FIELD MUSEUM OF NATURAL HISTORY BULLETIN

January/February 1990

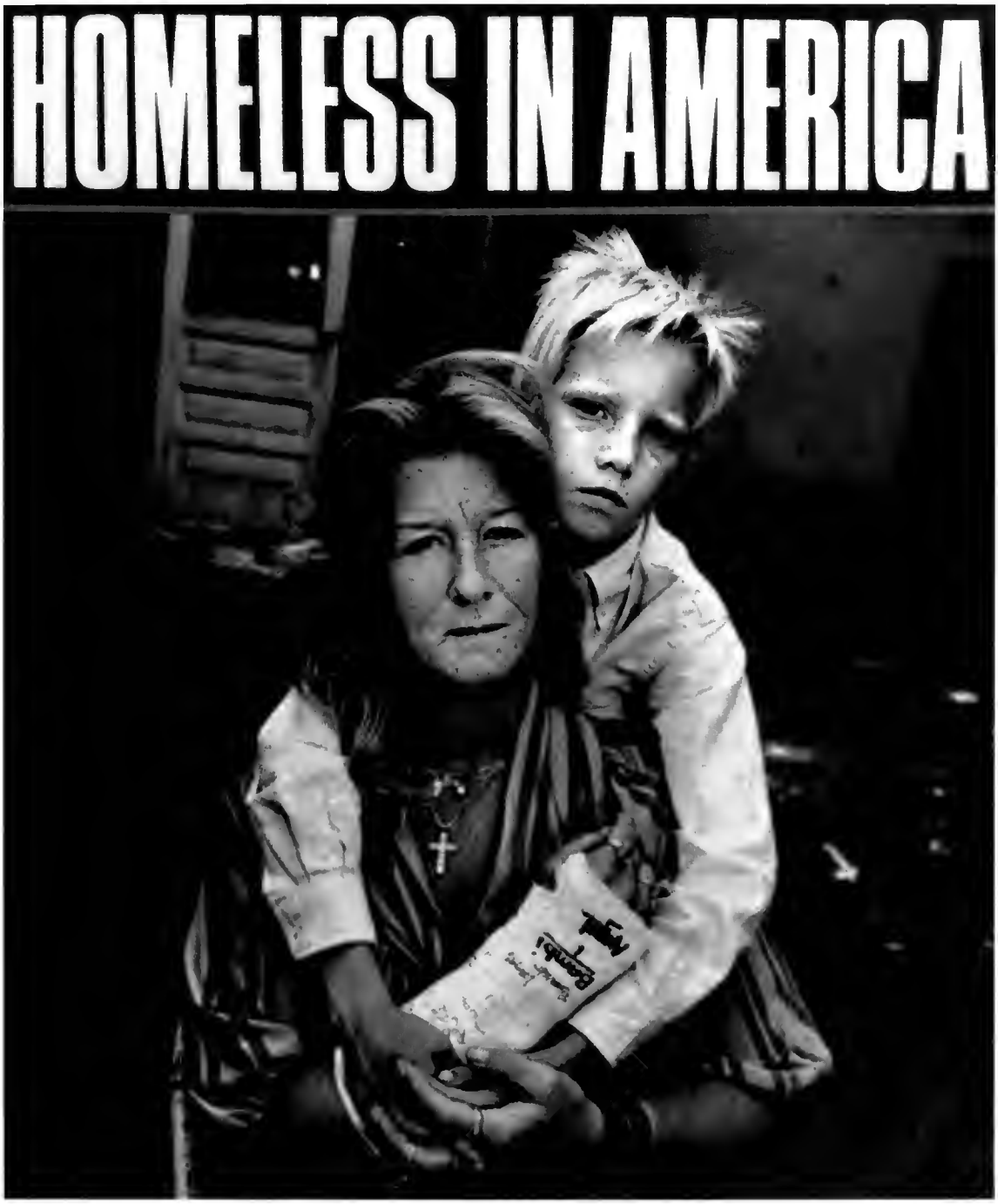

Photo Exhibit Continues through February 18

Field Museum of Natural History Bulletin

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Volume 61, Number 1

COVER

Cathleen Hamm and Son Michael, by Mary Ellen Mark. The young boy Michael flings his arms around his mother, mindful of the plaster cast encasing her right wrist. The pair force grim smiles but their eyes tell a different story as they are photographed in front of the Bible Tabernacle Mission in Venice, California. A sparkling metal cross hangs prominently from Cathleen's neck. *Cathleen Hamm and Son Michael* is among more than 60 photos in the exhibit "Homeless in America: A Photographic Project," continuing through February 18.

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EVENTS

World Music Programs

Weekends, 1:00 and 3:00pm

January

☐ *Jan. 6, 7*

1:00pm—Musa Mosley demonstrates African drumming

3:00pm—Shanta delights with African stories and song

☐ *Jan. 13, 14*

1:00pm—Raices del Ande performs Bolivian and Latin American folkloric music

3:00pm—Keith Eric performs Jamaican music and tells stories

☐ *Jan. 20, 21*

1:00pm—Thunder Sky Drummers perform using African percussion instruments

3:00pm—Amira Davis demonstrates African shakere

☐ *Jan. 27, 28*

1:00pm—Douglas Ewart plays Japanese bamboo flute

3:00pm—Ari Brown performs a seasoned saxophone

February

☐ *Feb. 3, 4*

1:00pm—Thunder Sky Drummers perform using African percussion instruments

3:00pm—Amira Davis demonstrates African shakere

☐ *Feb. 10, 11*

1:00pm—Musa Mosley demonstrates African drumming

3:00pm—Keith Eric performs Jamaican music and tells stories

☐ *Feb. 17, 18*

1:00pm—Shanta delights with African stories and song

3:00pm—Ari Brown performs a seasoned saxophone

☐ *Feb. 24, 25*

1:00pm—Douglas Ewart plays Japanese bamboo flute

3:00pm—Chinese Music Society of North America demonstrates instruments from the Chinese orchestra

These programs are free with Museum admission and tickets are not required. The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a CityArts grant from the Chicago Office of Fine Arts, Department of Cultural Affairs, and the Illinois Arts Council, a state agency.

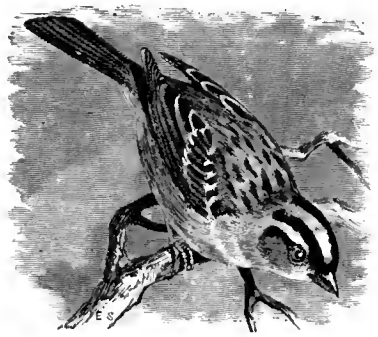
Adult & Family Programs

Children and their families are invited to explore the exciting world of natural history on weekends in January and February.

Beginning Saturday, January 20, children's workshops provide children ages 4 and K through 8th grade opportunities to discover the mighty dinosaur, to celebrate Chinese New Year, to unravel some secrets from the world of archeology, and much more!

Beginning Saturday, February 24, adults may join children in their exploration of the world around them in adult-child workshops. These activities provide an exciting, participatory experience for one child accompanied by one adult. Adult-child workshops are designed for children ages 2, 3, 4, and K through 8th grade.

Advance registration is required for both children's workshops and adult-child workshops. See the Children and Family program brochure for a complete schedule and registration forms. Workshops fill quickly; early registration is recommended. For further information, call the Department of Education, Monday through Friday, 9:00 am-4:00pm at (312) 322-8854.



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FIELD BRIEFS

Curator Hymen Marx Honored As Participant in Swedish Symposium

The significant contributions of Curator Hymen Marx to the literature on Palearctic reptiles were recognized recently by the Swedish Academy of Sciences and the Swedish Museum of Natural History. This recognition took the form of his invitation to participate in a September 5-11, 1989 symposium in Stockholm on "Museum Research in Vertebrate Zoology." Symposium participants also included 3 other American scientists, 30 from the Soviet Union, and 9 from Western Europe and Canada, in addition to Swedes. All were chosen to attend on the basis of distinguished achievement in their respective disciplines. The primary purpose of the symposium was to promote contact and cooperation between Western and Soviet specialists in vertebrate morphology, speciation, ecology, and biochemistry.

Marx co-chaired the symposium's opening sessions with Dr. Ilya S. Darevsky, of the Soviet Academy of Sciences in Leningrad who, like Marx, is a world-recognized authority on the snakes of Europe and Asia.

Highlighting the six-day affair, which was held as part of the Swedish Museum of Natural History's 250th anniversary celebration, was a banquet in the Stockholm City Hall, with King Carl XVI Gustaf and Queen Silvia in attendance. Marx was especially honored by being placed, as representative of the United States, at the royal table, together with Mrs. Marx.

Marx joined the Field Museum's scientific staff in 1949 and has been a full curator since 1973.

Hy Marx examining type specimens of reptiles described in the 18th century by the renowned naturalist Carl Linnaeus and curated at the Swedish Museum of Natural History, Stockholm. Type specimens are those individuals on which original descriptions of species are based.

Hy Marx (left) shown in 1970 with William P. Braker, director of the Shedd Aquarium, as they examine a leatherback turtle which had just been acquired by the Field Museum. A cast of the extremely large specimen was then being prepared for the aquarium. 81921

Homeless in America: a Photographic Project

Continuing through February 18

THE PROBLEM OF HOMELESSNESS is one of the most pervasive social, economic, and moral problems in the United States today. Especially during the holiday season, the plight of homeless individuals and families remains a harsh reality. Field Museum draws attention to this national crisis by presenting the award-winning photographic exhibition "Homeless in America," through February 18. The exhibit includes more than 60 black and white photographs that document the diversity of Americans affected by homelessness—mothers and children, veterans, runaways, victims of eviction, layoff, drug addiction, mental illness, and the lack of affordable housing.

Esteemed photojournalists Mary Ellen Mark, a Fulbright Award winner, Bill Pierce of *Time*, Eli Reed and Eugene Richards of Magnum Photos, and Stephen Shames of the *Philadelphia Inquirer*, created the principal photographs on assignment. Their powerful images are supplemented with compelling photos by 23 artists from cities and towns throughout the U.S. "Homeless in America" was coordinated by Michael Evans, former personal photographer to President Reagan. The exhibit also features a 12-minute educational video. "Homeless in America" is the recipient of two awards for photojournalism, the Leica Medal of Excellence for photojournalism, 1988 and the World Hunger Media Award Judges Award for photojournalism, 1988.

