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January
1977

Field Museum of Natural History Bulletin

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NATURAL HISTORY SURVEY

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Field Museum of Natural History Bulletin

January, 1977
Vol. 48, No. 1

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Field Museum of Natural History Founded 1893

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American bittern (*Botaurus lentiginosus*), wading bird common over much of North America. Its eyes are positioned low on the side of the head, so that when it points its head upward to blend with the reeds, it can still see what is happening in front. Photo courtesy Canadian Government Office of Tourism. For more on bird vision see p. 10.

Field Museum of Natural History Bulletin is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605. Subscriptions: \$6 a year; \$3 a year for schools. Members of the Museum subscribe through Museum membership. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605. ISSN: 0015-0703. Second class postage paid at Chicago, Ill.

Our Environment



Grizzly bear diorama, Hall 16

Grizzly Critical Habitat

Approximately 20,000 square miles in Idaho, Washington, Montana, and Wyoming have been proposed for listing as critical habitat for the grizzly bear, a threatened species, the Fish and Wildlife Service announced recently in the *Federal Register*.

The proposed areas actually merge to form four zones of about 13 million acres. These are located in:

- The region where Wyoming, Montana, and Idaho come together, in Yellowstone National Park and

adjacent areas, including parts of Custer, Shoshone, Teton, Targhee, Beaverhead, and Gallatin national forests, and part of Grand Teton National Park.

- Northwestern Montana, in Glacier National Park, the Bob Marshall Wilderness Area, most of the Flathead National Forest, and adjacent areas, including parts of the Lewis and Clark, Helena, and Lolo national forests, and small parts of the Blackfeet and Flathead Indian reservations.

- Extreme northwestern Mon-

tana and northern Idaho, in the Cabinet Mountains, mostly in the Kootanai, Kaniksu, and Lolo National forests; and

- Extreme northern Idaho and northeastern Washington, mostly in the Kaniksu National Forest.

These areas coincide approximately with the present regular distribution of the grizzly bear in the 48 contiguous states, and are the only remnants of the original range of the species which once covered a region approximately 50 times as great, from Canada to Mexico, and from the

Great Plains to the Pacific. These areas contain the only significant grizzly populations south of Canada, and, insofar as is known, provide all biological, physical, and behavioral requirements of those populations. Among the important characteristics of these areas is their relative inaccessibility and lack of the kinds of human developments and activities that tend to result in conflicts between the bears and man. This degree of isolation and freedom from excessive human presence seems critical to the survival of the grizzly. It is true that there are many natural or man-made sites scattered over these areas that are seldom or never utilized by the grizzly bear. It would not be possible, however, to attempt to identify all of these sites and exclude them from the overall designation.

There has been widespread and erroneous belief that a critical habitat designation is something akin to establishment of a wilderness area or wildlife refuge, and automatically closes an area to most human uses. Actually, a critical habitat designation applies only to federal agencies. It is essentially an official notification to the agencies that the Endangered Species Act requires them to ensure that their activities in a critical habitat area do not jeopardize endangered or threatened species or result in the destruction or modification of the habitat.

Public comments on the proposal may be sent through February 9, to the Director, U.S. Fish and Wildlife Service, Washington, D.C. 20240.

Annual Seal Slaughter

A massive killing of 23,110 fur seals occurred last summer on United States government land. From June 28 to the end of July, up to 1,000 seals a day were slaughtered under the auspices of the National Marine Fisheries Service of the U.S. Department of Commerce.

These killings were legalized by the Fur Seal Act of 1966, which has provisions calling for the United States to kill the marine mammals on their breeding grounds, the Pribilof Islands, situated in the Bering Sea 800 miles southwest of Alaska.

The basis of the Fur Seal Act was an attempt to stop other nations from killing the animals at sea. As a consequence, 15 percent of the U.S. kill goes to Canada and 15 percent to Japan.

The purpose of the annual slaughter is to save the herd; but the result has been to reduce the total fur seal population from an official figure of five million fur seals before the passage of the act to 1.2 million in 1976, as reported by the federal government.

In spite of the rapidly dwindling herd, Mark Keyes, Seattle veterinarian on duty during the slaughter, reported that plans had been made to start in 1977 the slaughter of two- to four-year-old female seals as well as males.

In 1976 the intent was to kill only bachelor male seals, but this is difficult because sexually immature seals of both sexes gather on the same hauling grounds from which they are driven inland for the kill. The kill is done by beating the seals with clubs.

Each fur skin is removed from the seal's body and shipped to Greenville, South Carolina, where it is commercially processed and sold at auction. A single firm holds a processing contract with the federal government. The carcasses are sold (also under contract) to an association of fur-breeders and recycled as food for ranch-raised mink.

The kill takes place in the name of conservation. By keeping the number of seals down, government biologists claim, the seals can thrive. In reality, say opponents, the Pribilof seal herds are thus threatened with annihilation. According to the Committee for Humane Legislation, headquartered in New York City, the number killed is diminishing even though every available seal is herded inland to the killing fields. The number killed in 1976 — 23,110 — is less than one-quarter the number of skins promised the furriers by the biologists. In 1972 testimony to the Congress concerning marine mammals, official data indicated that the federal management of seals would result in an annual kill of 100,000 seals.

The projected off-shore drilling for oil near seal breeding grounds is

also cited by the Committee for Humane Legislation as a serious threat to the animals' survival. Oil slicks and nets, they contend, are extremely hazardous to seals.

Bird Repellent Developed for Use on Fruit Crops

U.S. Fish and Wildlife Service researchers have developed a bird repellent for use on sweet cherry crops that allows growers to raise cherries successfully and still have birds in their orchards. If its use is registered with the Environmental Protection Agency—and scientists think it will be—it would be the first time a chemical has been approved for protection of fruit from bird damage. Its use on other crops also looks promising.

The chemical, methiocarb, is a short-lived carbamate that breaks down rapidly in sunlight. The compound is a potent emetic, and when birds eat a few cherries they soon learn to associate its taste with its effects. The effect is temporary, however, and birds recover completely. In 10 years of field-testing at practical repellent-use levels, no birds have been found whose death was attributed to methiocarb. No chronic effects have been observed and reproduction is normal. The treatment appears to work on every major species of bird which attacks orchards.

Nationwide, more than \$70 million worth of sweet cherries are grown annually and orchards are easy targets for birds which can and do inflict considerable damage on the ripening fruit. Damage in some orchards is now kept in food crops. Experiments conducted by FWS biologists over the last several years led to a registration of methiocarb in 1976 for use as a corn seed protectant against blackbirds. In many Eastern and Midwestern states blackbirds cause heavy damage to newly planted cornfields by eating the seeds shortly after they sprout. Methiocarb seems to be an effective solution to this problem, too. Methiocarb was also registered for use in 1976 as an insecticide on

cherry and peach crops with a distinctly high permissible residue tolerance of 25 parts per million on cherries and 15 parts per million on peaches. Methiocarb also looks promising as a bird repellent on blueberries, grapes, grain sorghum, and sprouting rice.

Critical Habitat for Four Endangered Species

The critical habitat, or living space animals need to survive, has been officially listed for four endangered species—the American crocodile (*Crocodylus acutus*), California condor (*Gymnogyps californianus*), Indiana bat (*Myotis sodalis*), and Florida manatee (*Trichechus manatus*).

The Fish and Wildlife Service published a final rulemaking September 21 listing the areas which ought to remain unruined if the species are to have a decent chance to be saved. The rule went into effect October 22.

