun in his one vulnerable place—a black spot on the sole of one foot.

Turkey calls were used to attract the wild turkey. A small tube made from a hollow bird bone was held in the mouth with the opposite end held between cupped hands (Witthoft, 1946, p. 378). When this was sucked, a good imitation of a turkey's gobble could be made. Traps of various sorts were used to catch turkeys. Cage-fall or board-fall traps were the most popular (Witthoft, 1946, pp. 373-374).

Special arrowheads were used for bird hunting. A sharp arrow would pass right through a bird and allow it to escape even though mortally wounded. A broad, blunt, heavy tipped arrow would crush and kill a bird without mutilating it (Witthoft, 1953, p. 12).

The eagle was hunted by hiding near its empty nest and surprising it when it returned to its nest. Another method was digging a pit to hide in; over this the carcass of a deer was placed. When the eagle landed to feed on the carcass, it was seized or its tail feathers were grabbed (Parker, 1928, p. 249). Eagle feathers were considered of great power and were worn solely by the men.

USE OF BIRD FEATHERS

Bird feathers were used mainly for decorative purposes. The Seneca made hats or caps ornamented with feathers. The typical Seneca hat had a single large feather that revolved in a tube into which it was inserted on the top of the hat (Morgan, 1901, vol. 1, pp. 253-254). In modern times, the Seneca, like most of the other North American Indians, have adopted the Western Plains style of feathered headdress so as to "look like Indians".

War clubs and tomahawks were often decorated with tufts of feathers at the ends. Pipe stems were also occasionally adorned with feathers to add to their beauty. Decorative fans and wands were made with feathers for use in ceremonies and dances.

More utilitarian was the feathering of arrow shafts. Twisting the feathering of the shaft made the arrow revolve in flight, increasing the accuracy of the shot, and probably saving the hunters from starvation.

The color of the feathers ornamenting such things as pipes and war clubs quite often had an important meaning. Among the Illinois, with whom the Senecas fought an intermittent war (1680-1684), the particular color of feathers on the calumet (Catlinite pipe) indicated war or peace (Kenton, 1925, p. 352).

BIRDS USED AS FOOD

Central New York, a region of marshes and lakes, was a bird paradise in Indian times. Statements of early explorers and missionaries

attest to this fact. Father Peter Raffeix, a Jesuit missionary stationed at various times in both Seneca and Cayuga territory wrote to his superiors in 1672 (Hawley, 1879, p. 64):

From his account we learn that near the banks of the Seneca River there were eight or ten fine salt springs. "It is there that numbers of nets are spread for pigeons and from seven to eight hundred are often caught at a single stroke of the net". "Lake Cayuga abounds with swan and geese through the winter, and in the spring nothing is seen but continual clouds of all sorts of game." Apparently many of the geese, swan, and turkey remained here all winter. This was also noted in the land of the Neutrals north of Lake Erie and around the Niagara River by the French explorer Daillon (Wright, 1963, pp. 14-15). The return of the pigeons was considered a harbinger of spring and a signal for everything else to cease. Even important councils were forsaken when the pigeons arrived. Entire villages became deserted and camps were set up around the nesting areas during March and April (Fenton, 1951, p. 42). Pigeons constituted the principal part of the food supply at this annual spring nesting period. The hunters lived on boiled squab while engaged in catching and packing the pigeons in bark casks. After a successful pigeon hunt, a levy of wampum, brooches, and other valuables was taken from the hunters and sacrificed to the pigeons near their colony (Fenton, 1955, p. 6). This apparently satisfied the pigeons since they continued to be one of the most numerous birds in America till the coming of the professional white hunter and the subsequent extermination of the passenger pigeon in the years following 1880.

The most common birds eaten by the Senecas were (Waugh, 1916, p. 135): Wild turkey, the most important game bird, wild ducks, geese, pigeon, larger owls, partridge, quail, woodcock, snipe, plover, black birds, woodpeckers, robin, meadowlark, and mourning doves. The crane or heron was seldom eaten. Chickadees were believed to make anyone eating them liars. Albino pigeons are mentioned in Seneca mythology; they were considered sacred and were never molested.

When available in season, the eggs of the partridge, quail, wild duck, and plover were eaten. For medicinal purposes, the oil of the owl was held in high esteem.

ARCHEOLOGICAL EVIDENCE

PREHISTORIC EVIDENCE

The very earliest evidence in New York State of birds being used as food and their bones as tools was uncovered by the Rochester

Museum at the Lamoka Lake site in Schuyler County, New York (Ritchie, 1932, p. 99). Radio-carbon dates taken at this site indicate an antiquity of 5383 plus or minus 200 years (Griffin, 1952, p. 366). Early Archaic hunters settled here probably because of the plentiful food supply to be found in and around the marshy shores of Lamoka Lake. Many fragmentary bird bones, the refuse from food, were found in the deep midden deposits. In this village debris awls or leather working tools were found made from bird bones.

At Frontinac Island in Cayuga Lake, the first artistic effort of the Archaic Indians at comb making was discovered in a burial containing a bird effigy antler comb (Ritchie, 1944, p. 295). This archeological site has been dated at 4930 plus or minus 260 years before present (Griffin, 1952, p. 366).

During the Early Woodland Point Peninsula occupation of New York State 3000 years ago, bolas-stones were an important tool (Ritchie, 1944, p. 162). These round and oval stones with grooves around their middles are still used by the Indian of South America as weights to bring down flying birds. Three or more of these stones were attached by thongs to a handle by which they were thrown into a flock of birds to bring some down.

Some of the finest Indian craftsmanship went into the making of "birdstones"—a highly polished stone object, usually of slate or igneous rock vaguely resembling a bird in shape, and often having tally marks on the edges. These may have been atlatl weights for the throwing stick used in projecting spears and arrows. Birdstones were made in three main forms: the plain, with elongated bodies; pop-eyed, with protruding eyes; and the bust, consisting of just the head. These beautiful and intriguing objects have been found most abundantly about the Great Lakes and constitute the most prized possessions of the majority of collectors (Townsend, 1959). The early woodland Adena and the middle woodland Hopewell mound builder culture centered in Ohio some 2000 years ago developed artists who wrought beautiful bird effigies in the form of pipes and effigies and engravings cut from mica and native copper. Many of these bird forms were of the duck-hawk, eagle, carrion crow, and the duck (Webb, 1957, p. 100).

Perhaps one of the most interesting discoveries in western New York was the burial of an adult woman about thirty five years of age with whom the complete body of a great blue heron had been buried. This burial was one of twenty three found in 1936 by the author on a sandy bluff overlooking the Genesee River on the Markham and Puffer estate about three miles north of Avon, New York.

Culturally the cemetery has been identified as prehistoric Iroquois. Whether or not it was Seneca is not certain but its location in the historic homeland of the Seneca makes it quite probable.

Since the heron was the totem or symbol for the Seneca heron clan, the burial of a heron with an adult female might suggest a clan mother buried with the symbol of her position in the clan. The chance of the heron having been a pet is quite improbable since it would be practically impossible to keep it fed with frogs, snakes, and fish. It is also quite improbable that it was put in the grave as food since the heron was not often eaten and entire bodies of animals or large birds were seldom put in burials as food for the departed. The skull of the woman was remarkable for exhibiting retrognathism. The lower jaw was underslung at least a half inch in back of the upper jaw. Her appearance certainly would not have won any beauty prize, she would have been a delight in any dental office with her curtailed mandible, advanced caries, abscesses, and pyorrhea.

The woman lay on her back with her legs flexed tightly to the left. Her arms were folded back with her hands on the shoulders. Her head was to the east—typical of nearly all prehistoric burials in western New York. She faced the south, looking at the great blue heron lying along her left side. The heron was stretched out full length with its head to the west. In the gizzard of the heron were 15 small pieces of blue shale, picked up by the bird for digestive purposes.

About the neck of the woman was a small necklace of four tubular marine shell beads made from the columella of the conch shell. These must have had their origin on the Atlantic coast somewhere south of Long Island. There were no other artifacts in the three foot deep burial, (see Plate 1).

HISTORIC EVIDENCE

The principal early historic Seneca villages serving as the source of information for this paper are located in the counties of Livingston, Ontario, and Monroe. From the beginning of contact with the European sometime before or near 1550 A.D., the Seneca lived in two large villages and later they had an additional two or more small towns located near the larger villages (Wray, 1953, pp. 53-63). The names of the principal village sites, their present owners, their locations, and date of occupation are as described on the chart, page 13.

BIRD BONES USED AS TOOLS

Awls

The bone awl was just as important to Seneca women as the arrow-head was to the men. This was the most useful tool she had without

SEQUENCE AND DATES OF PRINCIPAL EARLY
HISTORIC SENECA SITES

<i>Station</i>	<i>Site</i>	<i>Present (1963) Owner</i>	<i>Location</i>	<i>(Approximate) Date</i>
7	McClure (Onaghee)		Canandaigua, N. Y.	1700-1730
	Rochester Junction (Totiackton)	Dean Desman	Honeoye Falls, Mendon, N. Y.	1675-1687
	Boughton Hill (Gandougara)	Fred Greene M. Gonzenhauser	Victor, N. Y.	1670-1687
	Beal	Sam McClintock	Victor, N. Y.	1675-1687
	Kirkwood	W. W. Kirkwood	Avon & Honeoye Falls, N. Y.	1675-1687
6	Dann	Frank Mack	Honeoye Falls, N. Y.	1655-1675
	Marsh	Thompson	Holcomb, N. Y.	1650-1670
5	Fox	C. Voorheese Webb	Holcomb, N. Y.	1630-1650
	Power House	H. Greene R. Slocum E. Miller	Lima, N. Y.	1630-1655
	Steele	Paul Moore	Holcomb, N. Y.	1630-1650
4	Lima	State of New York Goodrich	Lima, N. Y.	1615-1630
	Bosley's Mills	John Morse	Avon, N. Y.	1615-1630
	Warren	Ted Finley	West Bloomfield, N. Y.	1615-1630
3	Dutch Hollow	Malone (now Cleary)	Avon, N. Y.	1590-1615
	Feugle	Howard Feugle	South Lima, N. Y.	1590-1615
	Factory Hollow	Glenn B. Morse	West Bloomfield, N. Y.	1590-1615
2	Cameron	Gordon & Donald Cameron Krebeck	Lima, N. Y.	1575-1590
1	Adams	Gordon David	Livonia, N. Y.	1550-1575
	Tram	William Williams	Livonia, N. Y.	1550-1575

which she could not have made the leather clothing worn by her family.

Awls were made from the joint bones of animals and the leg bones of the larger birds—principally the wild turkey. These naturally hollow bird bones could be cut or split in half lengthwise, the edges ground smooth and one end ground to a needle-sharp point. Some of these partially cut turkey leg bones were found at the early historic Adams site near Livonia, New York. These had been placed in graves along with completed bone awls and unworked raw material for the departed to use in the next life, (see Plate 2, top).

Splinter awls were made, as the name implies, from the splintered sections of bone. These jagged fragments of bones usually have one sharp point and required little working to finish to a point. Splinter awls are the simplest and most common awl and were frequently made of bird bones.

Fishhooks

The Seneca made fishhooks in addition to harpoons and spears for catching fish. Nearly all the fishhooks were made from sections of the leg bones of the larger birds, most frequently those of the wild turkey. Fishhooks in all stages of manufacture have been recovered from the refuse middens of the early historic Seneca villages. The large village site located at Factory Hollow, West Bloomfield, New York, has produced many fishhooks—both completed and in process, (see Plate 2, bottom).

The most common method of manufacture seems to have been by cutting a turkey leg bone in half lengthwise, similar to bone awl manufacture and then cutting a rectangular piece one and one half to two inches in length from this curved splint of bone. The next step was to perforate this blank near its center, either by drilling or by reaming with a knife. This perforation could then be elongated lengthwise leaving a narrow border on the sides and a heavier border at the top and bottom. Now by carefully cutting the narrow sides about one half inch above the base on one side and one half inch below the top on the opposite side, the craftsman had two nearly identical fishhooks. All that remained to be done was the sharpening of the point of the hook and the notching or grooving of the shank for tying on to the fish line. Fishhooks were also made from animal bones of suitable size but are not very common.

Fishhooks were sometimes included as burial offerings in graves of the historic Seneca. Burial No. 10 at the Power House site north of Lima, New York produced two bundles of three fishhooks each and several other bird bones and claws. This burial was of an adult male

lying flexed on his left side, head to the northwest, face to the east, and with his hands under his chin. In front of his face was an open-mouth bird-effigy pottery pipe, a triangular flint arrowpoint, and the bones of a squirrel. Behind the back was part of the skeleton of a dog, a whetstone, an antler flaking tool, the claw core of a very large eagle, and three bone fishhooks. Before the knees was a notched-rim pottery jar. Below the knees toward the feet were forty-five blocks of Onondaga flint, six triangular flint arrowpoints, a packet of brass arrowpoints, an antler arrowshaft wrench, three bone fishhooks, several antler flint flaking tools, three claw cores probably of the eagle, a drilled bear's tooth, and the perforated ferculum of a Canada goose.

Between the face and knees was a cache of three iron knives, four iron celts, two iron awls, three whetstones, a fragment of a glass bottle and about a pint of mixed animal and bird bones consisting of a bear femur, a squirrel skull, a weasel skull, various small rodent bones, passenger pigeon bones, and the lower jaw and tibia probably of a Great Horned Owl. Apparently this was the burial of an important hunter and his dog with his hunting and fishing gear, arrowhead chipping tools, raw flint blanks, his bird pipe and ceremonial charms.

BIRD BONES USED AS ORNAMENTS

Beads

Both the prehistoric and the early historic Seneca made necklaces of bird bones. Naturally hollow bird bones were cut into lengths varying from one half an inch to three inches. Cutting was accomplished by several methods: by chiseling through the bone with a knife, by sawing through the bone, and by simple scoring of the bone and then cracking it like glass tubing. The edges were usually ground smooth and the surface polished.

One complete necklace found in burial No. 20 in the Markham Cemetery near Avon, New York, contained fifty-three tubular bird bone beads and one wolf jaw segment cut and drilled for a bead (see Plate 3, top). The entire necklace measured nearly six feet in length. This necklace was coiled in the lap of a three year old child. The child lay on its left side, head to the east, face to the south, and in a flexed position with the hands clasped before the face. Also in the lap were two perforated fresh-water unio clam shell pendants and a rectangular bone pendant. Along the upper legs were eight perforated epiphysis of the deer—probably ornamentation on the child's clothing.

Single bird bone beads are found in the refuse middens of all historic Seneca sites before 1700. They are rarely found in burials in the historic period.

Claws

Bird claws were worn as ornaments on the clothing and in the hair of the historic Seneca. Their possible ceremonial significance is implied by their inclusion in ceremonial kits. From their occurrence in burials, it would seem that they were worn mostly by men. Besides in burials, they have been found in refuse middens and on the surface of the village area (see Plate 3, bottom left).