"*Homeless in America*" is a joint project of Families For The Homeless and the National Mental Health Association. Principal funding was provided by Triangle Industries, Inc., with additional generous grants from Eastman Kodak Company, the Public Welfare Foundation and the Federal National Mortgage Association Foundation (Fannie Mae). The traveling exhibition was organized by Lisa Cremin & Associates, New York.

and Aaron Burgess, 7, outside the St. Vincent de Paul Shelter for the Homeless
mber 1987. © Grace Mojica

Life in the Woods of Naples, Florida. Many men camped here are Viet Nam Veterans, day laborers who find housing in Naples unaffordable, August 1987. © Eugene Richards

Awaiting Eviction, July Fourth Weekend, Liberty Inn, North Bergen, New Jersey, July 1987. © Eugene Richards

Metro Station, Washington, D.C., October 1987. © Tonee Harbert

REMEMBER THE CHILDREN

An Exhibit about Children of the Holocaust

January 26 through April 22

© Isaiah Kuperstein

Between 1933 and 1945, as many as 1.5 million Jewish children lost their lives in the Holocaust. Field Museum presents "Remember The Children," January 26 through April 22, an exhibition in which today's children learn about children like themselves, who were killed under the Nazi regime. Through a series of walk-through environments and participatory activities, adults and children of every race, religion, and ethnic identity are confronted with the wounds and pain that people inflict upon one another as a result of bigotry.

"The exhibit is meant to sensitize children so they will recognize warning signs of prejudice and hate before such human behavior is allowed to fester beyond control," says Isaiah Kuperstein, guest curator of the exhibit and director of education of the United States Holocaust Memorial Council. "We want children to understand what can happen when hatred grows out of hand and challenge them to prevent events like the Holocaust from ever occurring again. While the Holocaust represents a blight against humankind, there are important lessons to be learned from it. The challenge facing the development team of this exhibit was to reach children with messages about the Holocaust in a sensitive and effective way."

"Remember The Children" takes visitors on a journey through a series of recreated environments where children who suffered through the Holocaust may have spent time. The journey includes recorded narration by Daniel, an imaginary young boy who relates his personal experience as a Jewish child in Nazi Europe. Parents are encouraged to accompany children through this exhibit, which is recommended for children in grade three and above.

Exhibit Components

Wall of Faces: As visitors enter the exhibit they are confronted with a haunting photo mural of children's faces —actual historic photos of Jewish children who experienced the Holocaust. The photo montage has been screened to form a pattern of about 1.5 million dots, representing the number of children deliberately killed in the Holocaust. The majority of these children were Jewish, others were Gypsies or mentally or physically handicapped. An introductory video provides background information on the people and historic events that culminated in the persecution of Jews during the 1930s and early 1940s. The video is presented through the eyes of children.

Daniel's Home: The first recreated environment that visitors encounter is an inviting, colorful parlor of a middle-class German home circa 1930. Daniel's young voice describes the happy, comfortable life he shared with his family in this home. Children who hear Daniel's story and visit this room may identify with the young boy. The life he is describing in this environment might be similar to their own.

Changing Times: Exhibit visitors leave the comfort of Daniel's living room and enter the corridor of *Changing Times.* Life-size photos depict Jewish storefronts shut down and boarded up. Uniformed guards dominate the scene. As visitors venture along the corridor they get further and further away from the glowing warmth of Daniel's home. Daniel talks about the changes taking place in his life, how new laws were effected against Jews. He explains that adults were losing their jobs because they were Jewish and wonders how long he will be allowed to attend school. As visitors near the end of the corridor, Daniel tells how the Nazis forced his family out of their home into crowded ghetto quarters designated for Jews only.

Ghetto Street: Visitors emerge into the ghetto street, once again recreated through effective use of life-size construction and historic photos. The area feels confining. Daniel explains that his family and other Jews were forced to remain in a ghetto like this, a walled-in section of town, ridden with filth and disease. He speaks of hunger, unbearable cold, and death.

Ghetto Apartment: The final recreated scene in the exhibit is a dismal room where Daniel and his family were made to reside in the company of 14 other people. Paint is peeling from the walls and a few straw-filled mattresses are strewn on decrepit bed frames. Daniel tells how the dirty, cold room was infested with mice and rats and describes the intense hunger he suffered at all times. His story concludes with the separation of his family as they are evicted from the ghetto apartment and sent to concentration camps. As a final note, Daniel the survivor recalls how he will never forget the other children who were killed.

Activity Area: Visitors leave the recreated settings and enter an uplifting section of the exhibit to explore themes of survival. A video tape outlines the valiant efforts of individuals who risked their lives to struggle against the Nazi regime. These heroes include Mordechai Anielewicz, who led the Warsaw Ghetto Uprising; Janusz Korczak, an orphanage director who protected children left homeless by the Holocaust; and Aart and Johtje Vos, a Christian couple who sheltered Jews from the Nazis.

A second video tape presents the true story of a Holocaust survivor who lived through the ordeal to tell her experiences today.

An especially effective component of the exhibit involves the "Watch Out Wall." Large graphic panels carry the headings "Put Downs," "Stereotyping," "Prejudice," "Hostility," "Discrimination," "Official Sanction," "Persecution," and "Genocide." Under the headings are warning signals, simple derogatory statements people make that could lead to extreme acts of hatred.

A variety of activities in this area allow children to express personal reactions and emotions the exhibit may evoke. Large, blank-paged binders encourage visitors to put their feelings down on paper. Children can draw their impressions on cardboard tiles which they may leave behind on display or take home with them as a remembrance of what they have learned in the exhibit.

"Remember The Children" was inspired and conceived by Mrs. Sidney R. Yates and carried out with great dedication by many individuals. Capital Children's Museum in Washington, D.C., developed the original exhibition on which this traveling version is based. Funding and additional support were provided by the United States Holocaust Memorial Council, cosponsor of the exhibition. Additional funding for the traveling exhibit was provided by the Arie and Ida Crown Foundation, The National Education Association, and the Blum Kovler Foundation.

The Chicago installation of "Remember The Children" is made possible through a generous grant from Polk Bros. Foundation.

Reconsecration Of Human Remains At Field Museum

by Jonathan Haas
Vice President, Collections and Research

In December of 1989 the Board of Trustees of Field Museum adopted a policy for the return of human skeletal remains and associated burial objects to the living descendants of specific individuals. This policy was developed in response to a growing recognition of the need to comply with native people's wishes to have their ancestors removed from the Museum and returned for reburial or reinterment according to traditional practices.

A policy that allows for the permanent removal of any objects from the collections is a matter of great importance, as the collections of the Field Museum stand at the very heart of the institution. It is only through the use and maintenance of the collections that the Museum can fulfill its basic mission to preserve, increase, and disseminate knowledge of natural history. In thus deciding to establish a policy for the reconsecration of human remains, the Museum is making a unique exception to its commitment to maintain the integrity of the collections.

In developing the policy for the return of human remains and associated burial objects, many factors had to be considered. The first looming issue that had to be faced was the loss of the scientific value of these collections. Field Museum has remains of approximately 4,000 individuals from around the world. Is there any value to be gained through the scientific study of these bones long held in our storage facilities? Will we lose knowledge if these bones are returned to living peoples for reburial? The answer to these questions is a resounding "yes!"

The analysis of human skeletal materials is today undergoing a revolution equal in every way to the revolution brought about by the discovery of radiocarbon dating forty years ago. Discoveries just within the past decade now enable physical anthropologists and archaeologists to begin to reconstruct the health and diet of ancient peoples, biological relationships between groups of people, movement of tribal groups from one area to another, and even patterns of residence after marriage (whether the couple goes to live with the bride's family or the groom's). One example will help illustrate the kinds of information anthropologists can get through new techniques of analysis:

By comparing the chemical composition of a person's teeth with that of other, nondental bone tissue, anthropologists can now begin to determine whether individuals moved around in the course of their lifetimes. As we all know, humans grow a permanent set of teeth in childhood. These permanent teeth, when growing, incorporate very small—"trace"—amounts of certain elements, such as strontium or fluorine, from the food and water a person consumes. The kind and proportions of trace elements found in the plants, animals, and water of a particular area depend upon the local geology and the source of the water. Thus, the trace elements found in one's teeth reflect the area where that person lived as a child, when the permanent teeth were growing.

Like teeth, one's other bones also incorporate trace elements from food and water. In contrast to teeth, however, the chemical composition of bone is constantly changing, as new tissue replaces old. When a person moves from one area to another, therefore, the chemical composition of the bones changes, reflecting the trace elements in the new environment.

When the tissue stops changing at death, the trace elements in the skeletal material represent the latter years of the person's life. Therefore, by comparing the trace elements in a person's teeth and bones, the anthropologist can determine whether the person moved from one geographical area to another in the course of his or her lifetime, and possibly even the location of the childhood home. Taken together, these factors all provide the anthropologist with a window into the past to look at the movement of people across the landscape. This window has just been opened in the past five years, and it is but one of several exciting new avenues of research arising out of recent analytical breakthroughs in bone chemistry.

In the face of such advances in analysis and the valuable information that may be gained from an analysis of human skeletal material, it was even more difficult to make the decision to return human remains for reinterment. However, the decision was based on the judgement that when descent can be established, public policy and the wishes of the descendants clearly outweigh the scientific values of retaining human remains in the collection.

Having made the decision to return, upon request, human remains and associated burial objects, several additional factors had to be considered in developing the Museum's policy of repatriation. Of central importance in returning remains is that they go back to the appropriate group. Toward this end, the policy states that human remains will be returned to any group for reinterment when such material is requested by an appropriate representative of that group, and if the remains are of ancestors of the requesting group. "Ancestors" can include any past members of the requesting group so long as there is a clear historical, archaeological, or ethnographic link to the group. It is not necessary to establish direct kinship ties between living members of the group and the deceased.

Although this policy was initiated to respond to the wishes of Native American peoples, it directly applies to all other cultural groups as well. It was felt that such a policy cannot be limited to just one group, but must be applied to all as a general principle of human equality. In the case of requests coming from foreign countries, remains will be considered for return only where there is an implemented standing policy on the part of the requesting people and their national government to reinter deceased individuals and associated grave objects.