It is by no means a guarantee, however, that man will be prevented from destroying the species.

Critical habitat for these four species, as well as for the snail darter (*Percina tanasi*) and the whooping crane (*Grus americana*), was proposed on Dec. 16, 1975. A final rulemaking designating critical habitat for the snail darter was issued on April 1, 1976. As for the whooping crane, so much information was received in response to the December 16 proposal that more time will be required for evaluation.

This determination is being made in accordance with Section 7 of the Endangered Species Act of 1973, which requires all federal agencies to ensure that actions authorized, funded, or carried out by them do not adversely affect the critical habitat of endangered and threatened species. The specific delineations of critical habitat in this rulemaking will assist federal agencies in knowing the areas where their responsibilities may apply. The designations, however, are not comparable to establishment of wilderness areas

or wildlife refuges. No legal jurisdiction is assumed, and no prohibition of particular activity is made. The only specific effect of the rulemaking is that federal agencies will have to evaluate their actions with regard to the requirements of Section 7. The Fish and Wildlife Service emphasizes that the determinations apply only to federal agencies and only to their actions that may adversely affect the species involved. It is thought that many kinds of actions in the designated areas would not be detrimental.

The critical habitat being designated for the American crocodile covers the area inhabited by nearly all of these huge reptiles that survive in the United States. The area is located in extreme southern Florida, mostly in Everglades National Park and the northern Florida Keys. The 200 to 300 crocodiles here are dependent upon the waters of Florida Bay and the associated marshes, swamps, creeks, and canals. All known breeding females, of which there are less than 10 in Florida, inhabit and nest in the delineated area. ➤



Manatee diorama, Hall N

The California condor, of which only about 60 survive, is among the two or three most critically endangered birds in the United States. Ten separate parts of its remaining range in southern California are being recognized as critical habitat. The largest of these, the Sespe-Piru Condor Area in Los Padres National Forest, covers about 250 square miles of territory used by the species for nesting and related year-round activity. Six smaller blocks of land, totaling about 135 square miles also mainly in Los Padres National Forest, are utilized for nesting or roosting. Three larger areas, covering about 540 square miles, are located on rangelands to the north, and are where the condor searches for the carrion on which it feeds.

The Indiana bat, though numbering several hundred thousand, is endangered because it is losing the relatively few special kinds of caves in which it concentrates during the winter. Thirteen of these caves, located in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia, are being designated as critical habitat. It is anticipated that additional caves, and possibly other parts of the bat habitat, will also be designated in the near future.

There are 600 to 1,000 manatees in the United States, the major concentrations being in Florida. Certain water areas are now known to be of particular importance, and these are being designated critical habitat. They include the Crystal River in Citrus County; portions of the Little Manatee, Manatee, Myakka, Peace, and Caloosahatchee rivers and Charlotte Harbor in west-central Florida; waters along the coasts of Lee, Collier, and Monroe counties; sounds along the southern tip of Florida; Biscayne Bay and adjoining waterways near Miami; Lake Worth, and the Loxahatchee, Indian, and Banana rivers, and portions of the Intracoastal Waterway along the east coast; and the St. Johns River.

Biologists who set out to determine what constitutes a critical habitat use these guidelines: (1) space for normal growth, movements, or territorial behavior; (2) nutritional requirements, such as food, water,



California condor

minerals; (3) sites for breeding, reproduction, or rearing of offspring; (4) cover or shelter; or (5) other biological, physical, or behavioral requirements.

Shark Repellent that Works?

"The first known chemical that can prevent a shark from biting," is the way Eugenie Clark, director of the Cape Haze (Fla.) Marine Biological Laboratory, describes "Albro," an extract from dorsal and anal fin glands of the Moses sole (*Pardachirus marmoratus*).

Clark and co-workers discovered that the sole, native to the Red Sea, secretes a milky substance that can kill small marine animals and stun sharks and barracuda, causing temporary paralysis. The toxin destroys red blood cells. Remarkably, the Moses sole is valued by Red Sea coastal peoples as a food fish; the poison is destroyed by cooking.

A component of the sole's milky secretion was observed to have an inhibiting effect on the toxin and is thought to protect the sole from its own poison. The inhibitor also counteracts the toxic effects of venom from bees and scorpions as well as from cobras, mambas, and coral snakes. Plans are underway to make the shark repellent commercially available.

EPA Cancels Mirex

The Environmental Protection Agency announced on October 20 the cancellation of current registrations of the pesticide Mirex. Mirex, a persistent chlorinated hydrocarbon like DDT, has been used since 1962 to control fire ants throughout the South. In announcing his decision, EPA Administrator Russell Train said that the cancellation "concludes one of the longest and most difficult chapters in environmental history."

The state of Mississippi, which owns the only Mirex 4X fire ant bait formulating plant currently in operation, offered a plan last fall to voluntarily cancel the registration of Mirex after EPA discovered residues of the pesticide in human tissue samples taken in the South. Mirex has caused cancer in laboratory animals, and, according to Train, is considered a human carcinogen. It is also known to be toxic to several forms of non-target organisms, especially those in the aquatic environment.

The cancellation plan would permit aerial application of a diluted formulation until Dec. 31, 1977. Ground application could continue until June 30, 1978. However, Hooker Chemical Company, which produces technical Mirex, refuses to sell this concentrated form of the chemical to Mississippi unless the state promises complete indemnification, thus protecting Hooker against financial losses from possible lawsuits.

National Parks Declining?

National park facilities and services are deteriorating because of inadequate funding and lack of employees,

according to a report released recently by the House Committee on Government Operations. The report, entitled "The Degradation of Our National Parks," outlines the findings and recommendations which are the result of an extensive investigation conducted by the Conservation, Energy, and Natural Resources Subcommittee.

The report charges that "The Park Service's resources are now, and have for the last several years been, inadequate to carry out the tasks which the NPS is mandated to perform. The guardian of our National Parks has, despite its best efforts, seen its resources deteriorate . . . park buildings, roads, bridges, trails, historic sites, and archaeological relics are not being maintained according to the Park Service's own standards."

Subcommittee Chairman Leo J. Ryan (Cal.) stated that "This report well documents the sad state of conditions presently existing in our national parks. It's about time the Interior Department, the OMB, and the Congress respond to the obvious need for additional resources of one of our most dedicated and responsible federal agencies — the National Park Service."

California Falcon Program Successful

For the first time in California, young prairie falcons bred in captivity have been introduced successfully into the wild. The breakthrough occurred last year when Gary Beeman, a falconer operating under a permit from the state, produced 10 young prairie falcons. This year 12 young were raised and two were placed in a nest of wild prairie falcons in northern California. They were adopted and fed by their foster parents and are now foraging for themselves.

Beeman noted that even under the best of conditions a pair of prairie falcons in the wild would require a minimum of eight years to produce 22 young, the number he brought off in two years. Techniques used in Beeman's captive raptor breeding program will be used to supplement wild



Diorama of Illinois woodland, Hall 29

populations of the endangered peregrine falcon in California. □

Certified Wildflower Varieties to Become Available

Certified varieties of native wildflowers are being released after ten years of cooperative tests by the U.S. Soil Conservation Service (SCS), the Kansas and Nebraska state agricultural experiment stations, and the Nebraska Department of Roads.