The early historic Seneca village at Dutch Hollow, Avon, New York, contained a remarkable burial that suggests the probable use of feathers of the turkey and the claws of the great horned owl. Burial No. 48 excavated by The Rochester Museum expedition in 1935 (Ritchie, 1954, pp. 9-10) was a double burial of two adult males. About their skulls were 16 claw cores probably of the great horned owl and two wing bones of the wild turkey. These apparently had been worn on the head as hair ornaments. In this same burial was a feather fan handle made with a strip of brass that preserved bits of feathers. A native-made pottery pipe representing a bird, possibly a duck, was also included in this grave.

In commenting on this burial, Ritchie states (1954, p. 46): "Wearing of bird claws, bird skins or parts thereof depended primarily upon their decorative effects or their supposed magical properties. . . . Burial No. 48 was the most striking instance of the probable use of the plumage, as well as the claws of the great horned owl, and the wings of the wild turkey for head ornaments".

Burial No. 58 on the Dann site, Honeoye Falls, New York, contained a massive adult male who apparently had travelled extensively and had collected charms of ceremonial significance. By his knees was a cache consisting of the skull and jaws of a dog or possibly a wolf, a piece of fossil bone, a fossil horse tooth, the leg bone of a bird (probably eagle), and a sprinkling of hematite powder. In front of his face were three unworked wolf canines and the claw core of an eagle. On his chest was a brass tinder box under which was a glass burning lens, an iron knife blade, and a grotesque human effigy pottery pipe with round red glass beads for eyes.

During his travels he received an arrow wound in the right cheek, a broken right temple, and a badly fractured left femur. All the bones had healed showing this veteran had survived his ordeals. The arrow wound in the right cheek had left the tip of the arrowpoint imbedded in the sinus cavity. The arrowpoint was made of an exotic material, a cream colored chert that appears to be similar to the Boone chert of the Missouri area, possibly indicating the direction of his travels.

Bird claws were sometimes included in ceremonial kits that were

buried with the dead. Burial No. 56, cemetery No. 1, Adams site, Livonia, New York was a good example of this. This was a multiple burial of two adult males lying in the flexed position, facing each other, and heading east. On each forehead a ceremonial kit had been placed. One kit contained four bird claws, apparently hawk, one eagle claw, one bob cat claw, one fish jaw, one weasel skull and jaws, one bear molar, one wolf canine, one cat canine, two fragmentary perforated wolf canines, three wolf subcanines, several triangular flint arrowpoints, one flint scraper, two rectangular pieces of shale, one splinter awl, a ground beaver's tooth apparently used as a knife, five unio clam shells, several flakes of flint, one iron chisel, and one unworked turkey leg bone.

The second man's kit contained one hawk claw, four woodchuck incisors, three wildcat incisors, one human pre-molar tooth, one calcined skull fragment, two fragmentary shell beads, two fragmentary animal teeth, one bone awl, one iron awl, twenty flint chips, one triangular flint arrowpoint, and some hematite powder. These kits probably were the personal magic kits of their owners and contained among the few useful items, the oddities collected by their owners for their special magical powers.

BIRD MOTIVE IN ART AND DECORATION

Beads and Pendants

Bird effigy pendants are one of the important time markers of the historic Seneca. These delicately made shell pendants resembling birds, possibly geese or ducks, appear quite suddenly in the late 1650's. They rise to a maximum popularity between 1660 and 1670 and then just as quickly disappear from Seneca culture. They are found most abundantly on the Dann and Marsh sites. In early literature they were called bird beads (Beauchamp, 1901, p. 362).

These bird pendants are quite uniform in style. Decoration was achieved by drilling and incising geometric designs on them. Invariably they are long and narrow in shape, having a short pointed head - possibly representing a beak, with two drilled indentations for eyes located either on the top or the sides of the head. The body is long and roundish possibly to represent folded wings. The necks are perforated laterally for suspension. Most commonly they are made of white marine shell and but rarely made of the scarcer purple shell (see Plate 3, bottom right).

The bodies are decorated in four different styles. The simplest and perhaps original being perfectly plain. The second variety has three horizontal lines just below the neck and two parallel horizontal

lines near the tip of the tail. The third style has two parallel lines inclosing a row of dots usually three just below the neck and a single line above a row of three dots at the tail. The fourth, the last and most intricate in the evolution of the bird pendant, has a single horizontal line below the neck, a single horizontal line either above or below a parallel row of dots on the tail, and a connecting transverse line across the back with either a single or double row of dots parallel to and on either side of this line. The incised lines seem to form either an S or Z shape.

The pendants were polished to a high luster and then as a final touch to make the design stand out against the white background, a black substance, probably charcoal powder, was rubbed into the incised lines and drilled dots. These pendants average between one and one and one half inches long and one quarter to three eighths of an inch wide.

Another pendant has been referred to in early literature as disk bird beads (Beauchamp, 1901, pp. 361-362). These shell pendants resemble a brooding bird with the head turned at right angles to the body. The head perforated laterally through the neck, serves as the point of suspension. These pendants may also be interpreted as representing bear claws. They were never decorated but were highly polished. They occur in the same time period, 1650-1675, as the other bird pendants and average about one inch in size.

An intriguing half bird-like and half man-like shell pendant has been found on Seneca sites that date between 1675 and 1687 at Rochester Junction, Mendon, New York, and Boughton Hill, Victor, New York. These large pendants, averaging from two to three inches in length, have heads resembling a man, have wings like a bird's on their backs, and legs resembling a swallow's tail. The pendant is perforated through the neck for suspension. Very possibly these were made to represent the Sky Eagle of Seneca legend—the mythical eagle that could change its form to that of a man (see Plate 4, top; side and front views of one specimen).

The most spectacular shell bird effigy so far found on a Seneca site came from the McClure site near Canandaigua, New York (Houghton, 1922, p. 62). This village was occupied by the Seneca around 1700 to 1730 and has been recorded in history as the village of Onaghee. The pendant probably represents an eagle with its wings spread, soaring fashion, and is decorated with drilled and incised geometric designs. It was made of white marine shell and measures approximately three by four inches. Other similar bird effigies have been found on historic Seneca sites, the earliest being one of sheet brass

found in the refuse at the 1600 Factory Hollow site near West Bloomfield, New York (see Plate 4, bottom). Shell effigies of owls have been found on Seneca sites but are quite scarce (Beauchamp, 1901, p. 362).

Combs

The height of native Seneca artistry was attained in the beautiful and imaginative ornamental antler hair combs made between 1600 and 1700 (Wray, 1963). Approximately 250 Seneca combs have been recovered by excavation. They are almost entirely made of moose and elk antler. Seneca combs average about three inches long and two inches wide, are mostly rectangular in shape, and are bilaterally symmetrical. Nearly one quarter of all Seneca combs are carved or engraved to represent birds (see Plate 5).

The native artists apparently were more concerned with artistry than with truthful reproductions of actual birds. Many of the birds portrayed seem to be combinations of several birds or purely fanciful creations. When recognizable, the heron, crane, woodcock, snipe, and the swan or goose are the most common. The two most common Seneca bird combs represent the heron and the crane. The first has two facing heron, head to head with their long bills forming the central bar of the comb. The second type has a boy or man wearing a hat and holding two cranes or geese by the neck, one in each outstretched hand. The influence of legends and stories on the artistry of combs is shown by this last comb type: Sojiosko the mischief maker, clutching the necks of two birds, is in a story common in the eastern part of North America (Parker, 1936, pp. 156-157).

Engravings

The surface of combs, especially the front side, was often engraved with fine incised lines forming geometric designs or figures of animals or birds. One such comb from the 1675-1687 site at Rochester Junction, has two facing birds engraved on the base of the comb (see Plate 5, top left). The birds have their wings extended as if in flight. Here again the mythical Sky Eagle may be represented.

Ladles

Woodcarving has been one of the better known modern Seneca achievements. They are experts at carving bowls, dishes, spoons, ladles, masks, etc. Archeological discoveries of wooden objects are rare indeed, requiring special circumstances and conditions for their preservation. When the European fur trader brought brass kettles to the Seneca, he made possible these special conditions.

It was the custom of the historic Seneca to place a container of

food in the grave at the time of burial of the dead. When they acquired brass kettles, food and a wooden spoon or ladle for serving it were often included in the kettle. The chemical reaction of the brass kettle with ground water and organic acids formed by the decay of organic material in the grave formed copper sulfate, a wonderful preservative. This usually preserved the organic material in the kettle as well as underneath and close to the kettle.

Some of the wooden ladles found in these brass kettles have carved effigy handles. A large kettle found in burial No. 17 of the Warren site near West Bloomfield, New York, contained three superimposed wooden ladles (see Plate 6, top). The handles of these ladles were carved to represent a human face, a bear, and a hawk or eagle. The bird is portrayed as sitting on a perch. The kettle had been filled with a mixture of fish and wild berries, which in turn indicated the time of the year the burial was made, probably midsummer, most likely July. Well-preserved turkey wing bones found in burials on the Dann site, Honeoye Falls, New York, are shown in Plate 6, bottom.

An isolated burial on a hill overlooking the Genesee Valley north of Avon, New York, contained the skeleton of a large adult male buried with an iron rapier, an iron axe, an antler comb (boy with the cranes), a square bowl pottery pipe, and a large brass kettle of food placed just before his face. Inside the kettle was a magnificent carved wooden ladle with an owl's-head handle. The artifacts in this burial suggest a date of approximately 1650 to 1675.

Pipes

The Seneca craftsmen drew upon their artists' license while moulding some of their spectacular effigy pipes. Certain of the animals and birds portrayed seem to be recognizable while others seem to be composite or purely imaginative. Once again the influence of clan totems is evident in wolf, bear, turtle, and hawk or eagle pipes.

Bird pipes are not as plentiful as animal pipes. Actually they are among the rarer varieties. Slightly less than ten per cent of native-made Seneca pipes represent birds. Only the eagle, the owl, and possibly the duck can be identified with certainty. Identification of the remaining depends on one's imagination.

Bird pipes may be divided into several distinct classes: the eagle pipe, the brooding bird, the open mouth bird, the perched bird, and the mic-mac or vaseform bird pipe. The last two are usually made of stone while the first three are usually made of pottery.

A pipe discovered in a shallow refuse midden at Boughton Hill, Victor, New York, is a classic example of the eagle pipe (see plate 7,

top left). Standing four inches high above the stem, the eagle is portrayed as sitting on a nest with the wings folded, the tail down, a massive hooked beak, and large protruding eyes. From beak to tail it measures three inches. The pipe is similar to one portrayed by Beauchamp (1898, pp. 132-133) and reported to have been found on the Dann site at Honeoye Falls, New York.

The brooding bird is portrayed as if sitting on a nest with the wings folded back and the head either turned to the side or facing straight forward. The pipe bowl is inclosed by the wings of the bird. Quite often the bird thus portrayed appears to be either an eagle, hawk, or duck (see Plate 7, top right).

The open mouth bird pipe portrays the wide-open mouth of a bird. The bowl of the pipe is inside the mouth of the bird. Sometimes only half the beak is present, the lower beak (toward the smoker) being removed. Usually the bowl is plain with only the eyes of the bird represented by indentations (see Plate 7, bottom right).

The perched bird shows the bird in an upright position with the bowl of the pipe behind the head of the bird and inside the body of the bird. The wings are usually folded down the sides of the pipe. A stem hole is in the back of the pipe—where a reed or wooden stem was to be inserted. The feet of the bird are often shown as if clutching a branch or perch on the front side of the bowl. This variety of pipe is almost always made of stone. It is one of the few Seneca pipes where the effigy does not face the smoker (see Plate 7, center). Similar pipes have been described by McGuire (1897, pp. 502-503) as having been found in New York and Pennsylvania.

The mic-mac or vaseform bird pipe usually consists of the head of a bird as the pipe bowl and it may be either facing the smoker or facing away from the smoker. They are usually made of stone and required wooden stems (see Plate 7, bottom left).

BIRDS USED AS FOOD

Refuse Bones

Proof that the Seneca ate birds can be found by screening their refuse middens and hillside dumps. These village dumps are filled with the bones of the animals and birds that they ate, along with the broken and discarded tools and things that they lost or accidentally threw away. Identifying single bird bones found at random in the refuse is an art that few ornithological experts are qualified or willing to do.

Kettles Contents

Parts or whole skeletons of birds found and preserved in the brass

kettles of food placed in the graves of the dead are much easier and more accurately identified. Dissecting the contents of these brass kettles is quite an exciting and educational experience. Entire skeletons of smaller birds, especially pigeons, are often found by themselves or mixed with a hodgepodge of animal, rodent, fish and reptile bones (see Plate 8, top). Some of the stews indicated by these feasts for the dead are real eye-openers and would empty a banquet hall of modern times.

The contents of these kettles, besides serving as an ancient menu, also may indicate the season of the year in which the burial was made—pigeons in the Spring, berries in the Summer, and nuts and grapes in the Fall etc. These kettles were not always filled with food. Sometimes they contained such unedible things as strings of beads, pouches of ceremonial objects, and caches of equipment.

One kettle found in burial No. 19 in a cemetery at the Rochester Junction site, the town burned by the French colonial army in 1687, contained four squirrel skeletons, at least half a dozen partial skeletons of passenger pigeons, and seven deer ribs. This fine kettle of food had been placed near the hips of an adult female lying in the extended position and with her head to the northwest. Her hands were clasped on the chest just below a wooden and brass crucifix lying on her throat. Also buried with her was an iron axe, an iron knife, and a small wooden keg of vermilion pigment. Ten black glass buttons were evenly spaced in a straight line down the middle of her chest, indicating their use as buttons.

Burial No. 34 on the Dann site, Honeoye Falls, New York, contained the undisturbed skeleton of an adult female lying on her back, legs flexed to the right, head to the north, facing the east and with her hands placed on the chest. Over her knees was a medium size brass kettle preserving a portion of a wool trade blanket that was immediately underneath it. Inside the kettle was the complete skeleton of a single pigeon. An iron knife blade lay by her left hip. A mass of shell wampum beads and tubular shell beads were about her neck.

Burial No. 141, Power House site, Lima, New York, contained the very interesting intact burial of an adult male. The skeleton lay flexed on its left side, head to the west and with both hands before the face. A large two-holed shell gorget lay by his chin. A large wampum belt of approximately three thousand beads lay across the chest and under a brass kettle which was between the face and the knees. The kettle contained scraps of animal bone and preserved a quantity of bark. Along the shin bones were two pair of iron scissors, two iron knives, eight gameing buttons of polished antler,

and an ornament of wampum. In back of the hips was a cache of two iron knives, a twenty-three inch long pewter pipe with the effigy of a hawk or eagle perched on a shelf on the back side of the pipe bowl, a bird effigy stone pipe (perched bird form), an oval brass mirror box with a decorated lid portraying Wilhelm Frederick, Prince of Orange, on horseback, hematite powder, and the skeletons of nine passenger pigeons. The pigeons had apparently been placed in some perishable container of which no trace remained.