Of course, in implementing such a policy there may be some disagreements with respect to a specific group's relationship to requested remains in the Museum's collections. The Museum will continue to make its archives and files related to remains available for review by representatives of descendant cultural groups making claims to such materials. The Museum will work cooperatively with these representatives to facilitate and expedite the return of such remains for reinterment according to the appropriate religious traditions. It is also recognized that customs of different groups vary, so reinterment will encompass all traditions including burial, cremation, or possibly an aboveground resting place.

In the event that there is a basic disagreement about the materials to be returned or the disposition of these materials, the Museum will submit the disagreement for resolution to an impartial third party, as authorized under the law of Illinois. All parties will also have the right to appeal to the courts for a final determination. The means of resolving disagreements are outlined in the Museum's existing procedural guidelines covering requests for repatriation.

The adoption of this repatriation policy at the Field Museum does not mean that the entire skeletal collections will be taken out and reburied in the near future. Most of the human remains in the collection are prehistoric in origin and date back hundreds or even thousands of years. With rare exceptions there are no known descendants of these prehistoric remains, and these will be available for limited scientific research while the Museum continues to care for them in a respectful fashion. There will also be cases where recognizable descendant groups do not request the return of ancestral remains. The Field Museum has remains from Europe, Africa, Asia, and South America, as well as North America, and many from countries where there is an active archaeological tradition and the scientific analysis of human skeletons is a well established part of the culture. Furthermore, even in those cases where groups do request the return of materials, it is likely that most will allow for basic analysis of the remains before they are reinterred.

What this policy does mean is that the Field Museum is entering a new era of open dialogue with native people in the U.S. and abroad. The rich anthropological collections in the Museum reflect the customs, art, and inventiveness of myriad groups, past and present, around the world. It is not enough to be simply a caretaker of these collections; however, the Museum must take an active role in reaching out to build ties and open lines of communication with the people, continuing the vibrant traditions of other cultures. **FM**

LIVING ON THE EDGE

Chicago's Endangered Falcons

by Mark Spreyer

photos by the author
except where noted

16 Peregrine with prey

Watching a peregrine falcon mother with her two chicks atop a Chicago office building was how I celebrated Mother's Day, 1988. The chicks were the first two peregrines hatched anywhere in Illinois in 37 years, so in the world of birds it was an auspicious Mother's Day indeed.

The failure of peregrines to reproduce during that time was due to the presence in the environment of DDT, a widely used, long-lasting insecticide that profoundly affects the reproduction metabolism and behavior of many bird species, notably raptors, which includes the peregrine. The federal government banned its use, except for special applications, in 1971, but because of DDT's low solubility in water, its swift absorption into the fatty tissues of animals, and its slow rate of chemical breakdown, the effects of the ban were not immediately realized.

In the case of the peregrine falcon, the presence of the pesticide interfered with calcium absorption, resulting in egg shells so thin that they broke under the weight of the incubating parent.

Though the agricultural application of DDT has long since been halted in the United States, it should be noted that the chemical is still manufactured in this country and continues to be applied as an agricultural pesticide throughout Latin America, where many migratory bird species are exposed to it.

At about the same time that DDT was banned, the peregrine became a charter member of the federal government's newly established list of endangered species. The equally new Peregrine Fund, meanwhile, was successfully breeding peregrines in captivity. By 1975 the Peregrine Fund began releasing falcons at various sites, in cities as well as rural areas, along the East Coast.

Cities may strike one as odd places to release endangered birds, but peregrines have often been spotted in urban areas. In an 1877 issue of the magazine *Forest and Stream*, George Boudin described an encounter with a peregrine: "On the 13th of September, 1868, I shot a fine specimen (male) at the corner of Fifth and Girard Avenue, Philadelphia. For nearly three weeks this bird of prey had made its home in St. Peter's steeple." A 1941 *Chicago Tribune* article reported on the peregrine, referring to it by one of its aliases: "The duck hawk, who likes to roost on the rooftops of Chicago skyscrapers and who sometimes preys on the Loop pigeons, is the nearest thing in the bird world to a Stuka dive bomber."

Arctic peregrines are spotted every spring and fall as they migrate between their northern breeding

Chicago's Northern Building (center, top), showing 1988 and 1989 peregrine nest site—ledge below dark rectangle near building's top.

Mark Spreyer is a naturalist for Hennepin County Parks, in Minnesota, where he moved from Chicago in 1989 with his wife, Dr. Peregrine Wolff. He was formerly an ornithologist at the Chicago Academy of Sciences as well as head of the Chicago Peregrine Release. He was co-producer of the ABC TV documentary "Living on the Edge: Chicago's Endangered Falcons," first aired during the summer of 1989. He has been a guest lecturer at the Field Museum and field trip leader. He was a featured speaker at the Midwest Regional Birding Symposium at the College of Du Page, Glen Ellyn, Illinois, in September 1989.

Peregrine falcon egg recovered May 1987 from Wacker Drive building ledge. The egg is about 2¼ inches long and blotched with brown.

grounds and their tropical winter range, but reports of peregrines nesting in Illinois are scarce in the literature. E.W. Nelson wrote in *Birds of Northeastern Illinois* (1876) that the bird was "formerly a rare summer resident." In 1889 R. Ridgeway reported finding several pairs nesting in the cavities of sycamores along the Wabash River near Mt. Carmel. In *Birds of Wisconsin* (1903), L. Kumlien and N. Hollister wrote that peregrines formerly bred at Racine, Wisconsin, several miles north of the Illinois border along Lake Michigan. The last recorded nest, before the release effort, was in Jackson County (far southern Illinois) in 1951.

Since then, modern agricultural practices and urban sprawl have done much to modify the Illinois landscape, inevitably affecting the habitats and lifestyles of much of our wildlife, the peregrine included. Fortunately, however, peregrines see nothing odd about taking up residence on structures built and occupied by man. A remarkable example of such adaptation was to be seen in the 1940s and '50s on New York City's Regis Hotel and, most dramatically, on Montreal's Sun Life Assurance Building where, over a period of 16 years, a female peregrine and three successive males raised a total of 21 young.

In 1986, atop another man-made structure—University Hall on the University of Illinois campus in Chicago, a release effort was initiated by the Chicago Peregrine Release, a cooperative effort of the Chicago Academy of Sciences, Illinois Department of Conservation, Lincoln Park Zoo, and the Chicago Audubon Society. It was my privilege to head this group during its first three years.

With its gravel roof and wide ledges on every floor, University Hall provided an ideal urban release site. The roof was free of dangerous wires and exhaust fans, and university officials committed themselves to publicizing our enterprise around campus, creating a community awareness which could prove critical to the success of the program.

Of the first five falcons released from University Hall in 1986, the male named Pacer became a media celebrity. Crippled with a broken wing, Pacer had been found in August of that year under an airplane at Meigs Field, just across the Outer Drive from Field Museum. Thanks to the medical know-how of staff at the University of Minnesota's Raptor Center, in Minneapolis, Pacer was successfully rehabilitated. Two months later, the fully recovered bird was released from the roof of University Hall. At last report he was sharing a territory on Chicago's North Side with a female released in Milwaukee in 1987.

In spring of that year, I was excited to learn that a pair of falcons had been observed in Chicago's Loop. When the reports included descriptions of breeding activity, I knew it was time for a closer look. There were indeed two falcons, and the female was in adult plumage. Since none of the Chicago falcons already known to us were even a year old, it was safe to surmise that the female was from out of town. Shortly after newspaper accounts of this nest appeared (including information about our peregrine release program), I learned from Sears Tower office workers that an egg was visible on a ledge of the Northern Building, just across the street from the Tower. I hurried over to check out the intriguing report. There it was: a lone egg sitting on an east-facing ledge at Adams and Wacker.

But now we had a problem on our hands: If this Chicago Loop pair were to defend its territory (for peregrines this involves a radius of some five miles), we could no longer release birds at University Hall (well within that radius) for fear that the youngsters would be attacked by the older, established pair. Then the U.S. Army came to our rescue, volunteering a release site at

Peregrine chicks awaiting shipment to release site.
Illinois Department of Conservation

Ft. Sheridan, some 30 miles north of Chicago's Loop. The new site was atop a century-old, ten-story water tower. It was from this structure that 11 falcons came to be released in 1987, these birds quickly dispersing to other points in Illinois and to Minnesota and Wisconsin.

MacArthur, the first to fly from the tower, appeared in Milwaukee in 1988 with Madonna, a female released the year before in Rochester, Minnesota. Much to the surprise of raptor biologists, Madonna and MacArthur, both just a year old, hatched two chicks in Milwaukee. Nicki, a female Ft. Sheridan release, took up residence on a Mississippi River cliff, near Hastings, Minnesota. PeriGreen created excitement among Du Page County birders when it adopted the Fermi Lab as its base of operations during the early spring of 1988. PeriGreen was recovered in a weakened condition the following June and died only hours later at the Lincoln Park Zoo, where it had been taken for treatment. Although no bones were broken, examination revealed that PeriGreen had suffered a tremendous impact. Oh yes, the name of the Lincoln Park Zoo veterinarian who examined PeriGreen? Dr. Peregrine Wolff, of course.

Meanwhile, back at the ledge across from Sears Tower: The pair that had laid the egg (which proved to be infertile) in the spring of '87 continued to be seen downtown during the following winter; the next spring the birds resumed courtship. We were able to identify the female as Harriet, a Minneapolis bird released three years before, and the male as Jingles, released from University Hall in 1986. In due course, Harriet laid

Peregrine release tower at Illinois Beach State Park. Shields near the bottom of the support posts prevent raccoons from climbing the tower. Tower was built courtesy of the Telephone Pioneers of America.

three beautiful eggs on the south end of the ledge where the infertile one had been found. Two of these three hatched. Jingles and Harriet were dutiful parents who fed their chicks, named Wacker and Adams, without fail. We were able to record much of their parenting activities with video equipment that permitted unobtrusive observation.

Adams and Wacker took their maiden flights on June 10, about 45 days after hatching. Keeping track of our novice fliers soaring through the canyons of the Loop was a difficult, frustrating task for our observers. After searching for two days, determined volunteer Matt Gies finally located the chicks on the 90th-floor setback of Sears Tower. Litter falling from construction sites in the Loop provided the playful young peregrines with mock prey; but in time, the play turned serious and the remains of various birds—even a Virginia rail, normally a marsh inhabitant— were discovered on Sears ledges.