The plants, according to SCS, control erosion, are beautiful, and provide wildlife food and cover. The newly domesticated wildflowers include purple prairie clover, pitcher sage, and thickspike gayfeather. Authorities expect the plants to be used initially to beautify and stabilize road rights-of-way.

SCS' Plant Materials Center at Manhattan, Kansas, will produce and

distribute foundation seed to selected seed growers this fall. Assuming a good growing season, there should be limited quantities available by the fall of 1978.

Pollution Control-Environmental Conference

A "how-to" session on putting profits on the black instead of the red side of the ledger when dealing with pollution cleanup is to be held in Chicago at a high-level industry and government conference January 17 and 18. The meeting place is the Hyatt Regency O'Hare.

The conference, titled "Beyond Environmental Regulations: Industry Takes the Initiatives," is cosponsored by the midwest EPA office, the U.S. Department of Commerce, state chambers of commerce and manufacturers' associations in Illinois, Indi-

ana, Michigan, Wisconsin, Ohio, and Minnesota. Corporations cosponsoring the conference include Commonwealth Edison, Eli Lilly, Dow Chemical, Hydrosience, Republic Steel, 3M, and St. Regis Paper Company.

The first day of the conference will zero in on achievements by corporations who have made process changes that save money, conserve resources, and reduced pollution. The day's agenda will be geared towards corporate decision makers. The second day will cover specific technical approaches of midwest companies in process changes and will be aimed at environmental managers.

Bald Eagles and Ospreys Recovering in Lake States

Bald eagles and ospreys are doing well on national forests in the Lake states, according to the Wildlife Management Institute. A 1976 survey by the U.S. Forest Service shows that eagle numbers "are holding up well and may even be increasing." The osprey had its best reproductive season since at least 1962. Biologists located 249 osprey nests this year compared to 238 in 1975. At least 120 young were fledged, the highest number ever recorded for the area.

This year researchers located 414 bald eagle nests. That is 16 more than last year. Those nests produced a minimum of 187 young, a few more than were noted in 1975. All things considered, biologists are encouraged by the continued improvement in eagle and osprey populations in the region.

'Wolves' Frighten Northern Minnesota Residents

The following report, taken from the November 11 Tower News, published in the northern Minnesota village of Tower, recounts the frightening experiences of local residents, presumably with wolves:

"The menacing presence of wolves in the vicinity of communities and farms has now become a reality in Tower-Soudan. While many people previously had regarded stories of wolf kills with indifference and had

questioned the credibility of the accounts, an incident during the past week has changed the opinions of many local residents.

"At dusk last Thursday, as John Pahula was returning to his home in Soudan, after having spent the day at his cabin on Armstrong Bay of Lake Vermilion, he sighted two wolves approaching him just off the right-hand side of the trail. Almost simultaneously, he caught a glimpse of another wolf on a hill to his left.

"John was accompanied by his constant companion, his little Pedro. While Pedro wasn't a tiny dog, he was described as just a little smaller than a medium size dog. Ordinarily, Pedro was inclined to rush to his master for protection and guidance in unusual circumstances, but on this occasion he apparently felt that he had to protect the life of his master. He rushed off in pursuit of the two wolves while the third wolf sped down the hill, across the trail and off into the woods after the dog. Mr. Pahula heard one loud yelp, followed by an ominous silence. He called in vain for his dog, and then hurried back to [the nearby home of a friend] relate the story and enlist his assistance.

"Darkness prevented a search of the nearby woods that evening, but Mr. Pahula [and his friend] went out Friday morning to look for Pedro, although both men felt that they already knew it was hopeless. They soon found the spot where little Pedro had been attacked and killed. They tracked the trail where the wolves had dragged their prey, and they ended their search on a heart-breaking scene, a tiny hank of hair, three small bones and Pedro's collar.

"While Mr. Pahula will never really know, he feels that Pedro's pursuit of the wolves was a valiant effort to protect his master, and believes that Pedro sacrificed his life for him.

"A number of people in the area have reported having seen wolves in the vicinity of Soudan and along the highway, although none of them have had the tragic experience of Mr. Pahula. Those who have sighted the animals feel that citizens should be warned of the dangers involved in

walking in the woods or working in the woods without some means of protection. However, residents are reminded that it is illegal to kill a wolf, since they are protected.

"Mr. and Mrs. John Spollar had what Mrs. Spollar described as 'a most terrifying experience' in September, when they encountered a pack of at least five wolves during one of their daily walks on the Six-Mile Lake Road. As they rounded a curve in the road, Mrs. Spollar spotted some animals on top of an adjacent hill. Before realizing that they were wolves, she thought crossed her mind that it was an odd place for a herd of cattle. One of the animals raised its head, and she noted the similarity between the animal and a German Shepherd dog which the couple used to have. In that split second, she realized that she was facing wolves.

"She shouted, 'Wolf,' to her husband, whose vision of the scene was blocked by the brush around the curve. He picked up a rock and threw it at the creatures, who were all standing with their heads raised. The couple had no means of protection, not even a pocket knife or matches, and they fled. 'We ran as fast as we could,' related Mrs. Spollar. 'My heart was pounding so, I thought I'd have a heart attack. When I saw the look of fear on John's face, I was even more terrified, if that were possible.'

"The fact that the animals stood their ground and seemed to have no fear of the two humans caused them further consternation. Mrs. Spollar began shouting as she ran, in an effort to frighten the animals. When asked if the wolves chased them or followed them, she replied that they never did look back, and never did ascertain if there were more than five wolves or if the animals had chased them at all.

"Traveling to Ely several weeks later, the couple spotted a lone wolf along the highway, and they and the occupants of a truck stopped to watch the animal, which showed no signs of fear.

"The Spollars still enjoy their daily walks, but they are now confining their travels to more heavily traveled roads."

Elephants and the Art of Taxidermy

A brief span of time—perhaps fifteen years at most—separate the Dumbolike representation of Indian elephants below and the stunning lifelike African elephants at the right. The Indian elephants and the mammoth, lower right, were on view in the 1890s at Field Museum's first quarters—the building which had served as the Palace of Fine Arts, in Jackson Park, during the World's Columbian Exposition. (At its founding in 1893 the museum was named "The Columbian Museum of Chicago"; the following year the name was changed to "Field Columbian Museum." Shortly before the death of founder Marshall Field in 1906, the name was again changed to "Field Museum of Natural History.")

The pair of African elephants at right were acquired by then chief taxidermist Carl Akeley during a 14-month expedition to Africa in 1905-06. They may still be seen, of course, in Stanley Field Hall, every bit as impressive and lifelike as when mounted 70 years ago. (The foreground in this photo has been added by a retouch artist.) The Indian elephants and the mammoth were disposed of before the museum moved to its present building in Grant park in 1921.



The Eyes Have It

The Remarkable Vision of Birds



By Eugene R. Slatick

Most of us know from experience that birds have sharp eyesight. Perhaps we found this out trying to sneak up on a crow, only to have it fly away before we got close. Maybe we realized it when we watched a barn swallow catch insects on the wing, or a hawk swoop down on a field mouse, or a ruffed grouse fly unerringly through thick woods. Such things tell us that there is little that escapes a bird's eye. Birds need to see well if they are to survive.