Burial No. 143 in the same cemetery contained the skeleton of a small child about six years of age flexed on its right side, head to the west and face to the south. Behind the head of the child was a notched rim pottery jar containing the bones of a single passenger pigeon and an iron knife blade. Scattered over the chest were five massive shell beads. The skeleton was under a layer of rocks that had been placed over the body.

Burial No. 138 in the same cemetery contained the partially disturbed burial of an adult female. Ancient looters had dug into the center of the burial dumping out the contents of a brass kettle and removing the kettle. From the copper stain on the hand bones lying before the face, it was apparent the kettle had originally been placed on the hands. The kettle's contents now scattered in the disturbed portion of the grave fill were stained green from having been in the kettle and consisted of the bones of three passenger pigeons. The undisturbed wrists of the female were covered with a mass of approximately one thousand wampum beads. Lying beside the hands was a heron effigy antler comb.

Miscellaneous bird remains from the Dann and Power House sites are shown in Plate 8, bottom.

Burial No. 58, cemetery No. 1, Adams site, Livonia, New York was a multiple burial of an adult male and an adult female, both flexed on their right sides, heading northeast and facing the west. The skeletons were covered with a "roofing" of field stones with the larger and heavier rocks over the skulls. By the male's right hand immediately in front of his face were the bones of two passenger pigeons. Beside the pelvis of the male were two turkey leg bone awls and three turkey leg bones, two unworked and the third partially cut in preparation for splitting to make awls.

Burial No. 17, cemetery No. 1, Adams site was also a multiple flexed burial of an adult male and female lying facing each other and heading south. On top of the skull of the female were two marine shell beads and the fragments of a few disintegrated round blue glass cane beads. Between the heads of the two skeletons was a perfect

human effigy pottery jar containing the bones of a single passenger pigeon and a few fish bones. Beside the right arm of the male was a union clam shell and a polished bone awl. The food offering in the pottery jar must have been some kind of a stew composed of fish and passenger pigeons. A layer of bark in the grave fill suggests a roofing over this burial.

TRADE MATERIALS

European businessmen soon discovered that fortunes could be made by trading cheap Venetian glass beads along with axes, kettles, and knives for stacks of valuable pelts, especially those of the beaver. Some of the European countries even courted the allegiance of the various Indian nations, pitting one tribe against the other in an effort to gain the fur trade and to carve colonial empires in the North American wilderness. England, Holland, and France were chiefly involved in this colonial war. England with the help of their Indian allies, the powerful Iroquois of New York State, finally won this three way tug of war.

Explorers and agents for the European countries brought special gifts for the Indian chiefs as bribes to win their friendship and gain special privileges. Long stemmed pewter pipes and shining brass mirror boxes found in some of the Indian burials probably represent some of these gifts.

Although quite rare, these long stemmed pewter pipes occasionally were ornamented with bird effigies. The bird was usually perched on a ledge extending from the back side of the rim of the pipe bowl (see Plate 9, top). The birds, apparently either hawk or eagle, peered over the pipe bowls facing the smoker. The length of the stems, ranging from eighteen to twenty-six or more inches, certainly made its smoker quite outstanding. Pipes of this type have been recovered from burials of the 1640-1650 Power House site and the 1650-1675 Dann site.

A brass covered iron mirror box discovered in burial No. 141 at the Power House site, besides portraying Wilhelm Frederick, Prince of Orange riding on horse back on the cover, was ornamented on the sides of the box with a hammered filigree design of a peacock in a forest scene. This obviously Dutch ornamental mirror box can be dated from the reign of Wilhelm Frederick, Prince of Orange, at the end of the 16th century.

One of the most popular trade items found on Seneca sites is the little brass hawk or falcon bell (see Plate 9, bottom). These bells originated and acquired their name in Europe. They were tied about

the necks of the hunting falcons. Falconry was a popular sport in Europe surviving to the present time. Falcon bells range in size from one half inch to one inch. They were stamped out in two halves of sheet brass, soldered together with an iron ball on the inside to make them tinkle, and sometimes were silver plated. Brass eyes were soldered to their top half for suspension. Some far-sighted tradesmen sent them to North America for the Indian trade. Apparently they were an instantaneous success and have been found on all the historic Seneca village sites from 1640 on. The Seneca wore them as ornaments on their clothing and as necklaces. Similar bells are still worn by modern Indians to add music and rhythm to their dances.

CONCLUSION

The Seneca Indians of western New York were one of the most populous and most powerful Indian nations in northeastern North America. Their influence, although not nearly as imposing as during colonial times, is still important enough to make headlines in local newspapers today.

Seneca mythology contains many stories about birds and their magical powers. Three of their clans were named after birds—the heron, snipe, and hawk. Many of their ceremonies and dances depicted birds or gave homage to birds. Bird feathers were extensively used in decorating clothing and implements. To catch birds, specialized equipment was required. Blow guns, nets, and numerous ingenious traps were invented to catch and kill birds. Birds were a seasonal supplemental food source with the turkey and the passenger pigeon most often going into the pot.

Bird bones were an important source of raw material for many of their tools, especially awls and fishhooks. The fact that bird bones were naturally hollow made them ideal for beads. Tubular bone beads were most often made from the leg bones of the turkey. The claws or talons of birds especially of raptorial birds were used to ornament clothing, and often were carried in charm kits for their supposed and hoped-for magical powers. Beaks, wings, and even entire skulls of birds were also included in these charm kits.

Seneca art was greatly influenced by birds. Beads and pendants of shell and antler were often carved to represent birds. Bird combs most often depicted the heron and crane. Bird-like designs were even engraved on the surface of combs. Wooden ladles sometimes had handles carved to appear like hawks, eagles, and owls. Smoking pipes of stone and clay sometimes were carved to represent birds—

most commonly the duck, hawk, and eagle, in positions simulating perching, brooding, or open mouth feeding.

The European fur trader was quick to recognize the Indians' feelings towards birds. Pewter pipes and brass mirror boxes ornamented with bird designs soon were popular trade items. Hawk or falcon bells, originally created for the hunting falcons of Europe, rapidly became one of the most popular trade materials. These added a new musical note to the Indians' ceremonies and dances.

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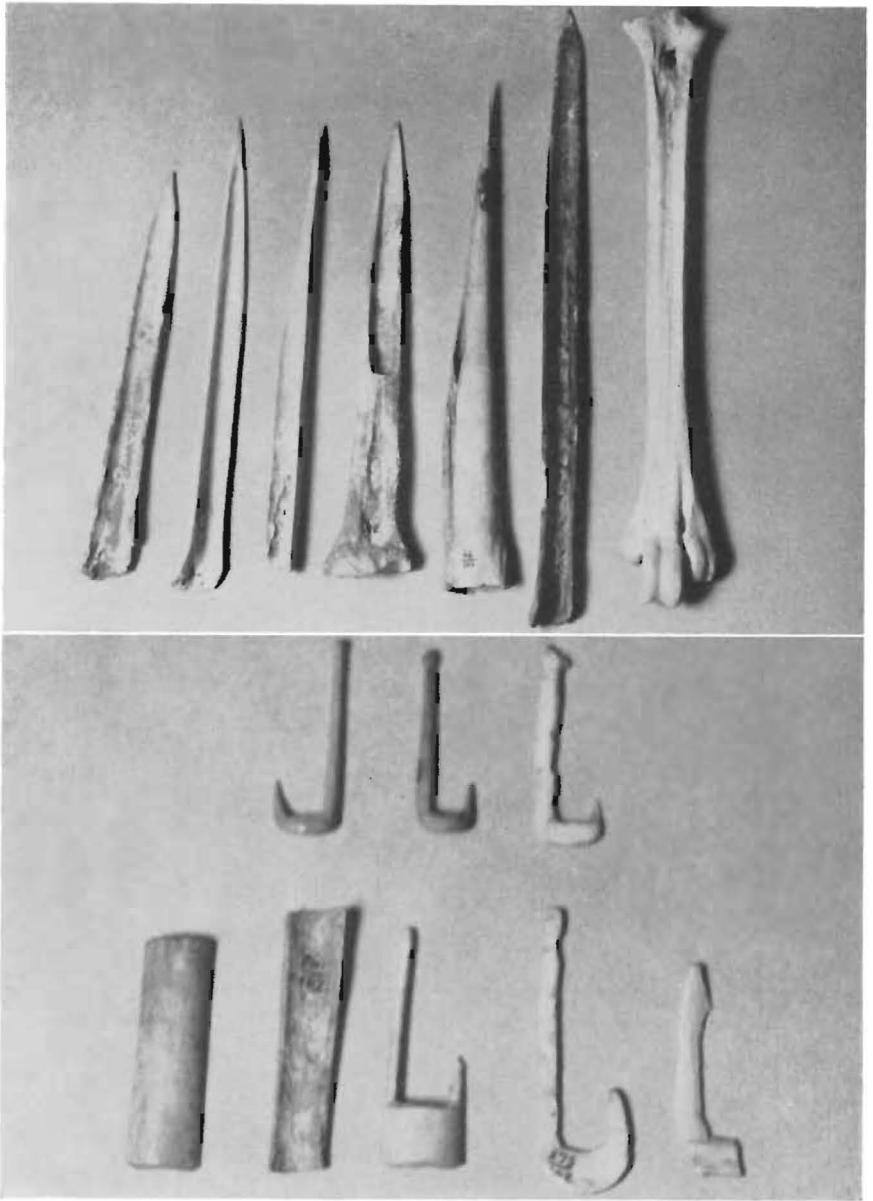
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PLATE I



Flexed burial, adult female, about 35 years of age, with skeleton of a great blue heron :
Markham and Puffer estate, Avon, New York. . . . Photo by Henry Selden.

PLATE 2



Top: Bone awls made from turkey leg bones, and partially worked bone; found in burials, Adams site, Livonia. *Bottom:* Fishhooks, blanks, and hooks in process; all turkey leg bones; in refuse, Factory Hollow, West Bloomfield, New York.

PLATE 3—*Top:* Necklace of bone beads made from leg bones of wild turkey and one bead made from a deer jaw; burial No. 20, Markham & Puffer estate, Avon, New York. *Bottom left:* Eagle, hawk, and owl claw cores; found in burials, Power House site, Lima, and Dann site, Honeoye Falls, New York. *Bottom right:* Shell pendants (bird beads) resembling geese or ducks; from burials, Dann site.