Later in the summer of '88 we launched 10 more falcons from a specially built tower at Illinois Beach

Ft. Sheridan water tower, where 11 falcons were released in 1987.

State Park, near Zion. So far we have not heard from the Class of '88. We have learned from the Peregrine Fund, however, that peregrines can now be found in at least 22 U.S. cities, nine of which had no release programs, and the peregrine population is so well established in the east that releases there have been largely discontinued—an astonishing recovery since the bleak days of 1964, when the bird was considered extirpated, or nonexistent, east of the Mississippi. Three nests were reported in Chicago in 1989 and we have had reports of peregrines hatching in cities from Baltimore to San Diego.

Other reports remind us that the pesticide threat, unfortunately, is not over. According to a U.S. Forest Service falcon specialist, the number of peregrines hatched in 1989 in southern Oregon and northern California dropped by two-thirds from a year earlier. Tests on failed eggs from this area showed the presence of dioxin as well as PCBs. In Illinois the use of Fenthion, an organophosphate, has recently been questioned. Primarily an insecticide, Fenthion is also marketed under a trade name for use against bird pests. Early in 1989 at a hearing held by the Inter-Agency Pesticide Committee of the Department of Agriculture, the chairman of the Illinois Endangered Species Protection Board and the director of the Illinois Department of Conservation presented evidence that at least two Illinois endangered species (Cooper's hawk and the sharp-shinned hawk) were among the raptors found dead from secondary Fenthion poisoning. This resulted from eating so-called nuisance birds such as starlings, which had ingested the poison from bait intended for them. If the peregrine success story is to continue, pesticide use must be strictly regulated, monitored, and reevaluated.

But the peregrine falcon has made a dramatic comeback in the past three decades. The experience has demonstrated that while man is capable of eliminating another species, he is also able to restore that species before it is too late. The biology of many birds, however, could not tolerate such a close call. Release efforts are an important step in the species-saving process. Such efforts must be planned with an animal's habitat requirements and biology in mind. Ultimately, releasing birds is not saving them. When birds return to nests they are saving themselves. **FM**

Outdoor mural on Chicago's near West Side.

COCKROACHES and ELEPHANT'S TEETH

A Tale of Volunteering at Field Museum

by Sally Wood

I hand a multicolored rock to the handicapped teenager who has been wheeled into the Place for Wonder by her mother. The sparkle catches the girl's eye. Suddenly, she is all smiles, bursting with the excitement of her discovery.

A six-year-old fascinated by a fossilized dinosaur bone confides in me that she plans to become a paleontologist.

A family about to travel to Africa share their stories of seeing coral in the ocean as we look at some specimens—pink, white, brittle and gnarled, like miniature bonsai trees. Hard to imagine that the brain coral specimen in my hand was once alive.

These are just some of the things that have happened in the six months I've been a volunteer in the Place for Wonder at "the Field" (as we like to call it!). As an Englishwoman in Chicago, I probably qualify as one of the unusual objects in the Place for Wonder. The only other living exhibits are the cockroaches and the crickets, and they're kept behind glass! I certainly don't think I'm a typical volunteer; but then, I doubt whether such a creature really exists.

About a year ago, I got married. At the same time, my husband was asked to come to Chicago on an assignment. Always ready for adventure, I resigned from my marketing job in educational software and crossed the Atlantic with my husband, landing in Chicago's western suburbs. Within a week, my husband was disappearing into the depths of AT&T everyday and I was suddenly a homemaker with a Social Security status "not valid for employment."

It took awhile to decide how I wanted to use all this "free" time. I was helping out at my local elementary school when I heard about the volunteer program at the Field Museum of Natural History. It sounded different. It sounded like a challenge. So I went along to an introductory session. Unlike most of the others attending, I knew practically nothing about the Museum; I hadn't even been there before and didn't have a particular interest in natural history. What I did have, however, was a background of talking to school groups, lots of curiosity, and a desire to use my brain instead of vegetating.

I decided to offer my services and see what happened. I had a feeling that it was going to be fun. First, there was the interview, which was more like a friendly chat really—certainly not as intimidating as a job interview. After all, the Museum always needs new volunteers. Then the training course. A chance to find out all sorts of weird and wonderful facts about the Museum and to meet some other new volunteers. Speakers from botany, zoology, anthropology, and geology came and went, and we learned a lot about people and museums in a short amount of time.

Finally, it was up to us to decide whether to commit ourselves to a year as a volunteer and to choose the type of work that we thought would be a good fit. I chose the Place for Wonder, a small and very special part of the Museum, where you can explore the natural world through touch, sight, and even smell. You can see a shark's fin or a meteorite, do a Chinese tangram puzzle or feel some fungus (among other things). Whether people or volcanoes are your thing, we can oblige.

A jumble of children rush and tumble from here to there, buzzing with questions. Another weekday morning. Another school group. We give them a sense of the possibilities of the place, then let them explore. Sometimes I'm a teacher, sometimes a pupil. Sometimes I answer questions and sometimes I can't (but I try). Recently, a very small visitor to the Place

for Wonder asked why starfish have points—let me know if *you* have the answer to that one! Sometimes I tell the stories of the objects in our room and sometimes I simply show people where to find things (including McDonald's and the bathrooms).

Afternoons are for everyone. The atmosphere of the Place for Wonder changes from moment to moment. It can be a quiet refuge from the overwhelming sights of the whole Museum or it can be hectic and full of the excitement of children making music and cooking an imaginary Chinese meal. We also have our share of reluctant visitors, but once they walk into the Place for Wonder, they're often reluctant to leave. Some mothers bring their children back every week, to play with "favorite things," and grandparents often bring grandchildren from out of town on an annual trip.

It's the people that make me come back every week—the visitors, always different. The Education Department staff, who always remember your name and treat volunteers as equals. Who share their expertise and ideas with you and, if you're lucky, sometimes even their lunch! Then there are the other volunteers. What an amazing bunch! Some have been with the Museum for over twenty years; some have busy jobs, yet give up a couple of weekends a month to help the Museum tick. Many have retired from a profession and are traveling in new directions. I've got to know a group of people who share a love of natural history, but are different in every other way imaginable.

There's something special about being a volunteer. There's no "financial deal" involved. You haven't offered yourself "for sale," but have chosen to share a part of yourself. To give four days a month from choice is a real pleasure. There isn't the daily grind, so you can give the best of yourself. You can *be* yourself too, because that's what the Museum wants: *you*. The job you do depends on who you are. You don't have to fit into a rigid job description; the job can fit you.

As a volunteer, I feel part of something important and I feel appreciated. There's a lot to be said for that. When I worked full-time, it wasn't something I thought about much, but we all like to feel useful and need some sort of routine in our lives. I certainly do. I know that every Thursday I'm needed at the Museum; they're expecting me. As a former full-time homemaker, I look forward to my day at the Museum. There's nothing worse than having nothing better to do than watch "Days of Our Lives"!

Volunteering means flexibility too. In what paid job could you decide to go off to Europe for two months in the summer (every summer if you wanted to and could afford it!) and be welcomed back with open arms? As a volunteer at the Field, you can. Paid staff know that volunteers have other things to do. They would *like* you to be there every week, but they know this is not always possible.

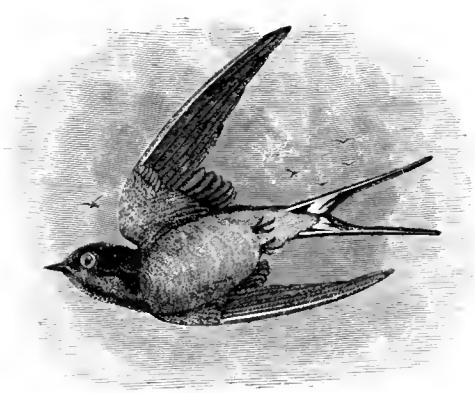
There are "perks" too. As a full-fledged volunteer, I can enjoy the pleasures of the Art Institute and other Chicago museums for free—just like a "real" employee. The discounts at the Museum shop are great for present buying and who would say no to cut-price meals at McDonald's?

Volunteering is a journey of discovery. I've learned about things I never even thought I was interested in. I can work Chinese shadow puppets, and I now know how rocks can make ice cream! Things I learned at school come trickling back to me. It's nice to know that they're still in there somewhere.

Volunteering stimulates your brain—yes, it's true. The Museum is more intriguing than a classroom and *much* bigger. Sometimes, if I arrive early, I wander through the quiet halls. The Museum has helped me to rediscover my own sense of wonder and curiosity about the natural world.

One thing tends to lead to another. Since becoming a volunteer I've plucked up the courage to go back to college to take a writing course, something I've always wanted to do. One of my assignments was to interview someone, so I picked John Wagner, biology specialist with the Department of Education, and learned quite a lot about beetles in the process.

What's the best thing about being a volunteer? I can't really pick out just one thing, so I'll have to say—just doing it! **FM**



Meet Bob Stolze—Curator of Ferns

by Susan Nelson

Something rather unusual happened at the Field Museum last summer. It was a small reception on the third floor, up one floor from the wondrous Hall of Plants and up two from the excited voices of children discovering "Sizes" and ancient Egypt.

On that day in July, many of the Museum's 32 curators made their way to the Botany Department's library, past a door with a bumper sticker reading "Ferns are FERNtastic" and along corridors the rest of us may recall from Members' Nights for their nonstop walls of gray steel cabinets that evoke the government warehouse scene near the end of "Raider of the Lost Ark."

But these cabinets, emitting the faint smell of mothballs, are no bureaucratic jumble. They hold the Field Museum's herbarium, a meticulously arranged, well-regarded library of 2.5 million plant specimens that in respect to certain groups of collections is the world's best.

This gathering was related to the Museum's herbarium, because it was a celebration for a new curator of ferns, one of the areas in which the Field Museum herbarium distinguishes itself. And what made the event so unusual was the fact that the person being honored was the one who had built up the fern collection during the past twenty or so years, without holding the customary title of curator.

Until his promotion to associate curator of Pteridophytes (ferns and allied plants) last July 1, Robert G. Stolze had been something of an anomaly. Though he has become a respected authority on ferns and won a National Science Foundation grant as co-author of the first modern study of ferns and fern allies in an Andean Mountain region, Stolze had lacked the title that is universally recognized within the academic world.