The eyes of a bird are very large compared to the size of its body. We may not realize this because the lid-opening of the bird's eye is often small. The eyes of some hawks and owls are about the same size as our eyes. In fact, the eyes of birds take up so much that they leave little room for eye muscles. A bird can move its eyes only a little, at best. An owl can't move its eyes at all because they fit so snugly. But the lack of eye movement doesn't create any problems. Most birds have eyes on the side of their heads which take in a wide view at a glance. Even those birds with eyes in the front of their heads, like hawks and owls, can still get a wide view by turning their heads on flexible necks. Sometimes an owl seems to twist its head completely around, but it cannot quite accomplish this. The owl turns its head almost 270° in one direction, and then quickly flicks it around to the other side to continue surveillance.

Like our eye, a bird's eye has a lens that can be focused, an iris that controls the amount of light that enters, and a retina that records scenes and transmits them to the brain. But the bird's eye has several features that make it something special — they illustrate how nature perfects a basic design to improve an animal's change of survival.

For example, when seen in cross section, the shape of the eye of most birds is a little flatter than our eye. That type of eye gives a wide view. Birds that need very keen vision, like hawks, have an eye in which the lens area protrudes. This gives a narrower field but a larger image of distant objects, and the bird can see more details — just like a telephoto lens on a camera reveals distant scenes more clearly. The huge, bulging eye of an owl is still another variation. It is designed to collect a lot of light, like a "fast" photographic lens.

But eye shape isn't all that makes a bird's vision

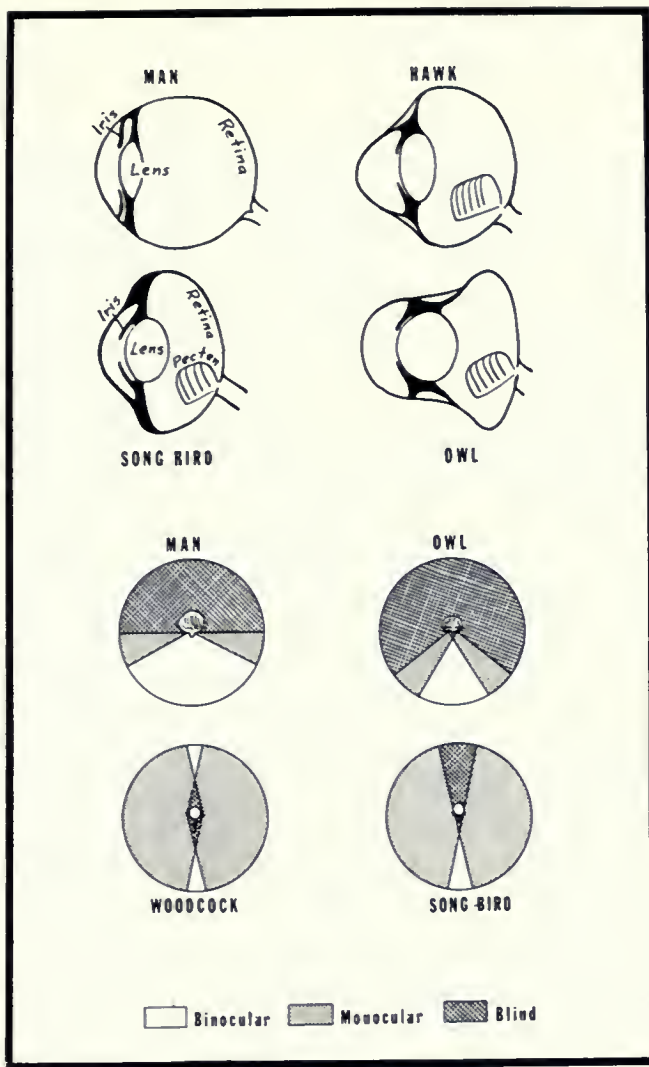
special. The retina of a bird's eye has many more light-sensitive cells than a human's retina. These very tiny cells are the rods and cones. The rods are sensitive to very dim light but not to color, while the cones respond to brighter light and give sharp detail and color vision. The avian eye may be equipped with a million cones per square millimeter — 7 times more than our eyes contain. No wonder a falcon is said to be able to spot a pigeon at 3,500 feet when the lighting is right. Sparrow hawks are said to have vision 8 times sharper than ours. The vision of the *buteo* hawks may not be quite as good as this, but their eyes are still about 5 times sharper than ours.

Many of the cones in a bird's eye contain tiny drops of colored oil that help sharpen the image, just like photographic filters help improve some pictures. The drops are generally yellow, but some may be red, orange, and green. In nocturnal birds they are pale yellow or colorless. The yellow drops help offset haze. Red drops probably give contrast to certain objects and improve vision when looking into water. About 20 percent of the droplets in songbirds, ducks, and herons are red, whereas the total is less in hawks and swallows. The kingfisher reportedly has the most — up to 60 percent.

Birds that are active during the day have more cones than rods in their eyes. This gives them sharp, colored vision during the day, but comparatively poor sight quality in dim light or at night. Birds of the night, like owls, have more rods than cones, enabling them to see very well at night; during the day, however, they don't see in great detail and probably not in much color. The difference in quality might be comparable to that of a sharp color photograph that is reproduced in black and white in a newspaper. The newspaper print gives a clear enough picture, but it lacks the fine detail of the photograph. We can see surprisingly well on a moonlit night, but imagine how well an owl must see at night — its night vision is 50 times better than ours.

Almost all birds have at least one place on the retina that gives the sharpest vision. Such a place, called the fovea, is surrounded by a region named the central area, which gives a picture almost as sharp. Many birds that hunt or feed on the wing, like hawks and swallows, need to judge distances accurately, so they have two foveae. One generally sees straight ahead while the other scans below. Many birds of the open fields and shores — hawks, ducks, shorebirds — have a central area that extends horizontally across the eye. It enables those birds to see the horizon and landscape in good detail without constantly turning the head.

By permission of the Pennsylvania Game News © 1974 by the Pennsylvania Game Commission



Sometimes we see a bird cock its head in an unusual position and think it is listening for something. A robin does this while hunting worms. But the bird isn't listening for the worms; it is looking for them, shifting its head so it can examine the ground with the sharpest part of its eye.

A bird's eye has a puzzling feature called the pecten, a folded, tissue-like membrane of blood vessels that protrudes into the eye. It is large in predatory birds and smaller in other birds. The pecten probably is a device that assures the eye of sufficient nutrients and oxygen, although scientists have suggested many other purposes.

Birds have been called "glorified reptiles," because they can be traced back millions of years to reptilian ancestors. One of the clues to this lineage is the pecten, also possessed by reptiles. Another is the sclerotic ring, a ring of a dozen or more bony plates surrounding the cornea, present in both birds and reptiles. It helps the bird's eye keep its shape when the eye muscles adjust the lens for various distances. The sclerotic ring ranges from a simple circle in songbirds to a large prominent structure in owls.

You might have noticed that birds blink differently than we do. Most of them blink with a third eyelid, or nictitating membrane, attached to the part of the eye near the bill. The other lids are usually used only when sleeping. The third lid, usually semi-transparent, cleans the eye and protects it against strong glare and wind. Some diving birds are thought to use the third lid when underwater.

In making the bird a sharp-eyed animal, nature didn't limit itself just to physically improving the eye. It also positioned the eye in the head to perform a function. Most birds have eyes on the side of the head that can see almost all the way around. The eyes of such birds are generally flat—the shape that gives the widest field of view. This group of birds has a certain amount of binocular vision, which is the area that can be seen by both eyes. The familiar pigeon, for example, has a visual field of 340°, including a binocular field of 24°. Generally birds that catch insects while airborne have a binocular field larger than the field of birds that feed from the ground. Predatory birds have eyes facing forward so that both can be used to judge distances. Hawks have a binocular field of 35° to 50°, whereas in owls it is up to 70°. The total field of view of these birds is reduced consequently to about 250° for hawks and 110° for owls. Ornithologists are not certain if birds see in three dimensions, or stereoscopically, when they use binocular vision. A bird that does not have much binocular vision can judge the distance of an object by moving its head to get different views.