PLATE 3

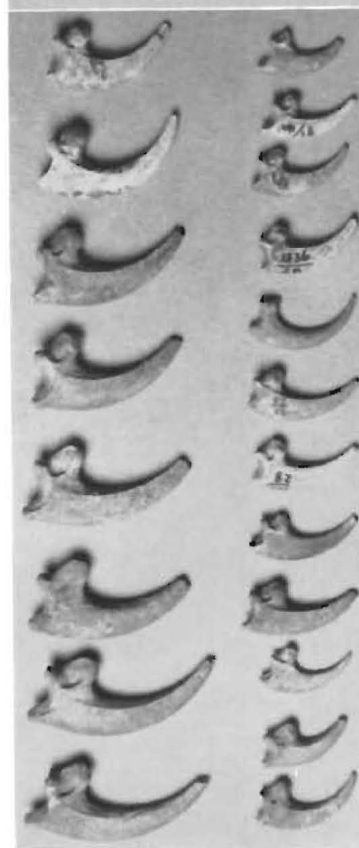
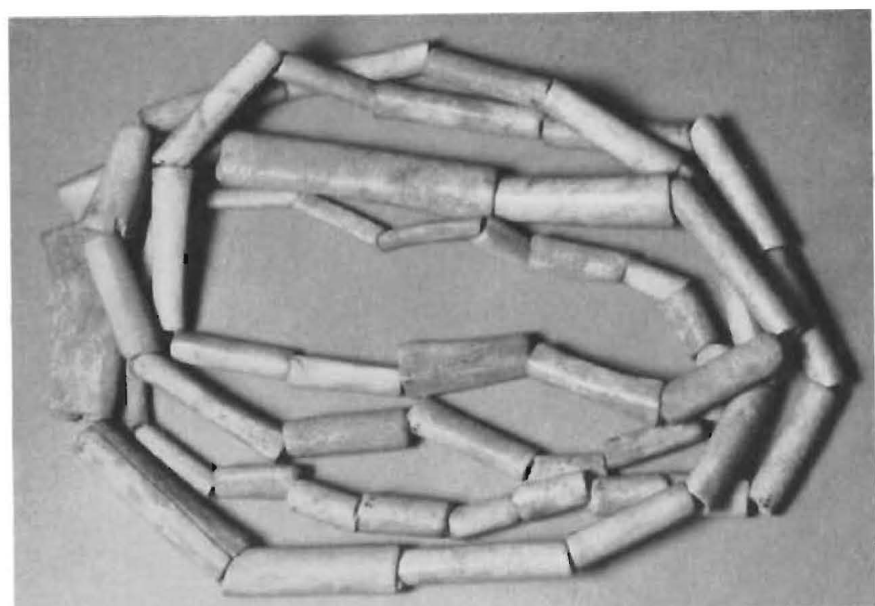
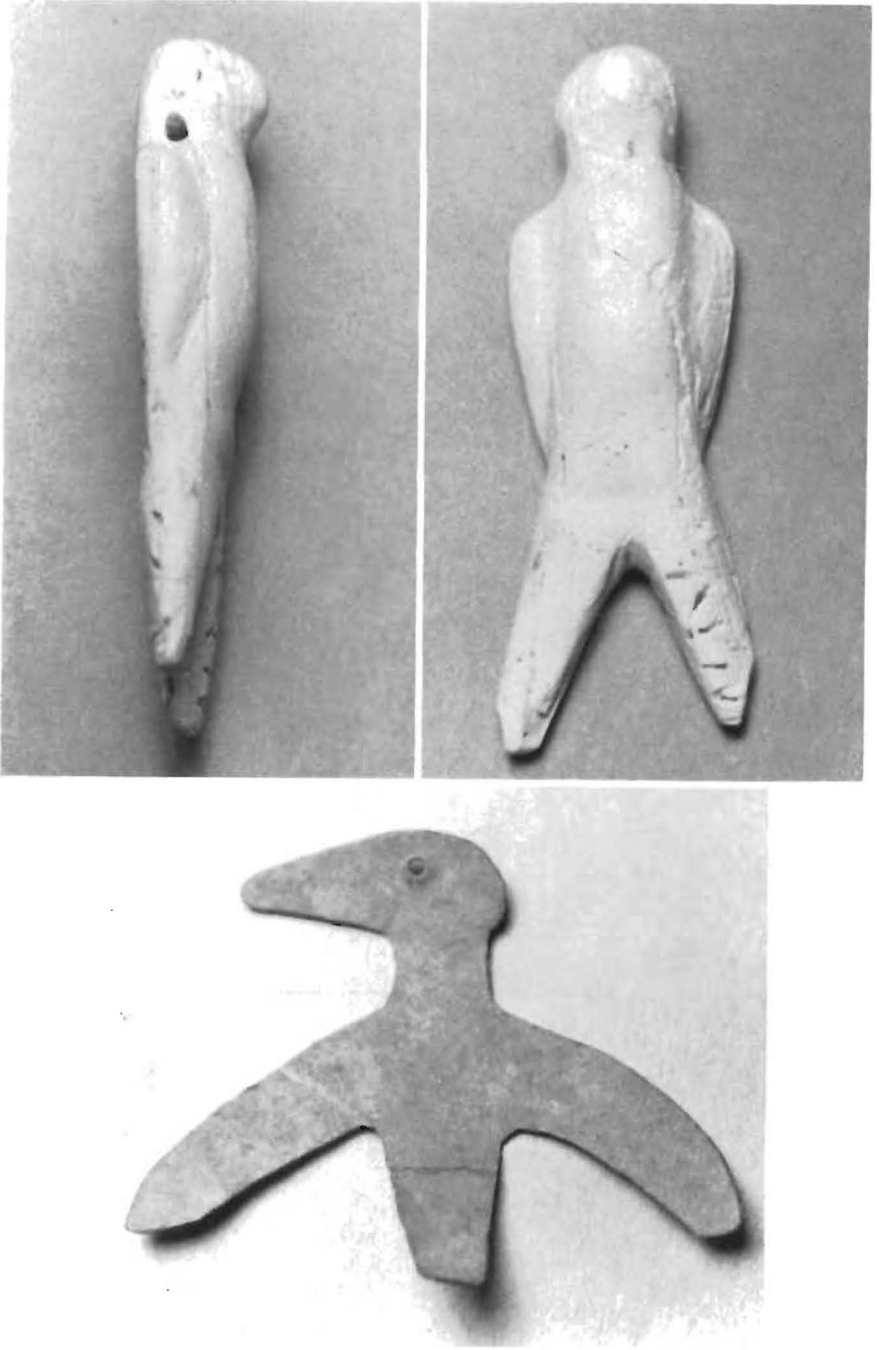
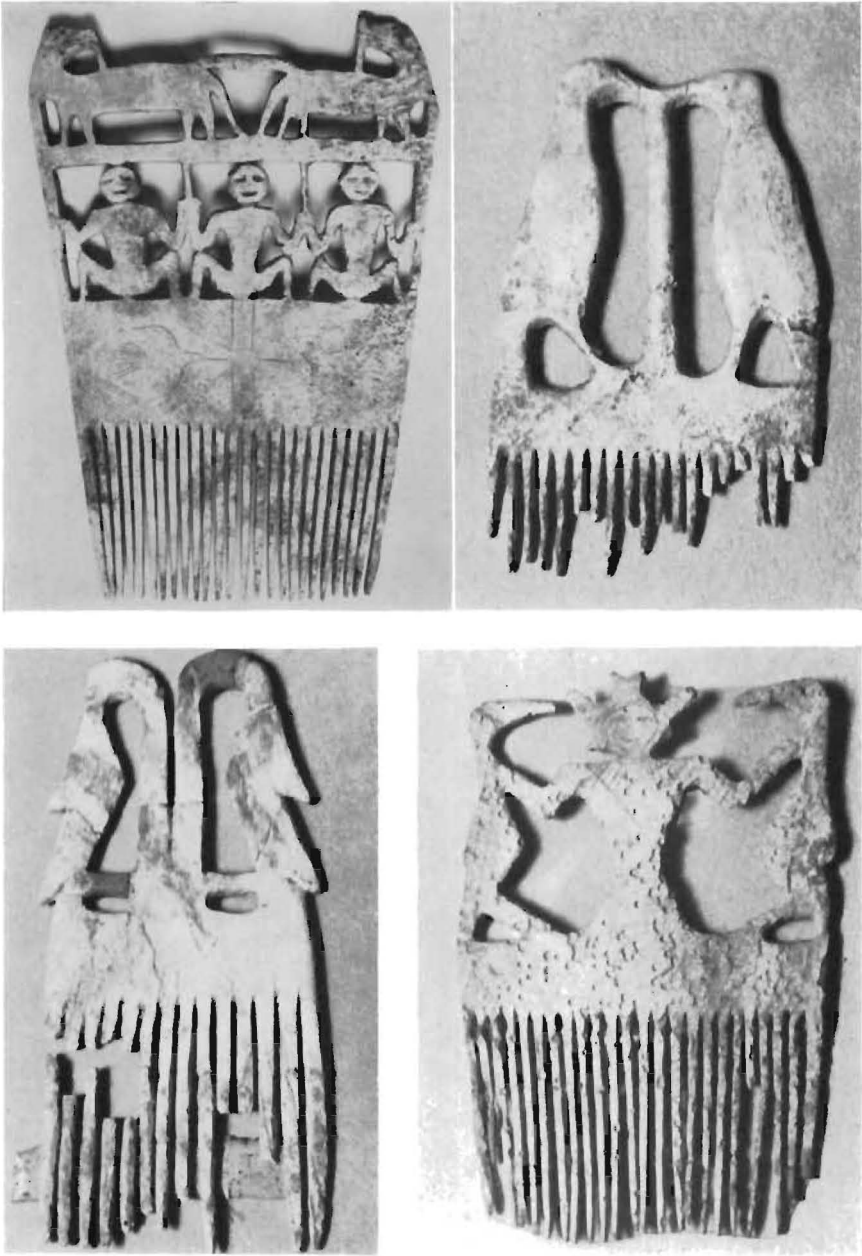


PLATE 4



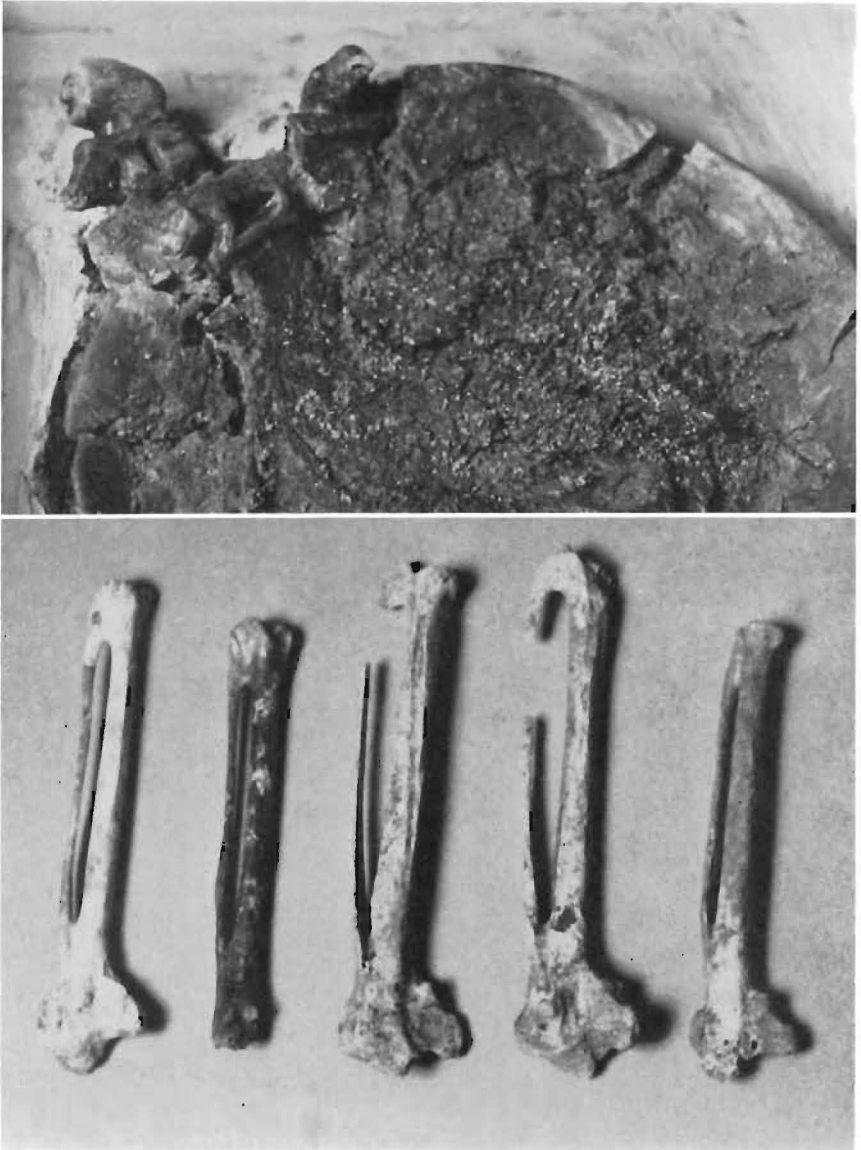
Top: Shell pendant resembling bird-man; found in the refuse on Boughton Hill, Victor, New York. *Bottom:* Bird effigy cut from sheet brass; found in the refuse at Factory Hollow, West Bloomfield, New York. . . . Collection of Robert Graham.

PLATE 5



Top left: Antler comb: there are eagles engraved on the base; found in burial No. 110, Rochester Junction, Mendon, New York. *Top right:* Bird effigy antler comb; Burial No. 92, Rochester Junction, Mendon, New York. *Bottom left:* Bird effigy antler comb; found in a burial on the Dann site, Honeoye Falls, New York. *Bottom right:* Sojiasco, the mischief maker, clutching the necks of two birds; found in an isolated burial on the Markham and Puffer estate, Avon, New York.

PLATE 6



Top: Effigy ladle handles preserved in a brass kettle; Warren site, West Bloomfield, New York. *Bottom:* Turkey wing bones found in burials on the Dann site, Honeoye Falls, New York.

PLATE 7—*Top left:* Eagle effigy pottery pipe; found in the refuse on Boughton Hill, Victor, New York. *Top right:* Brooding-bird effigy pottery pipe; found in burial No. 42 on the Power House site, Lima, New York. *Bottom right:* Open-mouth bird effigy pottery pipe; burial No. 10, Power House site, Lima, New York. *Center:* Perched-bird stone effigy pipe; burial No. 141, Power House site, Lima, New York. *Bottom left:* Bird head effigy stone pipe bowl; Tonawanda village, Tonawanda, New York.

PLATE 7

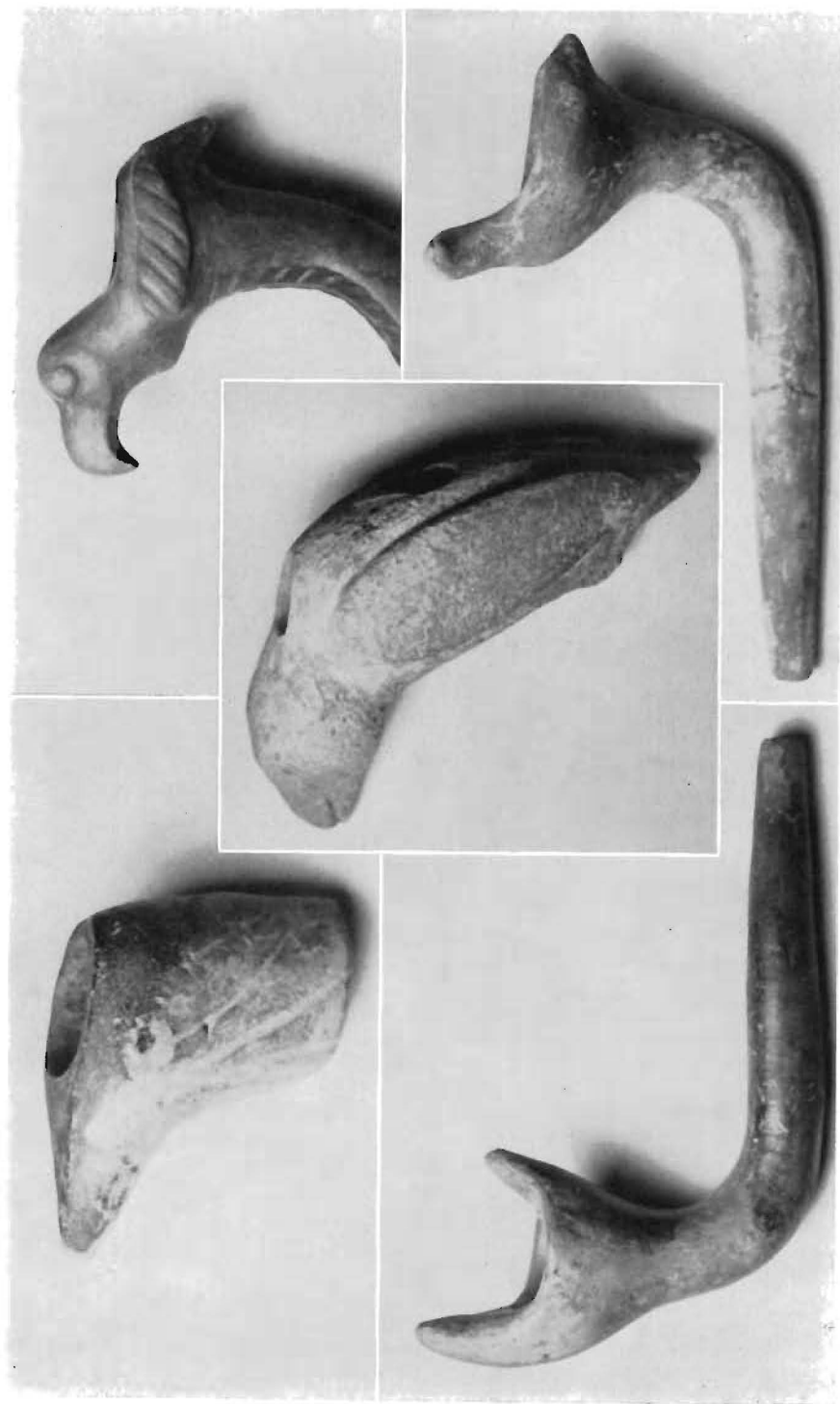
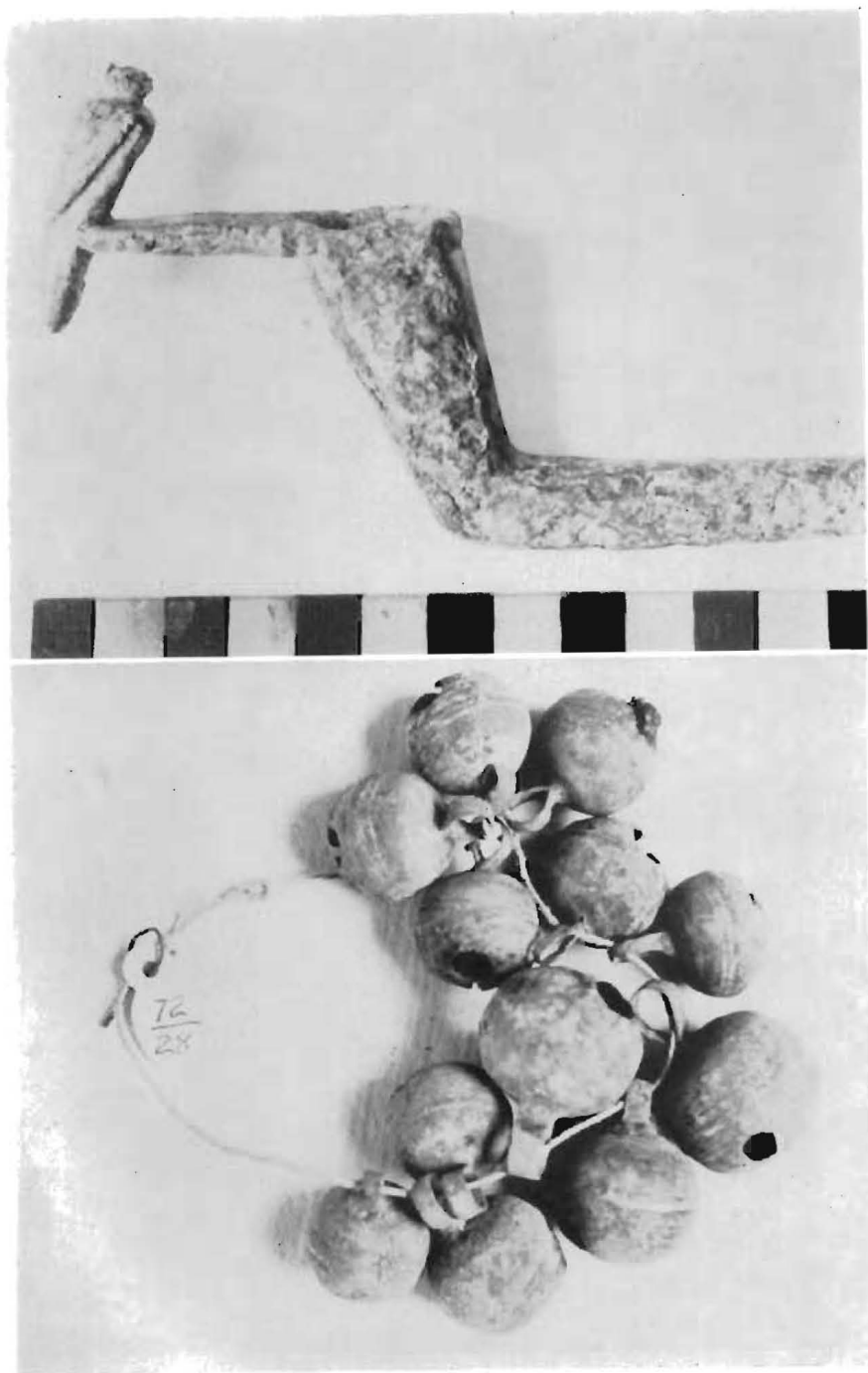