He had served on the Field Museum's Personnel Committee, and he is an enthusiastic supporter of making Members' Nights even more memorable by assembling his own medieval/Renaissance music group, The Ars Subtilior Ensemble, to play in the Plants of the World hall.

And so, earlier last year, the people in the Botany Department decided it was time to try to recategorize Robert Stolze. The obstacle all along had been his lack of a Ph.D.

Harold Voris, former vice president of Collections and Research, explains: "In all of the sciences, there has been a strong trend for the establishment of a requirement of academic credentials for various academic positions. Whereas fifty years ago it was not unusual to have a scientist initiate his career at the Field Museum, it is now extremely rare to find somebody who has the equivalent of a Ph.D. without having gone through the traditional Ph.D. discipline."

Stolze is the first person "within at least 20 years" to have become a curator without a Ph.D., and "it is not likely to happen again," Dr. Voris adds.

"It was felt that Bob Stolze had proven his academic prowess through a distinguished record of publication on his research, as well as the recognition from his peers and in receiving support from the National Science Foundation and other sources."

And, though he was the first in years and may be the last curator so selected, Stolze is not alone, Dr. Voris mentions. Mel Traylor, curator emeritus in the Division of Birds and former chairman of the Department of Zoology, does not have a Ph.D.

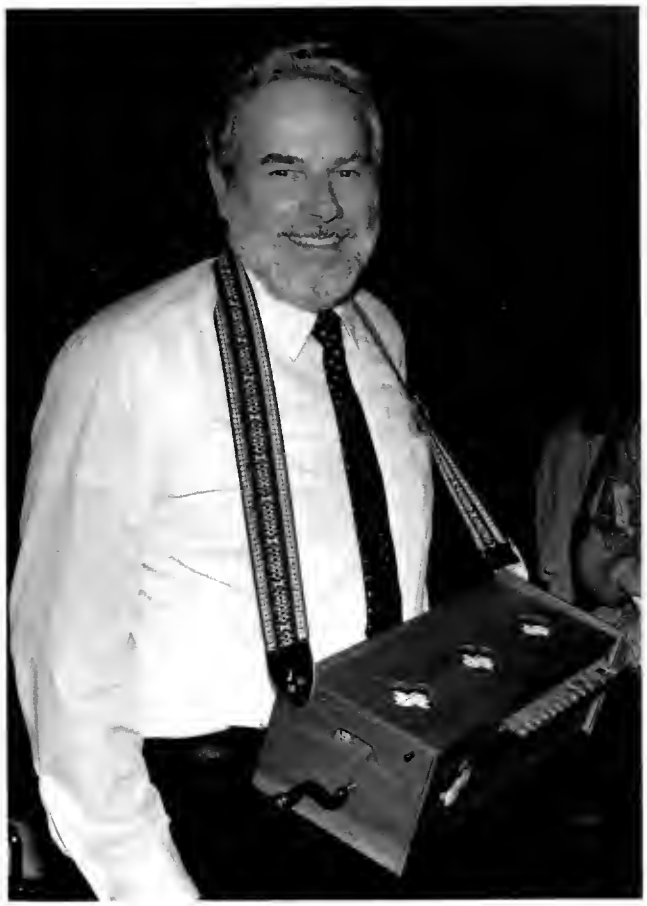
Hymen Marx, curator and head of the Division of Amphibians and Reptiles, also came up through the ranks. He has spent most of his 40 years at the Field Museum studying relationships of snakes (for more on Marx see page 6).

When Botany Department chairman John J. Engel, Ph.D., curator of Bryology (mosses and liverworts), recommended the change to him, Dr. Voris followed the formal procedure used for all promotions and new positions: a months-long review by a committee within the Museum, and a call for letters assessing the candidate's work from scientists around the country. At the end of eight months, Stolze was handily endorsed.

Dr. Engel, who was instrumental in seeing that Stolze was promoted, says, "I was troubled by the fact that, on the one hand, here is a man who has done excellent research, who is recognized by his peers, and who has curated our fern collection in an excellent manner and, on the other hand, he was classified as a member of the non-curatorial staff.

It was a situation that Stolze, for one, had never expected to change.

Susan Nelson is a Chicago writer who also wrote "Welcome to Ancient Egypt," appearing in the November 1988 *Bulletin*.



Bob Stolze during Field Museum Members' Night, May 1989. He carries a working replica of a 15th-century hurdy-gurdy. As director of The Ars Subtilior Ensemble, which performed on that evening in Plants of the World hall, Stolze played about ten different instruments, including strings, reeds, miscellaneous winds, and percussion. The five-member group, which Stolze founded in 1978, performs music from the middle ages and the Rennaisance.
Diane Alexander White 85096

"There were never any bones about it," he says simply, a tall, trim, soft-spoken man with a generous amount of gray, wavy hair and a neatly trimmed beard. His manner is relaxed; his clothes are sensible, right down to well-constructed leather walking shoes.

He is in his office, inside the door with the FERNtastic bumper sticker. Two plants are on a windowsill—a fern ally that grew unexpectedly from a forgotten spore, a Boston fern his wife sent to him when she learned of his promotion. A long table holds books and several specimens of dried ferns that are carefully arranged. Beyond two desks with books and clean tops—except for a few small photographs, a box of herb tea, and a couple of clean mugs—hangs a painting of a cool scene in the woods.

Bob Stolze is clearly pleased when he is asked about becoming a curator. "I was completely nonplussed," he says, in a drawl-touched voice that is part Garrison Keillor wonderment and part Dennis Weaver assurance. Stolze is an attentive listener, to what he himself is saying as well as to a visitor's questions.

He came to the Field Museum in 1963 as a part-time employee, a college graduate (B.S. in business from the University of Notre Dame, 1949) who needed a job to help him support his former wife and a sick child while he pursued studies in music at DePaul and Roosevelt Universities.

Stolze had grown up in Edwardsville, Illinois. His father, a banker with interests in a family lumber business, had died when he was 14, and Bob, like his brothers, went away to college and then returned to work for their uncles.

"I didn't know there was anything out there to make money doing what I *wanted* to do," he says, with the candor of one who has given it a great deal of thought. He was wholesale buyer of lumber for three yards, in Granite City, Wood River, and Belleville, and he detested it. "The main thing," he says slowly, "is to be happy at what your livelihood is."

Stolze tried flying lessons at a field near East St. Louis. "Even now, I can tell you anything about old airplanes. I thought I wanted to be a bush pilot in Alaska.

"And then the Korean War came along. I got drafted—no, not as a pilot," and he chuckles. "The infantry. The Army."

He was sent to counterintelligence school in Baltimore for sixteen weeks, which meant he was not shipped out for infantry duty but instead went to Japan. In Baltimore, he had met a young woman who became his first wife, and after the service they moved to Belleville, Illinois.

He tried the lumber business again, and they had a son who would require medical care for a long time. The pressures of being unhappy at work increased.

This was 1957, and Stolze was 30. What he decided he really wanted to do was music, and it was this decision that led him to Chicago and the Field Museum.

"From the 4th grade I had had a cornet in my mouth," he says. "One of my two brothers and I played in the bands. My mother, a former schoolteacher, had sung on the radio in St. Louis at one time, and so we always had music in the house."

He had enough savings to be able to finance a few years' study of cello, harmony, and other courses, he figured. And so, to everyone's amazement, Stolze and his wife and young son came to Chicago. He enrolled at DePaul and then switched to Roosevelt University, where his newfound interest in the cello flourished under

the genius of cellist Carl Fruh.

"He was marvelous, and I learned quickly. I just *loved* it, was playing in a chamber music group, practicing eight hours a day, and making progress. But then the light began to dawn: 'Yeah, you're doing the right thing, Bob, but you're doing it about 20 years too late.' And about that time the money began to peter out, and I had to get some part-time work."

It was at that point that he sent out letters with resumes to places that wouldn't expect him to sell anything. One day, in 1963, after getting home from a job at a book depository, he saw a note that E. Leland Webber, then director of the Field Museum, had called and wanted to see him.

"So I called him, and he said, 'We need someone to assist in the Department of Botany part-time, to work in the herbarium.' I said, 'What's a herbarium?' "

Stolze remembers being shown to a room that had the ferns in it. "In the history of this institution, the ferns had never had a curator. So these very nice people told me, 'When you run out of things to do, just sort of look around and see what you can do there.' " He laughs.

"And, as dumb as I was about that, I found out right away that the ferns were in a hell of a mess—filed wrong, not classified properly, misidentified. So these wonderful people would tell me which books to go to, to look at, how to use the library. And little by little, I began identifying ferns. I had a good eye for it; I took literature home and studied. The collections themselves are marvelous study material."

About then, Louis O. Williams, Ph.D., now curator emeritus of Vascular Plants, was in the process of becoming department chairman. He began to talk with Stolze about becoming a full-time employee.

Though he could offer no more promise of advancement than Webber initially had, when the director had counseled Stolze that he could advance in administration but not in the scientific departments without a Ph.D., Dr. Williams kept making irresistible assignments to Stolze.

He sent him on collecting trips in 1965 and 1966 to Wyoming, from which Stolze brought back an impressive number of specimens that he then classified and had carefully mounted. In-the-field collecting is one way of getting specimens for the herbarium. The other is by exchanging duplicate specimens with another institution's herbarium, and the Field Museum had been in need of reducing its obligations. This Stolze helped to do.

Earlier, two things had happened with Stolze's music: His cello teacher accepted an offer to travel with the Pittsburgh Symphony Orchestra on a European tour and would be leaving Chicago for a time; and a good friend, with whom Stolze played chamber music, had died.

And so he accepted the Museum job in 1964, with the title "Herbarium Assistant." At the time he investigated taking classes that would result in the required Ph.D., but the time and money it would take were prohibitive.

That same year, Rolla M. Tryon, Ph.D., curator of ferns at Harvard University, came to Chicago and stopped by the Field Museum's Botany Department. Stolze had been puzzled by a fern that looked like a member of one genus but clearly had different characteristics. He showed it to Dr. Tryon, who saw what Stolze had noticed.

"He told me this fern had been described, but only once, and that I should write it up in a paper and send it to *American Fern Journal,*" Stolze recalls. He did, and it was published later that year (1964). "I was walking on air—here was this dumb punk, and suddenly I get a paper published."