The bittern and woodcock have eyes in interesting positions. The eyes of the bittern are low on the side of the head, so that when it points its head upward to blend in with the reeds, the bittern can still see what is happening in front. The woodcock, on the other hand, has eyes set far back and high on the head, allowing it to see around while it probes the ground for food with its beak.

Although we know a lot about how a bird sees, we don't know just what it sees because its brain may receive the picture in a way different from ours. We can only imagine how a field mouse looks to a hawk high in the sky, or how an owl sees the landscape in the dark of night. It has been said that birds may not have sharper eyesight than we have but can assimilate what they see much faster and in more detail. One ornithologist made the analogy that a bird could tell whether a clock was operating simply by observing the movement of the hour hand, while we need to look at the minute hand.

A bird's eye also "sees" the time on the biological clock. It unconsciously records seasonal changes in the amount of light. The brain takes that and other stimuli into account, and directs the bird to migrate or mate.

Although our eyes are better than those of many animals, we find our match in the birds. As many outdoorsmen know, however, being "hawkeyed" or "eagle-eyed" is also a matter of training. Birds scrutinize the woods, fields and waters because it is a matter of survival for them. Perhaps with some practice we might learn to see a little more like a bird and maybe see new and interesting things in familiar scenes. □

What's the Weight, by the way, of a quarter-trillion locusts?

STRANGE YOU SHOULD ASK, because I just happened across that morsel of information while browsing through the *Guinness Book of World Records*: "about 500,000 tons," says Guinness. A swarm of this size, Guinness goes on, was observed flying over the Red Sea in 1889, and it covered an estimated 2,000 square miles—about the size of the state of Delaware. The weight of those insects would be equal to more than 1,200 fully loaded 747 jumbo jets.

And if locust swarms aren't your dish of tea, perhaps you'd be more impressed by the fact that the lowly ribbon worm (*Lineus longissimus*) has made it into the record books by virtue of its inordinate length. One specimen, washed ashore at St. Andrews, Fife, Scotland, in 1864 measured out to 180 feet, thus claiming the honored title "earth's longest worm." Even by Woolworth's standards that's a lot of ribbon.

The longest measurements for any type of animal were those of a giant jellyfish (*Cyanea arctica*) washed onto the Massachusetts coast in 1865. Its bell, or body, was 7½ feet in diameter and its tentacles measured 120 feet; thus, the total length with tentacles extended would have been about 245 feet.

And speaking of length, the world's longest snake was no slouch by any standards. That specimen was a 27½-foot anaconda (*Eunectes murinus*), captured in Colombia in 1944. The longest snake in captivity was "Colossus," a female reticulated python (*Python reticulatus*) which measured 28 feet six inches in 1956. At that time the snake, kept in the Highland Park Zoological Gardens, Pittsburgh, was growing about 10 inches each year. She died in 1963. The longest crocodile known was a 27-foot salt-water, or estuarine, crocodile (*Crocodylus porosus*) killed in the Philippines in 1823. Its weight was 4,400 lbs, some of which had been gained by dining on local villagers. The longest of living lizards was a Komodo monitor (*Varanus komodoensis*), which taped out at 10 feet 2 inches in 1937 when it was on display at the St. Louis Zoological Gardens. Its weight was 365 lbs.

The longest frog on record is a Goliath frog (*Rana goliath*) from west Africa, measuring 13.38 inches from snout to vent and 32.08 inches extended. It weighed 7 lbs., 4.5 oz. Perhaps the longest recorded frog leap—17 feet 4¾ inches—is that of "Wet Bet," a frog which performed this feat at the 1973 Calaveras County (California) Jumping Frog Jubilee.

Length records among fishes include 59 feet for a 90,000-lb. whale shark (*Rhiniodon typus*) caught in the Gulf of Siam in 1919, 37 feet for a great white shark (*Carcharodon carcharias*) captured off New Brunswick in 1930, 26 feet 3 inches for a Russian sturgeon (*Acipenser huso*), and 14 feet (between anal and dorsal fins) for an ocean sunfish (*Mola mola*)—the largest of the bony fishes—caught in Australian coastal waters in 1908; its weight was 4,928 lbs.

Among spiders, the giant is the bird-eating spider (*Theraphosa leblondi*) of South America. A 2-oz. male collected in French Guiana in 1925 had a 3½-inch body and a leg extension of 10 inches. A much larger, extinct relative was the 9-foot *Pterygotus buffaloensis*, a sea scorpion that lived some 400,000,000 years ago.

A claw span of 12 feet 1½ inches makes a 14-lb. specimen of the giant spider crab (*Macrocheira kaempferi*) the largest crab known; there are unconfirmed reports of 19-footers. The species occurs in deep waters off the coast of Japan. The heaviest of the true crab species is *Pseudocarcinus gigas* from the Bass Straits, off Australia; 30-lb. specimens are known. Lobsters—close cousins of the crab—are still heavier; the greatest authenticated weight is 42 lbs. 7 oz. for a North Atlantic lobster, *Homarus americanus*, caught off Virginia in 1934.

The longest insect known is the tropical stick insect (*Pharnacia serratipes*), which measures about 13 inches. The birdwing butterfly (*Ornithoptera victoriae*) of the Solomon Islands is also known to exceed 12 inches in wingspread. The heaviest insect is equatorial Africa's Goliath beetle (*Goliathus goliathus*), which has tipped the scales at 3.52 ounces. Among centipedes the longest species measured—*Scolopendra morsitans*—grows up to 13 inches long and comes from the Andaman Islands in the Bay of Bengal. The longest millipede species are *Graphidostreptus gigas* (Africa) and *Scaphistostrepus seychellarum* (Seychelle Islands), both measuring more than 11 inches long.

Size records among mollusks include 43 inches by 29 inches for a 579½-lb. clam (*Tridacna derasa*) found in 1917 on the Great Barrier Reef; 55 feet for an Atlantic giant squid (*Architeuthis sp.*) washed ashore on Newfoundland in 1878 and estimated to weigh 4,480 lbs.; and 25 feet 7 inches—radial spread—for a 118-lb. 10-oz. octopus (*Octopus apollyon*) caught in Puget Sound in 1973.



This remarkable fish, fantasized by Dutch artist Hieronymus Bosch, would have garnered all sorts of records.

The largest accurately measured vertebrate animal was a female sulfur-bottomed, or blue, whale (*Balaenoptera musculus*), caught in the South Atlantic in 1912. It measured 110 feet, 2½ inches. Another female of the species, caught in the same area in 1931, was calculated to weigh 183.34 tons, exclusive of blood, and its live weight estimated at about 195 tons.

The largest eye of any living animal is that of the giant squid (*Architeuthis sp.*), exceeding 15 inches in diameter.

The largest land animal is the African elephant (*Loxodonta africana africana*). The largest known specimen, shot in Angola in 1955, weighed about 24,000 lbs. Its standing height was about 12 feet, 6 inches. (The mounted carcass is now on view at the Smithsonian Institution.)