PLATE 8



Top: Contents of a brass kettle, passenger pigeon skeleton; burial No. 34, Dann site, Honeoye Falls, New York. *Bottom:* Bird bones, consisting of an eagle skull, eagle beaks, and passenger pigeon bones; found in burials on the Power House site, Lima, New York and the Dann site, Honeoye Falls, New York.

PLATE 9



Top: Bird effigy pewter pipe; burial No. 141, Power House site, Lima, New York.
Bottom: Brass hawk bells; Dann site, Honeoye Falls, New York.

FIGURE 1



FIGURE 2



FIGURE 3

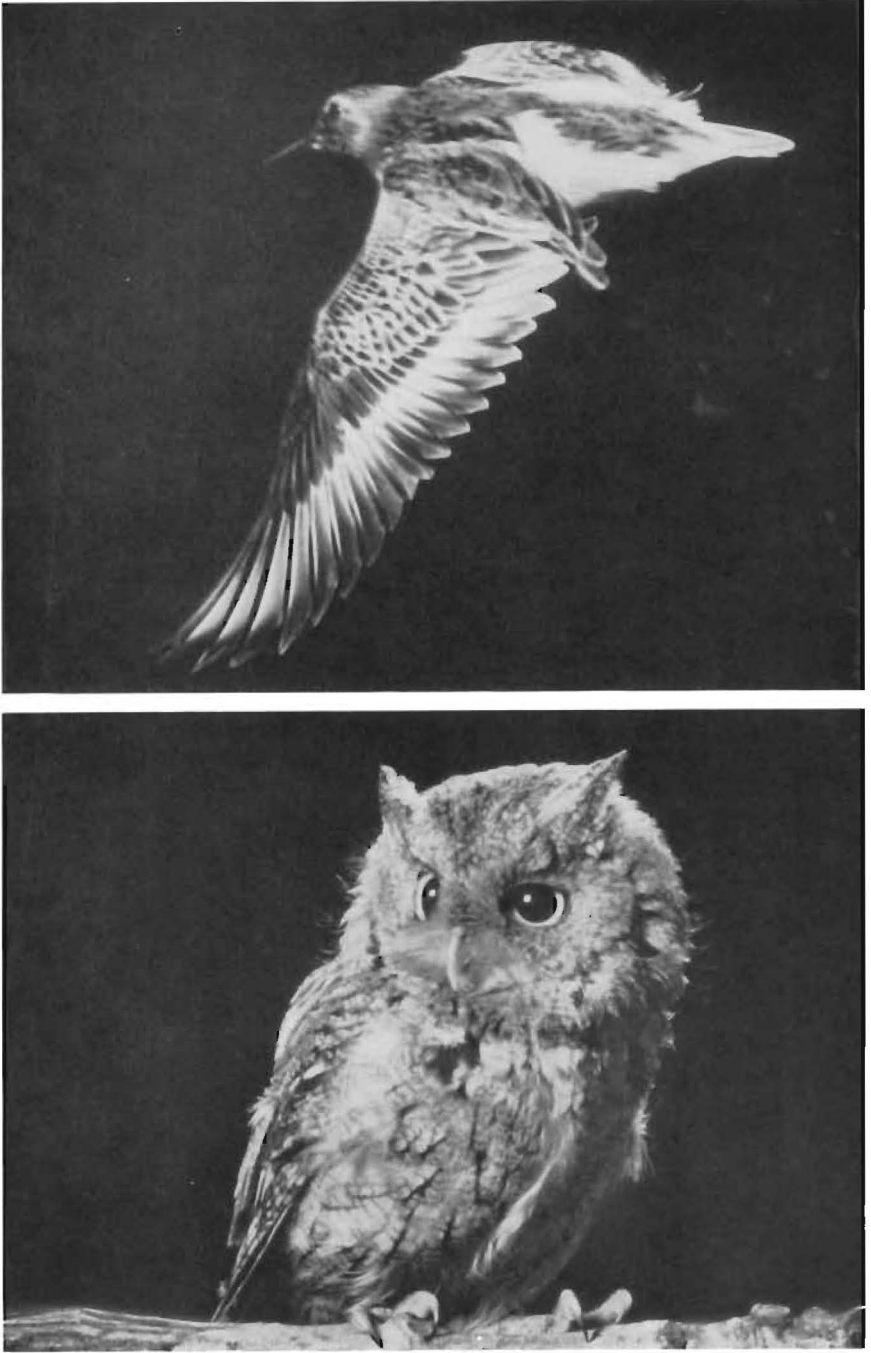


FIGURE 4

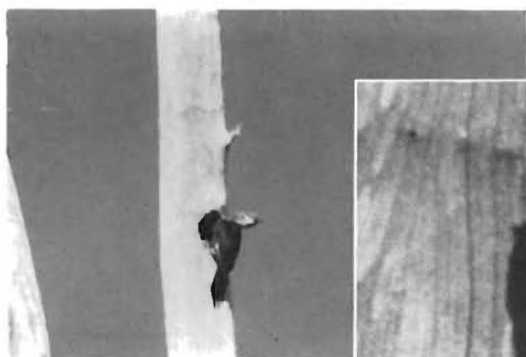


FIGURE 5

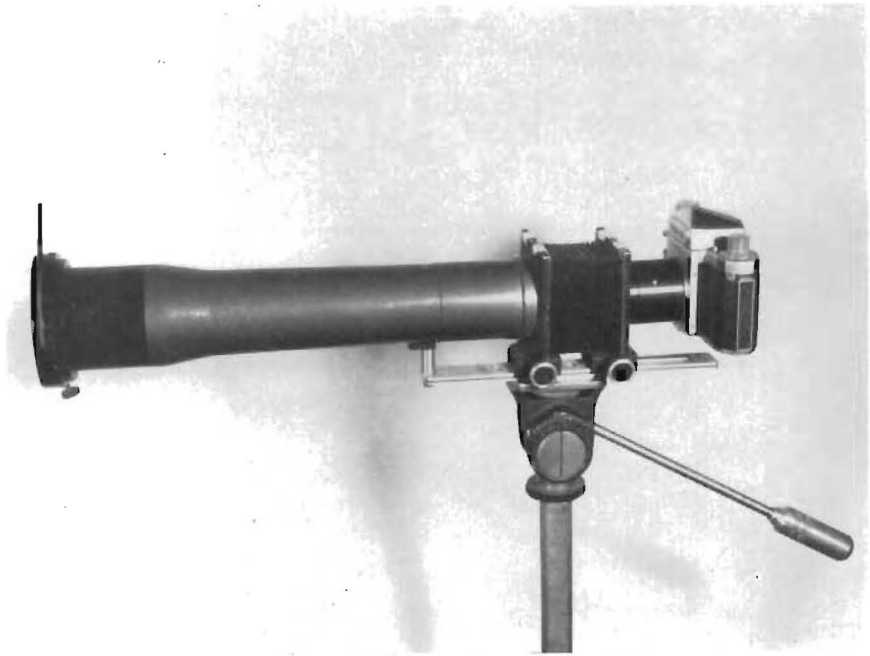


FIGURE 6



FIGURE 7



NOTES ON BIRD PHOTOGRAPHY

Several members of the Rochester Academy of Science are expert photographers who have worked out techniques for photographing birds. An outline of some of their methods—illustrated by black-and-white reproductions derived from their color slides—is given by them here. The notes should be useful to those wishing to extend a photographic program into this field.

The main problem is that of obtaining a sufficiently large image of the birds at a practical working distance. This can be solved in two ways: First, the camera is used close to the subject; second, a telescopic system is used at a relatively long distance. The first method can be varied by working from blinds, or else using remote control devices for operating the camera shutter; and by utilizing natural or artificial light. The second method utilizes natural light and the camera can be operated in the open or from simple hides.

J. F. Englert shows in Figure 1 results obtained with synchronized electronic flash illumination. Two units, of 200-watt seconds output each were arranged at the nest of this mourning dove. The main light was at 25 inches; the fill-in light was at 42 inches and was placed close to the camera axis in order to minimize cross shadows. Exposure factors were 1/200 second at f/22 with a color film having an ASA rating of 64. It is necessary to use at least 1/200 second in order to suppress ghost images that could result from a daylight component in the exposure.

The 4 x 5-inch camera, with a 135 millimeter lens, was at 42 inches on a tripod and the shutter was tripped by means of a remotely controlled solenoid. The photographer was in a hide at 40 feet from the nest. Binoculars aided in selecting a suitable pose. It is worthwhile to withhold making the exposure when doubt exists as to whether the bird's head is toward the camera, or is not suitably aligned with the light.

Flash illumination makes the photographer independent of lighting conditions. Nevertheless, remote control can be used for exposures by natural light, especially when the camera can be pre-focussed upon some known perch in the open. For Figure 2, a sunlight exposure only was involved. Englert pre-set the camera on the area where the egrets were seen to be feeding. He operated it from a small portable burlap blind 50 feet away. Details in the scene were used as landmarks for judging when the bird was in a suitable position.

Working from a simple hide at some distance from the camera and the subject, does have one disadvantage—usually only one

photograph can be made at a time. The photographer then has to disturb the bird as he changes film and re-cocks the shutter. Of course, a motion-picture camera can be run or a motor-driven still camera can be used.

A variation in the method allows more flexibility in camera handling. A reasonably commodious blind, having small ports, can be erected close to the area to be photographed. (With wary birds it may be necessary to first raise it at a distance and move it toward the desired location a few feet a day.) This blind holds camera and photographer. A quickly and silently adjustable tripod is a desirable accessory for steadiness and for ease in holding and aiming the camera.

M. R. Goff, in Figure 3, illustrates additional facets of bird photography. The flight pattern of the red-backed sandpiper was photographed by remote control, with a 4 x 5-inch view-type camera, and with a single electronic-flash unit at the camera. No blind was employed, but the photographer remained seated, hunched and motionless at a long distance from the camera. The presence of the bird in the camera field was not accidental. This achievement in operational technique was accomplished through the aid of two assistants knowledgeable in the behaviour of birds. First, the camera was focussed just beyond the water line, at a distance where it was judged the bird would rise. The photographer had noted the lateral limits in the field of view. Then, the two assistants carefully herded the bird into the desired area and "crowded" it at just the right moment to make it take flight past the camera. The slide was cut down from the 4 x 5-inch transparency to obtain the final composition. The lake water in the background recorded black because the basic daylight exposure, made short to obviate ghost images, did not record the water.

The screech owl was photographed under somewhat less racking circumstances, because it was a semi-tamed bird. Such specimens provide excellent opportunities for obtaining detailed and informative records. As much naturalness as possible was kept here by providing a logical outdoor perch and a black (cloth) background. Two flash bulbs were utilized. A lens of 8 inches focal length was used on a 35 millimeter camera, which was hand-held at close range. Such long-focus lenses provide good perspective and sufficiently large images at the approach possible in the open with the tamer birds and at the distances practical from blinds in which cameras are operated.

For greater distance and for a wide application of field work with birds, telescope systems are most useful. Figure 4 was provided by E. T. Wentworth. The meadowlark was photographed at 80 feet. The original slide was made in a 35 millimeter camera fitted to a field

model Questar catadioptric telescope. A sunlight exposure with fast color film was made at 1/125 second; the aperture of the telescope being f/12. Exposures have to be worked out by trial.