In 1968 Stolze was promoted to "Collections Manager, Pteridophytes." William C. Burger, Ph.D., curator of Vascular Plants, was well into his work classifying the flora of Costa Rica. "Dr. Williams thought it was time for me to get some tropical experience, and Bill Burger was in need of an assistant, so we drove a vehicle to Costa Rica from Chicago." Once there, Stolze collected ferns while Dr. Burger collected flowering plants for the Museum's herbarium.

Dr. Williams had nearly finished his monumental work, "Flora of Guatemala," and he suggested that Stolze complete the study with ferns. Stolze published the final volume of his flora "Ferns and Fern Allies of Guatemala" in 1983, a project that took nearly a decade to complete. With characteristic self-effacement and a ready laugh, he calls his section "the caboose" on Dr. Williams's work.

Dr. Burger appreciates Stolze's sense of humor. He also says, "Bob's well-organized, well-disciplined work habits account for his productivity. And his taxonomic decisions — which plant belongs to what species, whether you've got two species or possibly three—are highly regarded by his colleagues. He's not a 'splitter,' who makes lots of little categories, or a 'lumper,' who pours everything into the same group.

"We were very happy about this promotion," Dr. Burger says. "Here's someone who has worked his tail off for twenty-six years, and this is recognition of that achievement and dedication."

The abiding interest in music, he mentions, adds another dimension to Bob Stolze. "He pursues his

Attention, Fern Buffs!

Bob Stolze suggests that come spring, the Cook County forest preserves are a good place for Chicagoans to start looking for the 300 or so ferns that grow in North America. Better still are two more southerly state parks, Starved Rock and Giant City. Generally speaking, the farther south one goes, the more ferns there are to see of the world's 10,000 species.

For further reading, he recommends these three books:

❀ *How to Know the Ferns and Fern Allies* by John T. Mickel. William C. Brown Co. Publisher, Dubuque; 1979.

Dr. Mickel is curator of ferns at New York Botanical Gardens. In this book, using a pictured key with geographic distributions and realistic drawings of the ferns, he provides a good introduction to several hundred North American ferns.

❀ *The Home Gardener's Book of Ferns* by John T. Mickel. Holt Rinehart and Winston Publisher, New York; 1979.

This book, illustrated with photographs, tells how to grow ferns indoors and outdoors, from transplants and from spores. It includes discussions on watering, light, and temperature, and he suggests which are exotic, which are easiest to grow, and what problems to try to avoid.

❀ *How to Know the Ferns* by Frances Theodora Parsons. "Unaltered republication" Dover edition of the book originally published in 1899 by Scribner's; Dover Publications, Inc., New York; 1961.

Ms. Parsons' charming book, one of the many old books of a type, is illustrated with stylized, sometimes fanciful drawings. It contains an index to the Latin names of ferns and such chapter headings as "Ferns as a Hobby," "When and Where to Find Ferns," and "Notable Fern Families." Some of the information holds up just fine.

In addition, the American Fern Society, besides professional activities that include publishing a journal, also has a section devoted to amateurs. Several chapters are located across the country. Through them, members can learn about ferns and, for a nominal fee, send for spores from exotic ferns. Though no chapter exists in the Chicago area, Field Museum members are welcome to ask for more information from David Barrington, American Fern Society treasurer, Department of Botany, University of Vermont, Burlington, VT 05405. Please enclose a self-addressed, stamped envelope.—*Susan Nelson*

music with the same diligence as he does his ferns."

With the encouragement of Tryon and Williams, Stolze made several visits to Harvard's Gray Herbarium, where Tryon solicited Stolze's help with his work on tree ferns. This culminated with the publication of Stolze's monographic revision of the tree fern genus, *Cnemidaria*, in 1974. Collaboration between Tryon and Stolze continues today in their joint investigation of the ferns and fern allies of Peru, "Pteridophyta of Peru."

One of the photographs on Stolze's desk is of a smiling woman with short-cropped, silver-edged hair. "Oh, that's Sue," he says with obvious pleasure. "The light of my life. She's done an awful lot to make my life complete."

She grew up on the same block he did in Edwardsville, but she's five years younger. "Five years in high school is like a hundred years," he says gently. Like him, she had married someone else. But, as things sometimes happen, they became reacquainted and then became the best of friends. They were married six years ago.

"She's a great outdoor person who doesn't scream when she sees snakes or flies," he says, his eyes twinkling. They camp out and canoe. For a delayed honeymoon, "because I'd bragged it up so much," he says, he took her to Costa Rica, his own favorite country. "She just loved tromping through the rain forest and riding the funny old buses."

Sue Stolze is also Number One fan of The Ars Subtilior Ensemble. "She can't carry a tune in a water bucket," Stolze says, "but she played the drums for me one time, when I gave a demonstration of different instruments.

Stolze relaxes at their home in Wilmette—a town that reminds them both of Edwardsville because of the trees—by practicing on many of the fifty different instruments the members of Ars Subtilior play when they reproduce music of the 12th through 16th centuries from England, France, Spain, Germany, and the Flemish countries.

The holidays are the busiest time for bookings. A cassette called "The More Subtle Art" and now marketed by the group through the mail was made in response to requests for one when the quintet played at Members' Night 1988.

Mondays through Fridays, Stolze likes to walk to the train, transfer to the subway, and read during the comparatively long stretches between hikes. He may look over work-related projects or read—nonfiction about the Civil War or Indians, such fiction classics as *Moby Dick*, which he figures he's read five times, and Charles Dickens or Joseph Conrad.

The title of associate curator is highly prized. It carries with it a bit more money now, and it will make a bigger difference when Stolze retires. But that is something for later. Having finally found a life that pleases him so much, Bob Stolze is in no hurry to walk away from it. **FM**

Index to Field Museum of Natural History Bulletin, Volume 60 (1989)

Holland's presence may be easy to overlook in a world atlas. But not among the world's airlines.

Every day, KLM Royal Dutch Airlines blankets the globe with flights connecting over 135 business capitals on six continents.

In fact, we reach more cities in Europe, Africa and the Mideast than all U.S. airlines combined.

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FIELD MUSEUM TOURS

Legendary Shores
Turkey and
The Greek Islands

April 26 - May 7, 1990

Cruise and Land Fares
$3,395 - $4,545
Add air fare from Chicago - $600

Leader: William C. Burger, Ph.D.

Today, as in ancient times, the legendary Aegean is best appreciated from the sea. On this comprehensive itinerary we cruise in comfort and elegance aboard the *Illiria* to resplendent cities, idyllic islands, and ancient sites set against blue waters: Istanbul, Santorini, Ephesus, Crete, Mykonos, Rhodes, and Lesbos. Enhancing our voyage will be the team of expert lecturers, who bring the complex history of the region to life. Field Museum has selected Dr. William C. Burger, curator of vascular plants and a former chairman of the Botany Department to accompany our group. He will provide authoritative commentary on the plant life of the region and other aspects of natural history. Dr. Burger is also a highly skilled, widely published photographer who has taught courses in nature photography at Field Museum. He will be ready to share this special expertise with tour members as well.

We hope you will join us this spring as we visit these historic sites where western civilization was born.

Crow Canyon

September 16 - 22, 1990

Field Museum tours will be conducting an exciting tour to Denver's Crow Canyon Archaeological Center. The tour will offer a splendid opportunity not only to view, but to participate in an archaeological dig. At Crow Canyon you encounter the excitement of archaeology first hand. Here adults and students of all ages—most with no previous archaeological experience—excavate, analyze, and learn side by side with archaeologists.

Together you and the Crow Canyon scientists work toward an understanding of the Anasazi, the "Ancient Ones," who built countless stone pueblos centuries ago, and then departed. In this beautiful southwestern landscape they left villages, ceramics, tools, and silence. At Crow Canyon you help widen our knowledge of these early Americans.

Amazon
Jungle Rivers of South America: Puerto Ordaz, Venezuela to Manaus, Brazil

April 10-25, 1990

Cruise Price: $4,940 - $7,100
on the *Society Explorer*
Add International air fare from
Miami: $600

Leader: Barry Chernoff, Ph.D.

Our adventure along the Orinoco River into the heart of the Venezuelan jungle is an exceptional experience. You will pass through some of the most vast and virgin wilderness of Venezuela. Dr. Chernoff, an ichthyologist who has done much of his research in this area, is looking forward to sharing his expertise as we explore the river's tributaries. We will take a special flight over the world's highest waterfalls, Angel Falls. After stopping at Devil's Island, visiting the eerie ruins of this former French penal colony, now partly reclaimed by the jungle, we cross the equator at

the mouth of the mighty Amazon River and begin our exploration upriver. Each day we will make excursions in Zodiac landing craft, which make it possible for us to visit isolated villages, view colorful birds and butterflies, fish for unusual species, and take hikes into the jungle itself. Join us for an adventure to two of the world's greatest rivers.

The Galapagos Islands

March 2 - 13, 1990

Leader: John Flynn, Ph.D.

On many world maps it's difficult to find the tiny specks which appear off the coast of Ecuador in the Pacific Ocean. Yet, the Galapagos Islands are unique in their isolation. They contain mountains, forests, beaches, and bays unlike any others on earth. These islands lie 600 miles west of Ecuador, 800 miles south of Panama and almost 3,000 miles east of the nearest Pacific landmass. Most are relatively isolated from one another; a perfect setting for the evolutionary lab they would eventually become.

The first land inhabitants were windblown seeds that drifted into lava crevices and took root. The next were birds, perhaps also windblown, who stayed to breed. The last were reptiles, mainly lizards and iguanas, who rode tangled mats of river vegetation cast off the South American coast. But there the trend stopped. Few mammals arrived, and none who did was a predator. The result was a world which resembles earth's past. Birds ruled the air, reptiles the land. Furthermore, since there were no hunters, most species lived in peace. Life on these islands remains very much the same today.

We invite you to explore with us one of the world's greatest living laboratories of natural history. The primeval beauty of the area's colorful landscapes and wildlife excite the senses, and the remarkable tameness of the animals affords superb opportunities for wildlife study and photography.

We will fly from Chicago to Quito, Ecuador for three days, then on to Guayaquil/Baltra, where we will board the beautiful MV *Santa Cruz* and cruise comfortably to the islands of: Bartolome, Tower, Isabela, Femandina, North Seymout, Hood, Florena, Santa Cruz, and James.