For those whose special pleasure is diminutives, what could be more gratifying than to know that the smallest land mammal is Savi's white-toothed pygmy shrew (*Suncus etruscus*), full-grown specimens weighing between 0.062 and 0.09 oz. Mature ▶

individuals measure 1.32 to 2.04 inches, plus a tail length of 0.94-1.14 inches.

The fastest land animal, as any speed buff can tell you, is the cheetah (*Acinonyx jubatus*). Zoologists estimate the cat's maximum speed at 60-63 m.p.h. Under controlled conditions on an oval track, a cheetah was clocked at 43.4 m.p.h. average speed for 1,035 yards, but the animal was not running at its top speed. The pronghorn antelope (*Antilocapra americana*), nearly as fast as the cheetah, has been clocked at 61 m.p.h. over a 200-year distance.

The longest-lived land mammal, exclusive of man, is probably the Asiatic elephant (*Elephas maximus*). The oldest known specimen is Modoc, a female who, at 78, was still alive and well at last report.

The largest known herds of any animal species are those of the South African springbok (*Antidorcas marsupialis*). A herd viewed in 1888 in Cape Province, South Africa, was estimated to contain 100,000,000 individuals.

The longest known gestation period among mammals is that of the Asiatic elephant (*Elephas maximus*), with a minimum period of 609 days and a maximum of 760 days.

The shortest gestation period may be that of the American opossum (*Didelphis marsupialis*), which is normally 12 to 13 days, but sometimes as brief as 8 days.

Wing beats, too, have found their way into the record books. The fastest recorded wing beat of any bird is 90 beats per second—claimed by *Heliactin cornuta*, a tropical American hummingbird. Not to be outdone, a lowly midge (insect) of the genus *Forcipomyia* has moved its wings at the phenomenal rate of 1,406 beats per second! Butterflies, at the other end of the scale, manage to stay aloft with average wing beats for sustained flight as slow as 5 beats per second (*Papilio machaon*, a swallowtail).

But these achievements pale to mere exhibitionism when compared to utilitarian feats of the domestic cat and dog. In 1853, in Liverpool, England, a bull terrier by the name of "Jenny Lind" killed 500 rats in 90 minutes. A tabby cat by the name of "Minnie" is credited with 12,480 rat kills from 1927 to 1933 at the White City Stadium in London. Another Tabby, named "Mickey," killed more than 22,000 mice in Lancashire, England, over a 23-year period.



Specimens of the Goliath beetle, the heaviest known insect (3.52 oz.), are displayed by Rupert Wenzel, chairman of the Department of Zoology.

Note: Records cited above include only those considered authentic by Guinness. Their discussion here does not constitute validation or recognition by Field Museum.

Fieldiana: 1975 and 1976 Titles

Fieldiana is a continuing series of scientific papers and monographs in the disciplines of anthropology, botany, zoology, and geology; the series is directed primarily for exchange-distribution to museums, libraries, and universities, but all titles are also available for public purchase.

The following titles were published during 1975 and 1976 and may be ordered from the Division of Publications. Members are entitled to a 10 percent discount. Publication number should accompany order. A catalog of all available *Fieldiana* titles is available on request. (Please specify discipline: anthropology, botany, geology, or zoology.)

Fieldiana Anthropology

"Chapters in the Prehistory of Arizona," by Paul S. Martin, et al. Vol. 65, No. 2; publication 1201. \$9.75

"Mrs. Kadiato Kamara: An Expert Dyer in Sierra Leone," by Loretta Reinhardt. Vol. 66, No. 2; publication 1230. \$1.25

"Ethnological and Biogeographical Significance of Pottery Sherds from Nissan Island, Papua New Guinea," by Susan Kaplan. Vol. 66, No. 3; publication 1231. \$2.25

"The Bruce Collection of Eskimo Material Culture from Port Clarence, Alaska," by James W. VanStone. Vol. 67; publication 1244. Price to be announced.

Fieldiana Botany

"Flora of Guatemala Rubiaceae, Madder Family," by Paul C. Standley and Louis O. Williams. Vol. 24, Part XI, Nos. 1-3; publication 1202. \$8.75

"Austral Hepaticae III Stolonophora, A New Genus of Geocalyceae," by John Engel and R. M. Schuster. Vol. 36, No. 11; publication 1208. \$1.00

"Tropical American Plants, XVII," by Louis O. Williams. Vol. 36, No. 10; publication 1210. \$1.50

"Notes on *Calvatia* (Lycoperdaceae), 1," by Patricio Ponce De Leon. Vol. 38, No. 1; publication 1215. \$.75

"A Partial Revision of 'Paullinia' Sapindaceae for Ecuador, Peru, and Bolivia," Part I, by Donald R. Simpson. Vol. 36, No. 12; publication 1225. \$1.50

"New Species of 'Digitaria, Pennisetum, and Poa' (Graminae) from Costa Rica," by Richard W. Pohl. Vol. 38, No. 2; publication 1228. \$.75

"Flora of Guatemala—Vernonieae, Asteraceae, Inuleae, Heliantheae, Anthemideae, Cynareae, Mutiseae, Cichorieae, Eupatorieae, Helenieae, Senecioneae," by Dorothy L. Nash and Louis O. Williams. Vol. 24, Part XII; publication 1229. \$18.00

"Notes on 'Calvatia' (Lycoperdaceae), II 'Calvatia cretacea' (Berk.) Lloyd, An Arctic Montane Plant," by Patricio Ponce De Leon. Vol. 38, No. 3; publication 1233. \$.75

"Acutocapillitium, a New Genus in the Lycoperdaceae," by Patricio De Leon. Vol. 38, No. 4; publication 1237. \$.75

"Flora of Guatemala," by Dorothy L. Nash. Vol. 24, No. 4; publication 1238. \$5.25

Fieldiana Geology

"Pyritic Cone-In-Cone Concretions," by Bertram G. Woodland. Vol. 33, No. 7; publication 1200. \$1.25

"Caryocritinidae (Echinodermata: Rhombifera) of the Laurel Limestone of Southeastern Indiana," by T. J. Frest. Vol. 30, No. 4; publication 1203. \$1.50

"The Mammalian Fauna of Warsasi Rock Shelter, West-Central Iran," by Priscilla F. Turnbull. Vol. 33, No. 8; publication 1204. \$1.25

"Phylogeny of the Chelydrid Turtles: A Study of Shared Derived Characters in the Skull," by Eugene S. Gaffney. Vol. 33, No. 9; publication 1205. \$1.50

"Time Factors of Differentially Preserved Wood in Two Calcitic Concretions; in Pennsylvanian Black Shale from Indiana," by Bertram G. Woodland. Vol. 33, No. 10; publication 1206. \$1.25

"The Mammalian Fauna of Madura Cave Western Australia Part II," by William D. Turnbull and Ernest L. Lundelius, Jr. Vol. 31, No. 2; publication 1209. \$2.75

"Geochronology, Stratigraphy, and Typology," by John Andrew Wilson. Vol. 33, No. 11; publication 1211. \$1.00

"Phosphatic Microfossils from the Ordovician of the United States," by Matthew H. Nitecki, Raymond C. Gutschick, and John E. Repetski. Vol. 35, No. 1; publication 1214. \$1.00

"A New Species of Globidens from South Dakota, and a Review of Globidentine Mosasaurs," by Dale A. Russell. Vol. 33, No. 13; publication 1217. \$1.50