At the magnification provided by such telescope systems, it is extremely important to use as fast a shutter speed as possible, because the effects of camera movement become magnified to the same extent as the image of the bird. A firm tripod is essential, but even this does not prevent some tremors. Gyroscopic stabilizers have been employed for further steadiness with powerful telescopic systems and are extremely satisfactory for both still and motion-picture work with Dr. Wentworth's equipment. The focal length of the model used for Figure 4 is 1075 millimeters. The degree of magnification obtainable can be gauged by comparing the two records of the pileated woodpecker. These are reproduced here from entire 16-millimeter motion picture frames. The smaller image was made with an ordinary cine telephoto lens of 200 millimeters focal length, the larger with the telescope fitted with the motion picture camera. The subject distance in each case was 112 feet. It should be noted that filming was done at 32 frames per second in order to minimize the effects of camera motion, even though a heavy tripod was employed.

Helen Dakin is primarily interested in photographing bird behaviour and range at times other than the nesting season; (most birds have been thoroughly studied and photographed at that period). She pictures birds during the rest of the year. A blind is not feasible for this because one never knows when something of interest will be seen. She carries a camera at all times on hikes and other trips—the prairie falcon, Figure 5, was photographed from a car window. Ralph Dakin has designed and built her a telescopic system for making such photography convenient and quick.

Figure 5 also shows the commercially available telescope objective and Barlow lens mounted by him in a tube to provide a focal length of 840 millimeters at f/14. A single-lens reflex 35 millimeter camera enables the photographer to see the image up to the instant of shooting. The coupling bellows is arranged to permit focussing as close as 8 feet. A camera with a quiet shutter is desirable so as not to alarm wary birds. The unit weighs less than 5 pounds.

Figure 6 shows further records obtained with this home-made equipment—top: immature upland plover in a salt marsh; bottom: immature sanderling. A fast color film permits short exposure times such as 1/250 or 1/500 second. A tripod is needed for steadiness, although occasionally a tree branch, rock, or car window frame can serve as an opportune support. Careful focussing is imperative.

which is a fact that is evident from the shallow depth of field evidenced in Figure 6. The exposures should be made when the bird is momentarily still or only moving slowly.

There is one more approach to bird photography and it is chiefly useful in zoos or aviaries. It is commonly employed for making "delineations" of the birds rather than records of them in their habitats. Figure 7 (by H. Lou Gibson) was made in the Rochester Zoo. This wood duck was very tame and in fact friendly; therefore it was easy to pose and light. Three electronic-flash studio lights provided strategic illumination for depicting textures and patterns. What such a "studio" record lacks in naturalness can be made up for by the clear, over-all, portrayal of detail.

EDITOR

THE CHRISTMAS BIRD CENSUS IN ROCHESTER

1902-1963

RICHARD T. O'HARA

As almost everyone with more than a casual interest in birds knows, the annual Christmas bird count sponsored by the National Audubon Society originated in 1900 at the suggestion of Mr. Frank Chapman, one of the best-known ornithologists of the time and then Editor of *Bird Lore* magazine, now known as *Audubon Field Notes*, and *Audubon Magazine*. Its original purpose, in addition to the pleasure afforded to participants, was to call attention to the wanton killing of birds for sport as well as the intensive collecting for study, which was common at the time. The count is now a national event, widely reported by the press, and very useful for providing data on the relative present-day abundance of various species, such as the Bald Eagle and Eastern Bluebird, and also on the distribution pattern of many species at this particular season.

New York State has always been one of the leading areas in this count and our own city of Rochester has been a participant since 1902 with the exception of the years 1903, 1904, and 1935, when no counts were included in *Bird Lore* magazine from Rochester. In the early years, that is, up to about 1919, the counts were made by only a few observers, usually one or two. They covered merely a limited selection of areas within the circle of 15 miles diameter adopted for the observations. Hence, just small numbers of birds could be found. These areas included Forest Lawn and Sea Breeze, Highland Park and Pinnacle Hill, Mt. Hope Cemetery and Cobbs Hill, and occasionally other locations.

In these years, too, counts were sometimes reported on two or three different days within the count period and there was little communication between observers. For example, in 1915, a list of 11 species was recorded on December 21, 6 species on the 25th, and 10 species on the 26th. These three lists included a total of 15 species and contained the first Horned Grebe, Red-tailed Hawk, Mourning Dove 2, Great Horned Owl, and Northern Shrike ever listed from Rochester.

A total of only 42 species was recorded on all of the counts made between 1902 and 1918. A few of these would be considered fairly noteworthy even today. In this group one might mention the Iceland Gull—1 bird seen in 1918, and even more unusual because of the number—3 Bronzed Grackles in 1916.

The almost complete lack of coverage of suitable water areas is illustrated by the fact that on 26 counts made in fifteen different years before 1919, the only water birds of any kind recorded are the following:

Horned Grebe	1, 1915
Iceland Gull	1, 1918
Herring Gull	11 years
Ring-billed Gull	3 years

It may well be that all of these counts were made on the reservoirs at Highland Park and Cobbs Hill, or on the wide waters of the canal nearby.

With the advent of the post-war era after 1918 and with the use of the automobile, a rather sharp expansion of the list resulted from the evident wider coverage. On one of the first post-war lists, December 22, 1919, such species as the American Merganser 75, Red-headed Woodpecker 4, Migrant Shrike 1 (the Northern Shrike was not listed that year), Pine Siskin 5, and the Brown-capped Chickadee 1 (Horsey and Edson), were added for the first time to the previous tallies.

These years, which might be thought of as a second stage of development, run from about 1919 to about 1926. During this period leisure time had increased for many people and better roads plus the expansion of the park system in Rochester, together with other factors, brought about increasing interest in birds. Now, trips to other areas of the Lake Ontario shore, such as Summerville and Charlotte, began to supplement coverage of the original locales, which had tended to center around Highland Park and vicinity. Many birds which of course had been present all along, began to appear on the Census lists. So we find the first recording of the Common Loon, Scaup (Gr.-Lr.) 3, Golden-eye and Red-breasted Merganser 2, all in 1919.

By 1926 there had been recorded a total of 64 different species, including almost all of those we would think of as common today. Observers now were out in greater numbers, although the groups were not as large as those who make today's counts. They were including places like Durand-Eastman Park and Irondequoit Bay in their coverage.

Water birds remained rather neglected as a group and were usually seen only in small numbers all through the 1920's. The Great Blue Heron first appears in 1921, Mallard and Black Ducks in 1923, and 3 Pintail Ducks in 1924. By 1925 such diving ducks as Red-head, Canvasback, Bufflehead, and White-winged Scoter had all finally

appeared. As many as 300 Scoters were noted in one year but the species was not stated. Evidently the problems of certain identification by careful observers were present then as now! To the 3 Gulls previously recorded was added a new species, Bonaparte's Gull 16, in 1920, but the Glaucous Gull never did appear through 1926.

Almost all of the birds so far mentioned occurred only in very small numbers and many on very few occasions. This, of course, reflects the few observers and limited coverage in most cases although some species were no doubt less common in these years than now. Thus, for example, the Red-tailed Hawk had been seen only twice up to 1926, a single bird each time. In fact the only other hawks listed at all were the Sharp-Shinned (once), Coopers Hawk (once), Marsh Hawk (1 in 1920 and 1922), and the Sparrow Hawk (five times; 1 or 2 birds). The owls fared about the same as the hawks with only the Screech Owl and the Great Horned Owl making the list in three and two years respectively, and 1 Long-eared Owl in 1922.

Among the least expected species seen during this time should be mentioned the Ruffed Grouse (2 in 1919 and 1 in 1922). No indication of where these records were made was included in the records I examined. Others which are somewhat noteworthy include Catbird (1 in 1922), Red-winged Blackbird (2 in 1925), Pine Grosbeak (3 in 1923), and both the Pine Siskin and Redpoll, which were noted on one and five occasions respectively. No record of the Snow Bunting is included after 1908, at least through 1926.

It is interesting to note that the English Sparrow is not included on any count until 1928, presumably because the observers did not consider them worthy of noting although these birds must have been seen. The Starling first appears as 1 bird in 1922 but was noted in every subsequent year and the numbers mounted rapidly.

By 1926 counts had been made in twenty three years with the following results: One bird, the Crow, was recorded every year. The Downy Woodpecker and White-breasted Nuthatch were seen in twenty one years each, followed by the Tree Sparrow, twenty years. Chickadee, nineteen years, Herring Gull, eighteen years and Junco seventeen years. Greatest in number of individuals were the Herring Gull—up to 2,000 and Ring-billed Gull—up to 1,000. The only other birds seen in any relatively great numbers were the Mallard and Black Ducks, Scaup, Scoter (sp ?), American Merganser, Pheasant, Crow, Chickadee, Cedar Waxwing, Starling, Redpoll, Goldfinch, Junco, and Tree Sparrow.

Many species were still being listed only irregularly and in small numbers, which certainly does not reflect their populations as a whole. Thus, for example, the Bufflehead had been seen only once

(1 bird in 1926) and the Old Squaw (twice, 1922 and 1925). Others in this category are: Red-breasted Merganser (twice), Blue Jay (1 to 3 birds, five years), and Swamp Sparrow (once—1 bird). The Cardinal was listed first in 1913 and again in 1916 and then again in 1925.

Some species are rather surprising for their rather regular appearance in these years. The Flicker had been seen in four different years and the Red-headed Woodpecker in two years. The Brown Creeper is included fifteen of the twenty three years, the Robin ten years, Migrant Shrike, three years (only 2 less than the Northern Shrike!), Grackle four years.

Among the species which one might expect but which had never yet been listed on a census up to 1926 are the Rough-legged Hawk, Glaucous Gull, Snowy Owl, Hermit Thrush, Myrtle Warbler, Evening Grosbeak, White-winged Crossbill, Lapland Longspur, and several others which we now think of as quite regular in occurrence.

The following is a complete list of all the species recorded up to and including 1926 together with the range of numbers seen and number of years reported. Summaries for more recent years will be given further on for comparison.

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (up to 1926)</i>
1. Common Loon	3	1 (1919)
2. Horned Grebe	1-4	4
3. Great Blue Heron	1	1 (1921)
4. Mallard	1-75	3
5. Black Duck	2-300	4
6. Pintail	1-3	2
7. Redhead	2	1 (1924)
8. Canvasback	1	1 (1925)
9. Gr. Scaup	1-30	6
10. Lr. Scaup		
11. Golden-eye	1-15	4
12. Bufflehead	1	1 (1920)
13. Old Squaw	6-20	2
14. White-wg. Scoter	1-300	3
15. Amer. Merganser	1-40	7
16. Red-Br. Merganser	2-3	2
17. Sharp-sh. Hawk	1	1 (1916)
18. Coopers Hawk	1	1 (1906)
19. Red-tailed Hawk	1	2
20. Marsh Hawk	1	2
21. Sparrow Hawk	1	4
22. Ruffed Grouse	1-3	3

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (up to 1926)</i>
23. Pheasant	1-64	17
24. Iceland Gull	1	1 (1918)
25. Herring Gull	1-2000	18
26. Ring-billed Gull	1-1000	10
27. Bonaparte's Gull	16	1 (1920)
28. Mourning Dove	2	1 (1915)
29. Screech Owl	1-2	3
30. Great Horned Owl	1	2
31. Long-eared Owl	1	1 (1922)
32. Kingfisher	1	1 (1908)
33. Flicker	1-2	4
34. Red-headed Woodpecker	1-4	2
35. Hairy Woodpecker	1-5	10
36. Downy Woodpecker	1-11	21
37. Blue Jay	1-3	5
38. Crow	2-60	23
39. Chickadee	1-75	19
40. White-br. Nuthatch	1-12	21
41. Red-br. Nuthatch	1-2	5
42. Brown Creeper	1-7	15
43. Winter Wren	1-3	2
44. Catbird	1	1 (1922)
45. Robin	1-4	10
46. Golden-cr. Kinglet	1-15	7
47. Cedar Waxwing	1-50	6
48. Northern Shrike	1	5
49. Migrant Shrike	1	3
50. Starling	1-32	5
51. English Sparrow	(first inc. in 1928)	
52. Red-winged Blackbird	2	1 (1925)
53. Bronzed Grackle	1-3	4
54. Cardinal	1	3
55. Pine Grosbeak	3	2
56. Redpoll	3-50	5
57. Pine Siskin	5	1 (1919)
58. Goldfinch	1-33	3
59. Junco	1-32	16
60. Tree Sparrow	1-185	20
61. Swamp Sparrow	1	1 (1907)
62. Song Sparrow	1-8	12
63. Snow Bunting	2	1 (1908)
*64. Brown Capped Chickadee	1	1 (1919)

* Not carried on regular checklist for Rochester area and, therefore, listed out of checklist order.

One might well wonder who were the early observers in this area. The very first count was taken by Lewis Gannett who saw 9 species (16 individuals) in about two hours (1902). Mr. Gannett took part in one other count in 1908. The second count, 1905, was made by Nettie Sellinger Pierce who was out for about two and a half hours and saw 4 species. This type of short trip was the pattern followed for the next several years. The names of Harry Gordon and Oscar Schaefer first appear in 1910, Richard Horsey and William Edson in 1913, Gordon Meade in 1920, Lucius Paul in 1924 and Joseph Taylor in 1928. Mrs. Pierce was the most active observer before 1910 and Mr. Edson and Mr. Horsey were leaders after 1913. The total number of individual birds reached as high as 3,000 or more, but most species were reported in very small numbers as can be seen on the previous list.

The longest single early list appears to be one made on December 23, 1928 which includes just 25 species. Two more lists that year brought a total of 32 species seen on the three dates within the count period. This is somewhat better than average, but coverage and interest had now increased to the point where 25 to 30 species was regular on a Census report, as the third period—1927 to 1947—began. These counts were well summarized by James Barlow in the *Goshawk* issue of Jan.-Feb. 1948.

There is a notable increase in the number of observers after 1927 when the figure jumped from four to eight the following year, 1928. There was a slow but steady increase, with setbacks in some depression years until by 1940 and 1941 some twenty one observers took part both years. Individual counts were coordinated and reported on a single list after 1933. As noted previously, no count was published in *Bird Lore* for 1935. The most notable jump in observers came with the founding of the Genesee Ornithological Society in 1938. After that year, the number of observers never was below thirteen even in the years of World War II. However, until 1947, the number participating never did reach above twenty three persons.

The lists being reported in the years between 1929 to 1937 tended to include about 30 to 35 species. After 1937, there was again a definite increase as the Census area was covered more thoroughly and better coordination was established among the observers. Parties of observers, then, as now, tended to be small—two to four individuals, but now there were four or five such groups and they were staying out eight to ten hours in the field. The first previous observers to take such extended counts were Edson and Horsey in 1913, but they were the only party involved on that particular day. The total list of species for one count reached above 40 for

the first time in 1938 as a result of the increased activity and in 1939 reached the unheard of total of 52 species! There was something of a pause then, as many regular observers began to go off to the urgent business of World War II and gasoline rationing and other restrictions made long trips afield rare. The low point came in 1942 when only thirteen observers could be mustered to count 48 species. The end of the war saw activity and counts again reach a new peak, and so in 1946, twenty three observers counted a record total of 62 species—almost equal to the number included on all the counts made up to 1926!