Our stay in highland Ecuador provides a stimulating contrast in geology and wildlife. Dr. John Flynn, associate curator in the Department of Geology at Field Museum looks forward to sharing with you this unique experience unmatched by any other destination in the world.

Naturalist in Alaska

Circa July 10 - 25, 1990
(15-day tour)

Leader: David E. Willard, Ph.D., ornithologist
Accompanied by: Dan L. Wetzel, naturalist and tour operator

This expedition has been designed with an emphasis on education, for the person with keen interests and curiosities about the "real" Alaska. The 1,000-mile wilderness itinerary allows your personal interaction with the wildlife and wildlands of Alaska.

We begin our trip in Anchorage and move on to the Kenai Fjords, where we will experience the 38-foot bore tides, the second highest in the world, and a marked contrast to the one-foot tides of Prudhoe Bay where we complete our expedition. Our route includes Seward, Denali State Park, Denali National Park, Fairbanks, Coldfoot, and Sagavanirktok River. The Naturalist in Alaska Tour was created to bring the natural world of Alaska within your grasp. Let us send you more information about this unique opportunity.

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For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, IL 60605

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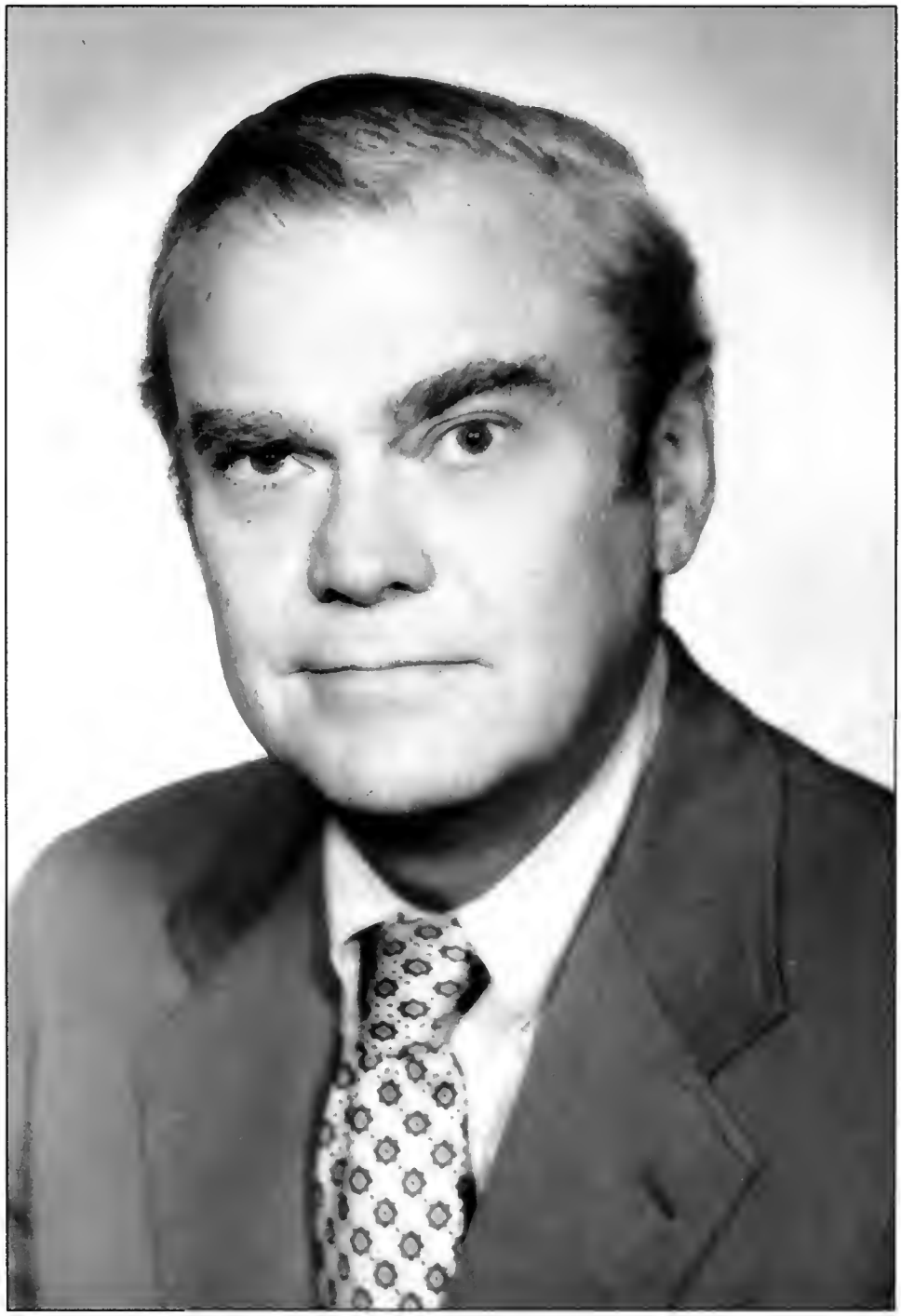
FIELD MUSEUM OF NATURAL HISTORY BULLETIN

March/April 1990



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Volume 61, Number 2

COVER

E. Leland Webber, 1920-1990. See pp. 7-9. 82696

Bulletin on Bimonthly Schedule

Beginning with the January/February 1990 issue, the Field Museum *Bulletin*'s schedule has changed to six issues per year from eleven. The Museum regrets this curtailment, brought on by the continuing rise of publication costs. The price of the *Bulletin* subscription, $3.00 per year for schools and $6.00 per year for individuals, remains unchanged.

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"He Works for the Museum"

Lee Webber examining mask from Papua New Guinea, 1960s photo.

Shortly after I came to the Field Museum as *Bulletin* editor in 1973, a colleague told me of a conversation with a young boy visiting the Museum. "What does your father do?" he asked the boy. "He works for the Museum," was the reply.

What a telling remark from a guileless 10-year-old. His father, Lee Webber, was then director of the Museum, the institution's chief executive officer. How eloquently this spoke, in turn, of Lee's estimation of his personal slot in the society of man.

My own most memorable encounter with Lee Webber was in 1976—the details remain clearly etched in my memory. I had discovered to my horror that two columns in the September issue of the magazine—which I had pasted up—were transposed. But the issue had already been printed; it belonged to history. Clearly, my only course of action was to tell Mr. Webber of the accident before someone else brought it to his attention. Though I was well aware of his reputation for demolishing errant employees, it seemed I had no choice.

"Can it be fixed?" he asked. I replied that the problem could be easily corrected by going back on press for 30,000 copies. "Well," he said, with the hint of a smile, "I guess we'll have to live with it, won't we?" He gave me a clap on the shoulder and told me to get back to work.

From then on, need I add, I would have scrubbed floors for the man. Lee Webber died on January 7, just days before his 70th birthday, following a brief illness. Though he now belongs to the ages, Lee Webber will live forever in the hearts of those privileged to have known him and worked for him.—*Ed.*

EVENTS

Hawaiian hula dancer, member of the Keolalaulani Halau Olapa O'Laka, a Hawaiian dance group which will perform during Field Museum's Pacific Festival, March 8 through 11. The group will also demonstrate traditional crafts from the Pacific. All Pacific Festival activities are free for members or with regular museum admission. For performance times and complete information call 322-8859.

Monte Costa, 1989 Waimea Park Makahiki

Adult Programs

In celebration of the opening of Field Museum's newest permanent exhibit, "Traveling the Pacific," adult programs feature the people and natural history of this region. These programs are supported in part by the National Endowment for the Humanities.

Adult Course

"Colonialists, Missionaries, and Anthropologist: A View of the Modern Pacific"

Western culture has influenced and, in some cases, damaged the cultural and political autonomy of Pacific Island peoples. This six-part series provides an overview of the ideas and people that have influenced the Pacific region and the responses of the diverse Pacific cultures.

AC90101, Wednesdays, 7:00 - 9:00pm
March 14 - April 18 (6 sessions); $60 ($50 members)

Special Lecture

"Margaret Mead: Pioneer of Ethnographic Film"
Malcolm Arth, Chairman, Department of Education, American Museum of Natural History

Malcolm Arth, anthropologist and long-time colleague of Margaret Mead, explores the coming age of enthnographic film. Focusing on Mead's pioneering work in the Pacific, Dr. Arth combines lecture with film clips and discussion. This lecture introduces the film series, "Films of the South Pacific: From Margaret Mead to the Present," scheduled Saturday, March 17.

LL90101, Friday, March 16, 7:00pm; $10 ($8 members)

Lecture Series

Sundays, March 11 - April 8, 1990 2:00p.m.
"People and Places of the Pacific"

The South Pacific remains, in the eyes of many, an area undefined geographically and romanticized culturally. This series introduces the many peoples of the area, their histories and cultures, and their links with the Western world.

Sunday, March 11
"Babeldaob to Majuro: A Guide to the Archaeology of Micronesia"

Brian Butler, Associate Director, Center for Archaeology Investigations, Southern Illinois University at Carbondale
LL90104

Sunday, March 18
"Art, Life, and Death in New Ireland, 1953-1981"
Phillip Lewis, Curator, Primitive Art and Melanesian Ethnology, Department of Anthropology, Field Museum
LL90105

Sunday, March 25
"Cargo Cults in the South Pacific"
Lawrence E. Sullivan, Associate Professor of the History of Religions, the University of Chicago Divinity School
LL90106

EVENTS

Sunday, April 1
"Pacific Encounters: Island Memories of World War II"
Lamont Lindstrom, Associate Professor, Department of Anthropology, The University of Tulsa
LL90107

Sunday, April 8
"Polynesian Music and Dance"
Adrienne Kaeppler, Curator of Oceanic Enthnology, National Museum of Natural History, Smithsonian Institution
LL90108

Entire Series: $20 ($12 members) LL90109
Single Lecture: $5 ($3 members)

Film Series

"Films of the South Pacific: Margaret Mead to the Present"

Ethnographic and documentary films present the remarkably diverse cultures of the Pacific Islands in an unique manner. The filmmaker's skill and the filmmaker's individual view combine with fascinating results. Included are early works of Margaret Mead through contemporary pieces.

LL90102, Saturday, March 17, 12:30 - 4:30pm, $10 ($8 members)

Arth Lecture and Ethnographic Film Series; LL90103; $15 ($12 members)

Also in March/April . . .