"Taphonomy of Eocene Fish from Fossil Basin, Wyoming," by Paul O. McGrew. Vol. 33, No. 14; publication 1218. \$1.00

"Permo-Carboniferous Fresh Water Burrows," by Everett C. Olson. Vol. 33, No. 15; publication 1219. \$1.25

"*Ptycholepis marshi* Newberry, A Chondrosteian Fish from the Newark Group of Eastern North America," by Bobb Schaeffer, David H. Dunkle, and Nicholas G. McDonald. Vol. 33, No. 12; publication 1220. \$1.50

"Ziphodont Crocodiles: *Prisichamsus vorax* (Troxell), New Combination from the Eocene of North America," by Wann Langston, Jr. Vol. 33, No. 16; publication 1222. \$1.50

"Silurian *Ischadites tenuis* n. sp. (Receptaculitids) from Indiana," by Matthew H. Nitecki and Charles C. Dapples. Vol. 35, No. 2; publication 1223. \$1.00

"Reconstruction and Interpretation of *Brittsia problematica* D. White (Fern, Pennsylvanian)," by Hermann W. Pfefferkorn. Vol. 33, No. 17; publication 1224. \$.75

"The Brain of 'Mesonyx,' a Middle Eocene Mesonychid Condylarth," by Leonard Radinsky. Vol. 33, No. 18; publication 1226. \$1.00

"Some Notes on Pennsylvanian Crustaceans in the Illinois Basin," by Frederick R. Schram. Vol. 35, No. 3; publication 1227. \$.75

"Functional Morphological Models: Evolutionary and Nonevolutionary," by Robert E. DeMar. Vol. 33, No. 19; publication 1234. \$1.00

"Paracanthopterygian and Acanthopterygian Fishes from the Upper Cretaceous of Kansas," by David Bardack. Vol. 33, No. 20; publication 1235. \$1.00

"Ordovician Batophoreae (Dasycladales) from Michigan," by Matthew H. Nitecki. Vol. 35, No. 4; publication 1236. \$1.00

"Type Fossil Mollusca (Hyolitha, Polyplacophora, Scaphopoda, Monoplacophora, and Gastropoda) in Field Museum," by G. G. Forney and Matthew H. Nitecki. Vol. 36; publication 1239. \$9.50

"Upper Devonian Receptaculites *Charidini n. sp.* from Central Afghanistan," by Matthew H. Nitecki and Albert F. de Laparent. Vol. 35, No. 5; publication 1242. \$2.00

Fieldiana Zoology

"Philippine Zoological Expedition, 1946-1947, Millipeds of the Genus *Polydesmorrhachis* Pocock (Polydesmida: Platyrrhachidae)," by Richard L. Hoffman. Vol. 65, No. 6; publication 1207.

"An Additional New *Stenus* from Australia (Coleoptera, Staphylinidae) 100th Contribution to the Knowledge of *Steninae*," by Volker Puthz. Vol. 65, No. 7; publication 1212. \$.75

"Notes on Rodents of the Genus *Gerbillus* (Mammalia: Muridae: Gerbillinae) from Morocco," by Douglas M. Lay. Vol. 65, No. 8; publication 1213. \$1.00

"Taxonomy and Evolution of Liontail and Macaques (Primates: Cercopithecidae)," by Jack Fooden. Vol. 67; publication 1216

"An Evaluation of Seth E. Meek's Contributions to Mexican Ichthyology," by Robert Rush Miller. Vol. 69, No. 1; publication 1232. \$1.50

"Review of the Pselaphid Beetles of the West Indies (Coleoptera: Pselaphidae)," by Orlando Park, John A. Wagner, and Milton W. Sanderson. Vol. 68; publication 1240. \$4.25

"*Rhinodoras boehlkei*, A New Catfish from Eastern Ecuador (Osteichthyes, Siluroidei, Doradidae)," by Garrett S. Glodek, Glenn L. Whitmire, and Gustavo Orces V. Vol. 70, No. 1; publication 1241

"Supplementary Catalogue of Type Specimens of Reptiles and Amphibians in Field Museum of Natural History," by Hymen Marx. Vol. 69, No. 2; publication 1243. Price to be announced.

In addition to its continuing Fieldiana series, Field Museum Press also published in 1976 the monograph *Endodontoid Land Snails from Pacific Islands* (Mollusca: Pulmonata: Sigmurethra), Part I, Family Endo-

dontidae, by Alan Solem; 508 pp., \$31.50. This work may also be ordered from the Division of Publications.

Field Museum has also reissued the popular *Mummies*, by Richard A.

Martin, in conjunction with the "Treasures of Tutankhamun" exhibit opening April 15. First published in 1945, the 48-page booklet has now been revised and updated by David P. Silverman, project Egyptologist for the forthcoming exhibit. Lavishly illustrated with new bibliography. Price to be announced.

Books

Birds of Nepal with Reference to Kashmir and Sikkim, by Robert L. Fleming Sr., Robert L. Fleming Jr. and Lain Singh Bangdel; published by Robert L. Fleming Sr. and Jr., Box 229, Kathmandu, Nepal; 349 pp., 150 color plates. \$15.50 at Field Museum Shop; 10% discount for members.

It was with real delight that I received my long-awaited copy of *Birds of Nepal*. Bob Fleming Sr. has been a field associate and friend of Field Museum for more than 40 years, and a resident for more than 20 years of Nepal, where he served as representative of the Board of World Missions of the Methodist Church. Fleming has sent the Museum hundreds of bird and mammal specimens, including new records for the country. This field guide to the birds of Nepal is a fitting culmination to Fleming's lifetime of collecting and observing the avifauna of the Himalayas. For the last 10 years, Bob Jr. has worked with him, adding many new species to the known avifauna. The new book is a field guide that will serve all the western Himalayas as well as Nepal.

In the introduction are descriptions of the different life zones of Nepal, which, in such a mountainous country, must be defined by altitude, and a guide to birdwatching in Nepal. Then follows the heart of the book—portraits in color of each species, with explanatory text on the facing page. The latter condenses a surprising amount of information into a short paragraph: altitudinal range, length, seasonal status, abundance, habitat, field marks, voice, status in Kathmandu Valley where most birdwatching will be done, and range in the

Himalayas. Finally, there are two appendices listing those birds found in Kashmir and Sikkim, but not in Nepal. On the endpapers are maps of Nepal as a whole and of the Kathmandu Valley.

The colored plates—the key to a successful field guide—are beautiful. Two Nepalese artists have done a fine job of rendering the birds lifelike, and the color reproduction is excellent. By having the text on the facing page, the maximum number of figures on a given plate is seven or eight, and there is none of the crowding that so often characterizes field guides. *Birds of Nepal* should be as useful in the field as it is attractive in the hand.

The sequence of families followed in this book will be unfamiliar to those raised on Peterson's guides, but this is of little consequence, for many of the families will be equally unfamiliar. Just the names of the pittas, minivets, barbets, scimitar-bills, honey-guides, tragopans and griffons should excite any bird-watcher to head for his nearest travel agent. Publication of this guide should do much to stimulate interest in the birds of the Himalayas, an area that heretofore has only been covered in multi-volume works.

Not least important is the fact that with faith and determination, the Flemings were their own publishers, and not only wrote their book but supervised every aspect of its production in Bombay. This was no trifling task, for the distance from Kathmandu to Bombay is roughly that from Chicago to Denver. Now their labors have been rewarded, and we are the beneficiaries.—Melvin Traylor, curator of birds

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A Major Operation

(The following article first appeared in the May, 1932, Field Museum News (former name of the Bulletin), and was written by Berthold Laufer, then curator of the Department of Anthropology. The stone turtle may still be seen in Hall 24.)