Every species listed up to 1927 was also seen at least once in the next twenty years except for the Ruffed Grouse, Red-headed Woodpecker, Migrant Shrike, and Brown-capped Chickadee. Most were seen much more regularly and in much larger numbers than previous to 1927. By the end of the third of the four periods into which this account is divided, that is by 1947, a total of 116 species had been listed in the Rochester area during the Christmas season and about half of them may be considered as very regular. In addition to 60 of the 64 species listed above, the following new species were reported in the years 1927–1947:

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (1927–1947)</i>
1. Red-throated Loon	1–2	4
2. Holboells Grebe	1	5
3. Pied-billed Grebe	1	2
4. Gannet	1	1 (1946)
5. Double-cr. Cormorant	1	2
6. Canada Goose	1–20	3
7. White-fronted Goose	1	1 (1932)
8. Snow Goose	5	1 (1941)
9. Baldpate	1–5	6
10. Green-winged Teal	1	1 (1941)
11. Shoveller	1	1 (1941)
12. Wood Duck	1	1 (1939)
13. Ring-necked Duck	1–6	4
14. Eider (female) sp.?	1	1 (1945)
15. Surf Scoter	1	1 (1943)
16. Ruddy Duck	2	2
17. Hooded Merganser	1–4	6
18. Turkey Vulture	1	1 (1942)
19. Red-shouldered Hawk	1–2	4
20. Rough-legged Hawk	1–3	12
21. Hungarian Partridge	1	1 (1941)
22. Mutant Pheasant	8	1 (1932)

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (1927-1947)</i>
23. Virginia Rail	1	1 (1947)
24. Florida Gallinule	1	3
25. Coot	1-4	7
26. Black-backed Gull	1-16	11
27. Glaucous Gull	1	3
28. Kumliens Gull	1	1 (1939)
29. Little Gull	2	1 (1939)
30. Snowy Owl	1	1 (1945)
31. Barred Owl	1	1 (1943)
32. Short-eared Owl	1-6	5
33. Red-bellied Woodpecker	1	1 (1939)
34. Amer. Three-toed Wdpkr	1	1 (1931)
35. Prairie Horned Lark	1-7	7
36. Northern Horned Lark	1	1 (1946)
37. Carolina Wren	1	2
38. Mockingbird	2	1 (1945)
39. Hermit Thrush	1	1 (1947)
40. Ruby-cr. Kinglet	1	1 (1947)
41. Myrtle Warbler	1-6	3
42. Blackburnian Warbler	1	1 (1946)
43. Northern Yellowthroat	1	1 (1946)
44. Meadowlark	1	2
45. Rusty Blackbird	1	1 (1946)
46. Evening Grosbeak	27	1 (1941)
47. Purple Finch	1-4	3
48. Hoary Redpoll	10	1 (1946)
49. Greater Redpoll	50	1 (1946)
50. Red Crossbill	4	1 (1927)
51. Field Sparrow	2	5
52. White-th. Sparrow	1-6	5

It should be noted that the Northern and Prairie Horned Larks are not truly separate species and the exact status of the Kumliens Gull seems still somewhat vague although it is not now generally regarded as a full species either. The so-called Mutant Pheasant represents a particular strain of birds which were released in this area at the time but did not persist and this was also true of the Hungarian Partridge.

The White-fronted Goose was an individual which was present for some time at Durand-Eastman Park where a flock of semi-wild Mallards was kept and fed in the winter months. These birds attracted several of the listed dabbling ducks during the 1930's also.

Among the more unusual birds for this area included on this list are certainly the Gannet, Turkey Vulture, Barred Owl, American three-toed Woodpecker (now called the Northern three-toed Woodpecker), Ruby-crowned Kinglet, Blackburnian Warbler, and the Greater and Hoary Redpolls.

It is worth noting that while the list of birds recorded for the first time during these years is quite long, most of them do not occur very frequently. Only the Rough-legged Hawk, Coot, Black-backed Gull and Prairie Horned Lark appear in more than six of the twenty years. On the other hand, no less than 28, or considerably over half, occurred in only one year. Some of these have never been recorded again to the present time, as will be seen later. The implication appears to be that most of these birds cannot be regarded as very regular or common in this area in the early winter season.

It has been noted previously that coordination between parties in the field improved after 1938. However, there was still little attempt made to keep the parties from criss crossing the whole circle or to insure the best possible coverage of certain areas by assigning leaders and territories. This refinement in method awaited an even later time and was not really effective until the very late years of the 1940's and early 1950's. It will be seen that another definite expansion of the species listed did result when this improvement was made, and there is little doubt that it also brought a much more accurate picture of the number of individual birds in the area.

Among the areas which were now producing the most birds regularly are: Irondequoit Bay, Durand-Eastman Park, Summerville, Ling Road, and Braddock's Bay. The area around Highland Park had by this time become of secondary importance to the lakeshore section. Sometimes valuable additions to the lists came from places less well covered like Genesee Valley Park, the Rochester airport, and Genesee River gorge.

Many of the very active observers of the present time were now involved in taking these counts. The name of Howard Miller first appears in the late 1920's and present observers would recognize increasingly more of the names each year until by 1947, G.O.S. was beginning to resemble its current portrait.

A few of the striking factors in the records which the 1948 *Goshawk* contained may be cited here. Evidently the Crow roost now noted yearly in Mt. Hope Cemetery or Genesee Valley Park was not being carefully observed or did not exist. The highest count for this species was 450 in 1946 and in most years was less than 100. After a fairly high count of 520 in 1927, Starlings were not being recorded

in large numbers by present standards. In only two years were counts of 1,000 or more noted.

The Blue Jay was still rather scarce so that only since 1938 has it always been seen and even in 1947 only 2 were listed. The Cardinal appears in each count after 1941, but 14 in 1945 was by far the highest count before 1948.

That some birds had not been reported seems surprising in view of their incidence today. For example, the Cowbird was unrecorded as were others such as the Common Scoter, Long-billed Marsh Wren, White-winged Crossbill and Lapland Longspur. Others were recorded much less often than might be expected. The Redhead is on only five of the twenty lists and never more than 1 or 2 birds. The Iceland Gull is missing entirely from 1931 to 1947 while the Glaucous Gull was listed only three times in those twenty years.

The increase in the Black-backed Gull shows very clearly in these records. Never recorded on the Census until 1937, it has appeared in every year since but up until 1947 no more than 16 were noted in any one year.

It is rather surprising to note that the Snowy Owl had first been seen in 1945, the same year in which the first Mockingbirds appear and two years before the Hermit Thrush was recorded. Those who remember recent winters may also wonder that the Evening Grosbeak had been seen only once while the Pine Grosbeak had been listed six times.

On the other hand, it is also noteworthy that some species occurred as often as they did. The Red-shouldered Hawk, four times; is one example, and others include the Baldpate, six times; Ring-necked Duck, four times; Hooded Merganser, six times; Holboells Grebe, five times; Florida Gallinule, three times; Red-throated Loon, four times; and Double-crested Cormorant, twice.

Finally, we come to the fourth and last period in the Census history—from 1948 to 1963. In many ways these last sixteen years represent the culmination of the efforts of earlier years. We now have a fairly complete knowledge of the potential of the Census area and observers who have many years experience in covering the most productive of these parks, woods, and bays. While the list of species which may occur casually is perhaps almost endless, it is not likely that the average yearly count will change much in the years ahead. Indeed, it may decrease somewhat as the area continues to be built up and some habitat disappears. This has already happened in some parts of the circle and must be expected to continue. Nevertheless,

there will continue to be places where practically all of the possible species may reasonably be looked for successfully.

Following is a complete list of all the species which have been recorded on any Christmas Census in Rochester together with a range of numbers and the number of years seen over the period. Species not recorded prior to 1948 are printed in bold-face type.

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (1902 to 1963: 59 counts)</i>
1. Common Loon	1-13	18
2. Red-throated Loon	1-5	7
3. Holboells Grebe	1-2	8
4. Horned Grebe	1-34	25
5. Eared Grebe	1	1 (1957)
6. Pied-billed Grebe	1	7
7. Gannet	1	2
8. Double-crested Cormorant	1	2
9. Great Blue Heron	1-3	11
10. American Bittern	1	2
11. Canada Goose	1-45	7
12. White-fronted Goose	1	1 (1932)
13. Snow Goose	5	1 (1941)
14. Mallard	1-600	38
15. Black Duck	2-2,000	41
16. Gadwall	2	1 (1963)
17. Baldpate	1-5	6
18. Pintail	1-4	12
19. Green-winged Teal	1-2	8
20. Shoveller	1	2
21. Wood Duck	1	8
22. Redhead	1-22	15
23. Ring-necked Duck	1-6	6
24. Canvasback	1-18	9
25. Gr. Scaup Duck	1-1,000	43
26. Lr. Scaup Duck	1-540	19
27. Golden-eye	1-752	38
28. Bufflehead	1-86	24
29. Old-squaw	1-4,850	31
30. White-winged Scoter	1-660	26
31. Surf Scoter	1-2	5
32. Common Scoter	1-4	4
33. King Eider	7-2	3
Eider, sp.? *	1	1 (1945)

* Eider, sp.?

female, quite likely a King Eider.

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (1902 to 1963: 59 counts)</i>
34. Harlequin Duck	1-2	2
35. Ruddy Duck	1-6	7
36. Hooded Merganser	1-6	18
37. Common Merganser	1-1,479	41
38. Red-breasted Merganser	1-1,203	38
39. Turkey Vulture	1	1 (1942)
40. Sharp-shinned Hawk	1-3	19
41. Cooper's Hawk	1-9	26
42. Red-tailed Hawk	1-22	34
43. Red-shouldered Hawk	1-2	5
44. Broad-winged Hawk	1	1 (1963)
45. Rough-legged Hawk	1-11	24
46. Marsh Hawk	1-14	23
47. Sparrow Hawk	1-29	36
48. Ruffed Grouse	1-2	3
49. Hungarian Partridge	1	1 (1941)
50. Mutant Pheasant	8	1 (1932)
51. Ring-necked Pheasant	1-412	53
52. King Rail	1	1 (1949)
53. Virginia Rail	1-2	5
54. Florida Gallinule	1	4
55. Coot	1-2	12
56. Killdeer	1-4	4
57. Wilson's Snipe	1	1 (1959)
58. Red-backed Sandpiper	1	1 (1959)
59. Red Phalarope	1	1 (1963)
60. Glaucous Gull	1-4	11
61. Iceland Gull	1-3	11
62. Kumlien's Gull**	1	1 (1939)
63. Black-backed Gull	1-114	27
64. Herring Gull	1-9,000	54
65. Ring-billed Gull	1-4,180	47
66. Bonaparte's Gull	2-7,000	24
67. Little Gull	2	1 (1939)
68. Mourning Dove	1-167	17
69. Screech Owl	1-23	27
70. Great Horned Owl	1-13	22
71. Snowy Owl	1-3	9
72. Barred Owl	1	2

** Kumlien's Gull,
now considered a race of the Iceland Gull.

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (1902 to 1963; 59 counts)</i>
73. Long-eared Owl	1-2	10
74. Short-eared Owl	1-6	18
75. Saw-whet Owl	1	3
76. Kingfisher	1-5	14
77. Flicker	1-12	26
78. Pileated Woodpecker***	1	1 (1949)
79. Red-bellied Woodpecker	1-12	6
80. Red-headed Woodpecker	1-4	2
81. Yellow-bellied Sapsucker	2	1 (1963)
82. Northern three-toed Wdpkr.	1	3
83. Bl.-Bkd. three-toed Wdpkr.	1-5	2
84. Hairy Woodpecker	1-50	47
85. Downy Woodpecker	1-120	57
86. Horned Lark (incl. sub-sp.)	1-59	18
87. Blue Jay	1-153	34
88. Crow	2-17,262	59
89. Black-capped Chickadee	1-512	55
90. Brown-capped Chickadee	1	2
91. Tufted Titmouse	1-17	8
92. White-breasted Nuthatch	1-76	56
93. Red-breasted Nuthatch	1-18	35
94. Brown Creeper	1-33	48
95. Winter Wren	1-7	30
96. Carolina Wren	1-4	8
97. Long-billed Marsh Wren	1-7	6
98. Mockingbird	1-2	8
99. Catbird	1-2	6
100. Robin	1-45	41
101. Hermit Thrush	1-2	7
102. Bluebird	1	4
103. Golden-crowned Kinglet	1-139	40
104. Ruby-crowned Kinglet	1	2
105. Pipit	1	1 (1951)
106. Cedar Waxwing	1-325	33
107. Bohemian Waxwing	1-12	3
108. Northern Shrike	1-8	27
109. Migrant Shrike	1-2	3
110. Starling	1-11,860	43
111. Red-eyed Vireo	1	1 (1952)

*** Pileated Woodpecker, this bird may have been seen outside the circle, since in 1949 and 1950 certain areas south of the circle were included in the totals.

<i>Species</i>	<i>Numbers</i>	<i>No. of years seen (1902 to 1963; 59 counts)</i>
112. Myrtle Warbler	1-13	13
113. Blackburnian Warbler	1	1 (1946)
114. Northern Yellowthroat	1-2	5
115. English Sparrow****	25-2,077	31
116. Meadowlark	1-15	8
117. Red-winged Blackbird	1-188	22
118. Baltimore Oriole	1	2
119. Rusty Blackbird	1-42	14
120. Grackle	1-5	14
121. Cowbird	4-197	13
122. Cardinal	1-204	27
123. Evening Grosbeak	1-56	8
124. Purple Finch	1-15	12
125. Pine Grosbeak	1-113	10
126. Redpoll	1-500	21
127. Greater Redpoll	50	1 (1946)
128. Hoary Redpoll	10	1 (1946)
129. Pine Siskin	2-238	24
130. Goldfinch	1-122	30
131. Red Crossbill	1-4	3
132. White-winged Crossbill	2-12	4
133. Towhee	1	4
134. Savannah Sparrow	1	3
135. Slate-colored Junco	1-365	52
136. Oregon Junco	1-2	3
137. Tree Sparrow	1-1,212	56
138. Field Sparrow	1-3	6
139. White-crowned Sparrow	1-13	3
140. White-throated Sparrow	1-23	21
141. Fox Sparrow	1	3
142. Swamp Sparrow	1-45	26
143. Song Sparrow	1-105	49
144. Lapland Longspur	1-17	7
145. Snow bunting	3-500	24

In addition, a few other birds have probably been seen, but the observers in these cases did not consider the observations entirely satisfactory.

There are still a few species one might expect to appear which

**** English Sparrow, probably present every year since 1902 but not counted before 1928.

have not. These include the Black-crowned Night Heron (which has been recorded at Buffalo on several occasions), Goshawk, Bald Eagle, Barrow's Golden-eye, Common Eider, Purple Sandpiper, and possibly one or two other shorebirds. Of course, stragglers of other species which seem even less likely than these will probably occur.

It can readily be seen from the complete list to date that 30 species have been added in the past sixteen years. Quite a few of these have occurred more than once and are not now considered particularly rare, i.e., Common Scoter, Saw-whet Owl, Long-billed Marsh Wren, Bluebird, Bohemian Waxwing, Cowbird, White-winged Crossbill, Oregon Junco, White-crowned Sparrow, and the Lapland Longspur.

Several of the species which seem most unlikely have occurred in years of especially mild winters, but this is not always the case. For example, a Baltimore Oriole in late December would have seemed impossible a few years ago, but recently they have also begun to turn up in other localities in the Northeast. Perhaps the rapid increase in winter feeding in suburban areas is the most reasonable explanation for their appearance on the Census. A few birds of this and other species may have been left behind each year in the past but probably did not survive long. Most of the so-called half-hardy species which are recorded on Census lists probably fail to live through the winter in this climate, but those few that do may return again in later years.

What does the Census record seem to show about population trends? Most generalizations would probably be unwarranted since really meaningful data does not go back too far and the area is quite limited in size. However, it does seem to confirm most of our present understanding about the relative abundance of most species of birds in this area at this time of year. For instance, while the Lesser Scaup is listed as having a range of numbers from 1-540, in most years none were listed and in the vast majority of years when it was seen, the numbers were between 1 and 10. In some years of mild weather large rafts of apparent Lesser Scaup may still be seen on the Lake (Ontario) at Christmas time, but they depart soon after and in most years have left before the Census date. On the other hand, the Greater Scaup numbers usually continue to increase on Lake Ontario into January as smaller or more northerly bodies of water freeze over.

Many other points of interest will be noted from a study of the list. The almost exactly equal status of the Glaucous and Iceland Gulls becomes apparent whereas one observer may see so few of these birds that his own records even over many years could give

a different impression. The relative winter status of such family groups as ducks and the birds of prey is quite accurately pictured as far as the area inside the Census circle is concerned. Just outside, not far away, greater numbers of certain species could very well occur; the 7 1/2 mile radius must be kept in mind. (For readers not familiar with the boundaries of the Census area, it need only be stated here that the center point of the circle has varied slightly over the years; today it is at Dewey Avenue and Stone Road in Greece. It includes the Lake Ontario shore and off-shore waters from Braddock's Bay to beyond Irondequoit Bay.)

Not much has been said about the total number of individual birds seen. This is mainly because the numbers vary so widely that these figures probably have almost no meaning. In recent years the numbers have varied by many thousands depending probably not so much on actual changes in birds present as on such factors as local weather conditions, areas intensely covered, number of observers, hours in the field, and others. A very few species account for the vast majority of the total number of individual birds. These chiefly are certain of the ducks and gulls, the Crow, Starling, and occasionally 1 or 2 other species. Only 33 species have ever been recorded in numbers greater than 100 and even many of these are usually seen in smaller numbers. The grand total of individuals has run as high as 40,000 or more made up chiefly of Gulls, Crows, and Starlings.

The interesting statistics revealed by a close study of these data are almost endless. One can note that 21 species have been seen only once and of these only 6 were recorded within the past ten years; 12 others made the list only twice; and in the great majority of cases, these 33 species have occurred as single individuals. They are truly pretty scarce birds in this area in later December or early January!

If we arbitrarily say that a common species is one occurring at least twenty times in the fifty nine years of census records, we find 49 such species and few if any surprises. Perhaps Cooper's Hawk and Bonaparte Gull are the least expected. On the other hand, no less than 74 species are reported in fewer than ten years so that more than half of the species listed are far from common. Perhaps the most surprising in this group are birds like the Canvasback, Snowy Owl, Tufted Titmouse, Carolina Wren, Hermit Thrush, Evening Grosbeak, both Crossbills, and the Lapland Longspur. Some of these have occurred in a far higher percentage of recent lists than they did before 1948 and, therefore, such statistics may seem misleading to current observers.

One way of finding the rarest birds on the list is to look at those

species which have never been listed since 1947. We find 9 such species, not including the Kumlien's Gull. These are the White-fronted and Snow Geese, Turkey Vulture, Hungarian Partridge, Mutant Pheasant, Little Gull, Blackburnian Warbler, and Greater and Hoary Redpolls. The Little Gull is perhaps the most surprising of these, although, either of the Redpolls might be noted again when Common Redpolls are around in good numbers. There is some question of the appropriateness of listing released species such as the Mutant Pheasant and Hungarian Partridge until they have become truly established, and there is also some question about the White-fronted Goose being truly a wild bird although its origin is unknown so far as I can determine. The Snow Geese, Turkey Vulture, and Blackburnian Warbler would be most unlikely to be recorded again, especially the Warbler.

Of those species recorded after 1947, several are almost equally unusual. These include the Gannet, Eared Grebe, Double-crested Cormorant, Bittern, Broad-winged Hawk, King Rail, Pipit, Red-eyed Vireo, Baltimore Oriole, and White-crowned Sparrow. The last two of these seem to be establishing a pattern in the northeast and are the most likely to be recorded again, especially at certain feeders in this area. Others, like the Gannet and Eared Grebe are rare birds here at any time. The Red-eyed Vireo is perhaps least likely to repeat of this group, although with the possible exception of the Bittern, it could be a great many years before any of these occur again on a Census list if indeed they ever do re-appear!

There are 21 species in the group which has appeared on the Census list from ten to nineteen times. In some ways these are the most interesting as they are unusual enough to make them worth searching for, but seen often enough to provide a good chance to be observed. Included in such species are the Common Loon, Great Blue Heron, Pintail, Redhead and Lesser Scaup Ducks, as well as the Hooded Merganser. Among the Hawks, only the Sharp-shinned fits into this rather narrow group (seen nineteen times now). Also included are birds like the Coot, Iceland and Glaucous Gulls, Mourning Dove and both Long- and Short-eared Owl. Among the smaller birds, we find the Kingfisher, Horned Lark, Myrtle Warbler, Grackle, Cowbird, Rusty Blackbird, Purple Finch, and Pine Grosbeak. To a large extent the success of a Census in terms of variety of species recorded depends on how many in this group are observed, because we know that not many in the least common group will be recorded and practically all in the more common group should be seen.

Finally, some indication ought to be given of the total numbers of species now seen on the Census counts. This has varied since 1948

from about 65 species to a maximum of 88 species in 1963; in only two years to date has the count reached 80 species or more—1959 saw 86. As noted with respect to total number of individuals seen yearly, this figure varies with certain factors, especially weather conditions. However, there probably is more true variation here since the number of half-hardy species present may drop very sharply in a year of severe conditions preceding the census. While it is possible that in some future year 90 or more species could be seen, we probably are now recording a pretty accurate account of the species present each year. The number of observers taking part is now usually around forty to fifty and this may be expected to increase.

In concluding this brief review, a word of thanks and encouragement ought to be tendered to the faithful observers, both past and present, who have provided the data included and, also, to those who have carefully compiled and preserved it for us. In the latter case, Dr. Gerhardt Leubner is the person largely responsible, but any errors in reporting figures for this paper are the responsibility of the author.

CITATIONS IN THE ROCHESTER ACADEMY OF SCIENCE

1961*

MAURICE BROWN, Ph.D.

Honorary Member

Science serves us in two ways: it can help us to live with the World and in the World. But the first, spiritually rewarding phase is often eclipsed by the second, materially rewarding activity. Yet both are vitally necessary for us to work out our tenancy here.

The Rochester Academy of Science is dedicated to advancing this dual function. At this time we wish to recognize a vigorous proponent of the former. He was the first curator for the Hawk Mountain Sanctuary Association, and still holds that position.

For almost thirty years the Sanctuary has been a safety zone, instead of a dangerous crossing, for hawks and related species migrating over the Kittatinny Range in Pennsylvania. Previously the special geography of the place made it a vantage point for the misguided shooting of thousands of birds annually.

Notwithstanding early malevolent opposition, he succeeded in transforming the ridge from a shooting gallery for a few hundreds of people into a Nature sanctuary for many thousands. These figures indicate our basic human need of a spiritual migration. Around him a forceful Association has grown to provide such release by extending the original scope of the Sanctuary.

He has written the book "Hawks Aloft", to recount the project. In his native Boston his first ornithologic efforts were those of helping to assemble data for a monumental work on northeastern American birds. He has been associated with conservation and natural history projects ever since leaving school. His "Index to North American Ferns" is one of the outstanding guides to this group of plants. He has been granted a Doctorate by Muhlenberg College.

Because he has not only given the hawks a safe passage in their journeys, but also provided a flyway for the human spirit to soar above the sometimes aberrant volleys of utilitarian science, we are honored to welcome him as an Honorary Member.

* Because of the time period between election and citation, Fellows Dakin, Johnson and Weber were erroneously listed for 1961 in Volume 10, No. 6, instead of 1962.

ROBERT GEORGE SUTTON, Ph.D.

Fellow

Science sometimes has to go back in order to go forward. Our candidate does just this. Certainly by uncovering and decoding the story imprinted in our ancient local rocks he has significantly advanced the science of geology.

He is Acting Chairman in the Department of Geology at the University of Rochester. He has a capacity for enthusiasm in his own researches and for the encouragement of the initiative of students, both in the school and in the field. He has extended these qualities to our Academy by serving on the Council, by lecturing and by writing for the Proceedings. His "Stratigraphy and Structure of the Batavia Quadrangle", in Volume 9, was a noteworthy effort.

Since that time he has prepared several other contributions to books and journals, including valuable data for bringing the Geologic Map of New York State up to date. He is a member of eight learned societies concerned with the academic and economic phases of geology, mineralogy and paleontology. He holds a Doctorate from Johns Hopkins University.

For his ability to reach the strata that lie below our land and all strata of scientific interest in those who live upon it, we are pleased to offer our Fellowship to a distinguished Member.

1963

SISTER MURIEL S.S.J.

Honorary Member

Research is an attitude of mind as well as an outlet for mental and manual abilities. We are proud to honor a proponent of this viewpoint, who, as Chairman of the Science Department of Nazareth Academy, directs the studies of high school girls and teaches them the intellectual approaches and technical skills of science. She gives them insight into the three elements of our existence through courses in earth science, biology, and religion.

Her background of zoology was obtained at Syracuse University and she received a master's degree in physiology from the University of Pennsylvania. Three summers of research at the Marine Biological Laboratory in Woods Hole prepared her for the work she is now doing.

It is logical that the same spirit which prompted her to join the Community of the Sisters of Saint Joseph should direct her inclinations toward cancer research. She has carried this into the school-room and the most exciting aspect of her teaching is the guidance of students in doing actual research. For example, a research team under her tutelage has been able to induce tumor regression in mice. The stimulation these girls must experience in preparing the work for publication in a professional journal needs no elaboration here. Such a venture, which is unusual at the high school level, furthers the aims of the National Science Foundation Grant for Teacher Research, sponsored by Cornell University. In addition, she is active in encouraging other students to develop projects for science fairs and talent searches.

As a teacher of teachers, she has addressed educational gatherings with such lectures as: Teaching Large Groups; Evolution and Philosophy; and Teaching Science in Elementary Schools. In 1962 she conducted a seminar to investigate the role of photography in high school science classes. These endeavors show her dedication in promoting programs for the better teaching of science as well as in practicing them.

For successfully mixing girls in white coats with mice in white fur, we most cordially welcome her as an Honorary Member in the Academy.

GRACE L. MURRAY

Fellow

Science is advanced in two ways: By the scientists, who uncover ten new questions in finding the answer to the one they have asked; and, by the science teachers, who nurture the young scientists to work on those ten new questions.

Our candidate has done research in biology, entomology, botany, and virology. She is now finishing her requirements for a doctorate in microbiology. A graduate of the University of Rochester, she has received numerous scholarships and awards.

The major part of her career has been in the teaching field. After spending many years in the Science Department of Monroe High School, she is now Associate Professor of Biological Science at Monroe Community College. Her skill and zeal as a teacher are evidenced first by the enthusiastic way in which a large number of her students have participated in Science Fairs, and second by the award-winning quality of their exhibits. Outstanding among her students is one who gained an Honorable Mention in the 1951

Westinghouse Science Search and another who finished in the top ten in 1954—the first time this honor has come to Rochester. Two of her students received Honorable Mention in the 1962 Ford Future Scientists of America Award Program. She is currently Regional Chairman of this Program for our area.

For the Academy she has served as Secretary for the Photography Section and on the Council for many years. At present she is our Representative to the Rochester Council of Scientific Societies. Her special interest is working on our Grants Committee in conjunction with the American Association for the Advancement of Science. Noteworthy among the many honors she has received from scientific, fraternal, and academic groups in the City, is the Certificate of Merit she was granted in 1956 by the Rochester Museum of Arts and Sciences for stimulating student participation in Museum activities.

For her own achievements and for the far-reaching achievements that will be the harvest of her efforts, we are pleased to extend her our Fellowship.

CHARLES F. WRAY

Fellow

Our candidate exemplifies the result of exposing a boy to science and encouraging his interest. It is true that his first "dinosaur" discovery turned out to be the remains of a pioneer horse on his father's farm in Avon. Yet the thrill of a seven-year old at the finding could not be quenched by the cold facts of taxonomy. Further determined search uncovered a genuine specimen from antiquity—this time an Indian arrowhead.

His interest in the ancient cultures of the area has continued ever since. He has often assisted field expeditions of the Rochester Museum of Arts and Sciences and has done considerable excavating on his own. He has one of the finest archaeological collections in the state and has supplied authenticated materials to the Smithsonian Institution, Corning Museum of Glass, and others. He is Past President, and currently a Trustee, of the New York State Archaeological Association and is Past President of its Morgan Chapter here. He is a Fellow of the Rochester Museum, the New York State Archaeological Association, and the Pennsylvania Archaeological Association.

A master's degree in geology from the University of Rochester provides his formal background and he is head of the Mineral Department of Ward's Natural Science Establishment. Archaeology still holds his interest and his particular attention is toward certain geologic phases. His article on flint, among several papers on

archaeology, is a widely used reference work. In another paper he and an associate provided the best analysis that has been published so far on the chronology of historic Seneca villages. One of his activities has been the locating of ancient quarries and the identification of types of materials used by the Indians for arrowheads and tools.

Ever mindful of his own early adventures, he is a frequent lecturer to school classes. And knowing the interest of adult groups in science, he has presented many discussions of the former cultures of our area to them.

For combining the discipline of geology with archaeology in order to show us the old that we may better see the new, we are happy to confer upon him our Fellowship.

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