In this time of reductions, when the weight of ladies, income, wages, and almost everything except taxes is reduced, the following story may merit rescue from oblivion.

Although the incident is posted on a label explaining an exhibit at the north end of the East Gallery (George T. and Frances Gaylord Smith Hall), many visitors to the Museum may have missed their chance to read a curious story. The exhibition case in question contains a single large monument—a huge turtle sculptured from stone as the support of a tablet inscribed in Chinese. This turtle has been in existence for exactly 1,190 years.

In 1908 when traveling in China and Tibet on behalf of Field Museum, I spent several months at Si-an-fu, the center of the ancient Chinese civilization. One day this turtle was carried into my courtyard by four men of herculean physique. It is carved from a solid block of stone, and it then weighed about 1,200 pounds. Immediately the thought of the cost of its transportation to Chicago loomed in my mind and was a source of great concern to me.

Five hundred large boxes filled with numerous antiques had already accumulated as the result of my treasure hunts, and

were awaiting transportation on mule carts to Honan-fu, the nearest railroad center (present seat of the Chinese government).

It was a journey of from eight to ten days (depending on weather and road conditions) to reach that point. The normal freight rate at that time was \$8 per cart, but unscrupulous speculators took advantage of my situation and drove the price up to \$18, intimidating the muleteers, who were kept away from me. It took two weeks of negotiations to break this conspiracy, and little assistance was received from the local government, which was powerless against these rackets.

The turtle therefore had to be reduced in weight to save expenses, not only in transportation on the mule carts, but also in railroad freight from Honan to Hankow, in steamer freight on the Yangtse from Hankow to Shanghai, and finally on the ocean steamer from Shanghai to Seattle. I hired two stonecutters who for three weeks operated on the turtle, pounding on its belly, boring into its interior and hollowing its entrails out, removing masses of superfluous stone to the extent of 460 pounds. This reducing process resulted in a savings of several hundred dollars in the cost of transporting it to Chicago.

Although now reduced to 740 pounds, the good turtle has not changed its appearance or equanimity. It still is as complete, robust, and steadfast as before. According to Chinese belief, the turtle is an emblem of longevity, strength, and endurance, and is reputed to reach an age up to three thousand years.

Stone turtle, on view in Hall 24.



January at Field Museum

JUST OPENED

The Place for Wonder. Visit the newly opened *The Place for Wonder* gallery. Open to visitors of all ages, this room provides a "hands-on" approach to numerous natural history specimens and artifacts. The gallery is staffed by museum volunteers and is open to the public: weekdays, 1 p.m. to 3 p.m.; weekends, 10 a.m. to 3 p.m. Ground floor.

NEW PROGRAM

Japanese Noh Drama Performance. Thursday, January 27, high school and college-age persons are invited to a demonstration/performance of the ancient Japanese noh drama, *Sotoba Komachi*—a tale of demons. This multi-media demonstration is performed at 10 a.m. and repeated at 11 a.m. and 1:15 p.m. in Simpson Theatre, ground floor. Reservations are necessary for admittance. Write Group Programs, Field Museum.

SPECIAL EXHIBITS

I Wear the Morning Star. Exhibit of garments and objects designed by Western Plains Indians for the Ghost Dance, a pacifistic religious movement borne of one man's impressive visions and adapted by 30 tribes in the late 19th century. Hall 9. Through Feb. 6.

Male and Female: Anthropology Game. This exhibit of 38 artifacts is a great way to learn that economic and social roles of the sexes are not universally the same. South Lounge, 2nd floor. No closing date.

Man in His Environment takes a global view of some of the most serious environmental problems confronting all mankind and asks visitors to involve themselves in these problems—and the need for solution. Hall 18. No closing date.

Pliny's Natural History: The First Encyclopedia. Two rare editions (1513 and 1530) of Pliny the Elder's work—viewed today as an astonishing mixture of fact and fiction—are on view in the South Lounge, 2nd floor. No closing date.

Pterosaur. A stylized model of the largest known flying creature—an extinct pterosaur—dramatizes a special exhibit of pterosaur fossils; Northwest Arcade, 2nd floor. No closing date.

CONTINUING PROGRAMS

Saturday Discovery Programs. Saturdays, 11 a.m. to 3 p.m.; take tours, follow demonstrations, participate in museum-related activities.

Winter Journey for Children: "All that Glitters." Throughout the ages, gold and silver have made poor men rich, built their empires, and filled everyone's teeth. A free, self-guided tour explores these elements and their properties. All children who can read and write are invited to participate; families will enjoy it too. Journey sheets available at information booth.

The Ancient Art of Weaving. Resumes Jan. 17. Members of the North Shore Weavers' Guild demonstrate weaving and spinning every Monday, Wednesday, and Friday, 10 a.m. to 12 p.m. South Lounge, 2nd floor.

SPECIAL-INTEREST MEETINGS OPEN TO THE PUBLIC

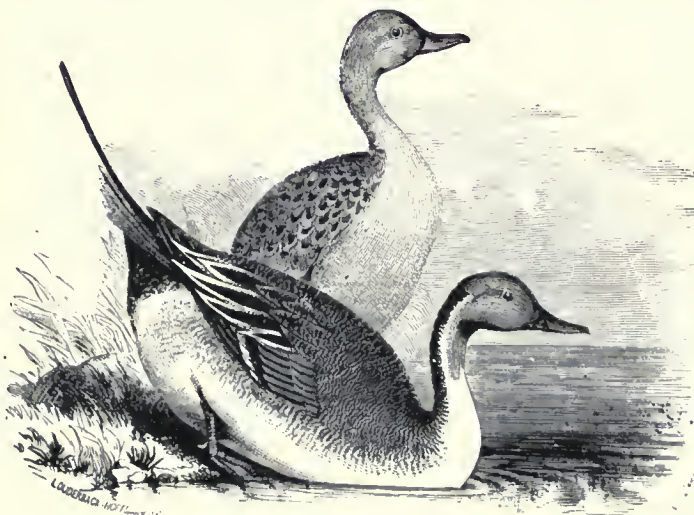
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|--------------------|---|
| Jan. 4, 7:30 p.m. | Kennicott Club |
| Jan. 7, 8:00 p.m. | Chicago Anthropological Society |
| Jan. 11, 7:30 p.m. | Chicago Nature Camera Club |
| Jan. 11, 8:00 p.m. | Chicagoland Glider Council |
| Jan. 12, 7:00 p.m. | Chicago Ornithological Society |
| Jan. 12, 7:30 p.m. | Windy City Grotto, National Speleological Society |
| Jan. 13, 8:00 p.m. | Chicago Mountaineering Club |
| Jan. 18, 7:30 p.m. | Chicago Audubon Society |

JANUARY HOURS

The Museum Opens daily at 9 a.m., closes at 4 p.m. weekdays and 5 p.m. weekends. On Friday s, year-round, the museum is open to 9 p.m. Food service areas are open weekdays 11 a.m. to 3 p.m., weekends to 4 p.m.

The Museum Library is open 9 a.m. to 4 p.m. Monday through Friday (closed Jan. 3). Obtain pass at reception desk, main floor north.

Museum Telephone: 922-9410





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