Family Performance

"Do You Really Want A Dinosaur?"
Trinity Square Ensemble
Saturday, March 24, 1990, 2:00pm

It is the magical summer before her 10th birthday and Marty has permission to get the pet of her choice. Marty's idea of a great pet happens to be a dinosaur. Join her as she takes a journey through knowledge and imagination in search of her dream dinosaur.

Tickets: $5.00 for adults; $3.00 for children 12 and under.

Discover the beautiful and sophisticated weaving techniques of the ancient Peruvians, learn to speak conversational Swahili, try your hand at the ancient art of Chinese Brush stroke, or create three-dimensional Origami figures. For a full listing of adult courses and workshops, consult the March/April/May Adult Programs brochure or call the Department of Education at (312) 322-8854.

Registration for People and Places of the Pacific

Be sure to complete all requested information on this registration application. Registrations are confirmed by mail. For registrations received less than two weeks before the program date, confirmations are held at the West Door one hour before the program begins. Phone registrations are accepted using Visa/Master Card/Amx/Discover. Please call (312) 322-8854 to register. For further registration information, consult the March/April/May Adult Program Brochure.

Return complete registration with a self-addressed stamped envelope to:

Field Museum of Natural History
Department of Education, Program Registration
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Programs/Number	Date	Number of Members	Number of Nonmembers	Amount Enclosed
People and Places of the Pacific	Indicate Date(s):			
Colonialists, Missionaries, and Anthropologists: A View of Modern Pacific AC90101	March 19, 7:00 pm- April 18, 9:00 pm			
Margaret Mead: Pioneer of Ethnographic Film LL90101	March 16, 7:00 pm			
Films of the South Pacific: Margaret Mead to Present LL90102	March 17, 12:30 pm			
Malcolm Arth Lecture and Film Series LL90103	March 16, 7:00 pm March 17, 12:30 pm			

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Thanks to Harold K. Voris

Harold K. Voris 84347

From the Board of Trustees:

Field Museum of Natural History is indebted to Harold K. Voris for almost five years of service as vice president for Collections and Research.

Dr. Voris began his career at Field Museum in 1973 as assistant curator of Amphibians and Reptiles in the Zoology Department. He established a reputation as a top-notch herpetologist and evolutionary biologist. He is one of the world's experts on sea snakes and a superb field biologist; his publications and analyses are based almost entirely on data resulting from his field work. Dr. Voris was also the first scientist at Field Museum to introduce and make use of biochemical techniques in systematic studies; Field Museum now has a biochemical lab with a full-time manager who is expanding the abilities of the lab in new and exciting directions.

Talents such as those possessed by Dr. Voris did not go unnoticed, and in March 1985 he was asked to serve as the Museum's first vice president for Collections and Research. Dr. Voris brought to this position the same insight and organizational abilities that are so successful in his research. Under his leadership, the scientific area began a move towards excellence that has gathered momentum and is continuing now under his successor, Dr. Jonathan Haas. Many tasks were accomplished during his nearly five-year tenure as vice president, and many directions he initiated will be realized in the coming years. He has been an exceptional academic and administrative leader. He has effectively established the role of vice president for Collections and Research and set a high standard for the future.

The Trustees of Field Museum of Natural History express their sincere gratitude to Harold K. Voris for his service and leadership in science at Field Museum.

From His Colleagues:

Harold Voris was happily tucked away in the basement of Field Museum, in close proximity to his beloved sea snakes, where he could study their every move and nuance, when along comes some administrative type and asks him to get involved in a navel-examining, paper-pushing project called *Centennial Directions*. This is the point at which nine out of your average ten curators would have said, "Get serious!", but not our Harold. No, Harold was (fill in the blank according to your preference) *naive? stupid? foolish? good-hearted?* enough to say, "sure, sounds like a lot of laughs." Thus began his dive into the administrative depths of Field Museum, eventually landing him into the position of vice president for Collections and Research.

So Harold moved up to the third floor, where the air is a little thinner and tried to keep his brain cells intact, in spite of the fact that he had to wear a tie every day and often a jacket too, and keep his fingernails clean and his shirt spotless and act polite to people and make rational decisions and all kinds of things that are difficult for nine out of your average ten curators. Not to mention attending docket and countless other meetings that would turn just about anyone's mind into Jello. And with occasional forays to Borneo to spend a few weeks lifting up rocks and hoping something slimy would be underneath, he managed to do it for almost five years.

For this, Harold, we say thank you. Thank you for all those mornings you put on a tie and did it again for the good of science at Field Museum. Thank you for watching over the hopes, needs, and wants of the scientific area and representing those at those countless meetings. Thank you for doing the job with a sense of humor so we have giggle hour at late afternoon meetings. Thank you for doing it so that no one else had to.

E. Leland Webber

1920–1990

E. Leland Webber, chairman of the Field Foundation of Illinois, president emeritus of Field Museum of Natural History, and long-time civic leader, died on Sunday, January 7, at Evanston Hospital in Evanston, Illinois. Memorial Services for Mr. Webber were held January 12, at the Church of the Holy Comforter in Kenilworth, Illinois.

Mr. Webber was recognized as one of the foremost museum leaders in the United States. Born in Chicago in 1920, he entered the museum world at age 13 as a student usher for lectures at the Field Museum in the 1930s. Higher education and World War II took him away from the Museum. He returned to the Museum in 1950 following several years with the accounting firm of Ernst and Ernst. In 1962 he was appointed director of the Field Museum and later president. Mr. Webber retired as president in 1981 and since that time he had remained an active and valued member of the Field Museum Board of Trustees.

Mr. Webber's impact on the Field Museum was dramatic and enduring. Although not a museum curator himself, Mr. Webber quickly and sensitively grasped the essence of an institution engaged in research, exhibits, and public programs based on encyclopedic collections pertaining to the world's physical and cultural environments. Under Leland Webber's leadership, Field Museum embarked on a major program of providing increased and advanced collection storage and research space, and commenced the remounting of exhibits in the nearly 500,000 square feet of the Museum that is open to the public.

Among the many important exhibit projects initiated during Mr. Webber's tenure at Field Museum were the reinstallation of the Northwest Coast Indian, Eskimo, and Jade collections. The Pawnee Earth Lodge and the Place for Wonder were inaugurated and became national examples of how a museum can involve visitors actively. Mr. Webber initiated a special traveling exhibit program for the Field Museum which brought to Chicago "The Treasures of Tutankhamen," "The Great Bronze Age of China," and other milestone exhibits. The pace of the Museum's public programming increased dramatically under his leadership. Adult courses, field trips, and a variety of festivals were introduced to the public.

Lee Webber was imaginative yet practical; he engendered respect and affection from all who worked with and knew him. The Field Museum stands at the forefront of its genre because of his exemplary leadership.

In 1987, Field Museum opened the Webber Resource Center for Native Cultures of the Americas as a tribute to Leland Webber. This center makes available to the public a variety of materials concerning the cultures of the indigenous people of the Americas. This in-depth approach to visitor learning reflects the commitment E. Leland Webber had throughout his life to helping people from all backgrounds learn about natural history.

As a result of his exceptional leadership in Chicago, Mr. Webber's counsel was sought in the American and international museum community. He was an active and influential member of the American Association of Museums (AAM), serving as both vice president of the association and as a member of its Executive Committee from 1966 to 1970, and was chairman of the Association's Committee on Museum Needs, which prepared "America's Museum: The Belmont Report" from 1967 to 1969. From 1979 to 1984, he was a member of AAM's Legislative Committee, serving as chairman from 1981 to 1984. In the spring of 1989, the American Association of Museums named Leland Webber recipient of the association's highest honor, the "Distinguished Service to Museums Medal," given to an individual who has made a cumulative contribution to the field of museums. Mr. Webber was an active member of the Association of Systematic Collections. He was appointed by President Nixon to the National Council of the Arts and by President Carter to the National Museum Services Board. Mr. Webber served as a member of the Joint Committee on Museums for the Indo-U.S. Subcommission on Education and Culture from 1976 to 1982.

Upon his retirement from the Field Museum presidency in 1981, Mr. Webber undertook several vital projects of significance for metropolitan Chicago. At the behest of the philanthropic community, he visited the headquarters of corporations located in Chicago to encourage increased philanthropic support by corporations. In 1985-86, he served as interim president of the

United Way/Crusade of Mercy Campaign.

In 1982, Leland Webber was elected a director of the Field Foundation of Illinois, Inc., and in 1983 was elected chairman. The Foundation is an independent, philanthropic foundation aiding institutions and agencies in the fields of health, welfare, education, culture and civic affairs in the Chicago area.

Among his many activities, Mr. Webber served on the boards of the Savings & Profit Sharing Fund of Sears Employees, Sears, Roebuck & Co., Growth Industry Shares, William Blair Ready Reserves, Illinois Chapter of the Nature Conservancy, the Illinois State Museum Board, the State of Illinois Board of Governors of State Colleges and Universities, and served as chairman and member of the board of the Chicago YMCA Hotel. He was also a member of the Chicago Committee of the Chicago Council on Foreign Relations, the Southside Planning Board, and the National 4-H Service Committee. His club memberships included Commercial, University, Tavern, Economic, Arts, Caxton, and Michigan Shores.

Leland Webber was an active member of the Church of the Holy Comforter in Kenilworth, Illinois.

In recognition of his public service, Mr. Webber's awards included Egypt's "Order of the Republic" from President Anwar Sadat in 1979, for the presentation of the "Treasures of Tutankhamen" exhibit and the Ex-

Artist John Underwood shows Lee his collection of twin figures from western Nigeria which he acquired there in the early 1960s. The Museum, in turn, acquired the valuable pieces from Underwood 1967 photo. 81038

Lee with dignitaries and other visitors during opening of Moon Rock exhibit in 1969.

Lee With (l. to r.) Dave Willard, manager of the Bird Collection; actress Helen Hayes (a close friend of Lee's); Mrs. G. Corson Ellis; and Mel Traylor, curator of Birds. 1980.

ceptional Community Service Award from the University Club of Chicago in 1973. He received an LHD from DePaul University in Chicago in 1980 and was a fellow at the Rochester Museum of Science Center in 1970.

Mr. Webber received his B.B.A. from the University of Cincinnati in 1942 and completed studies at the University of Illinois in preparation for his C.P.A., awarded him in 1949. He served as an officer in the U.S. Naval Reserve in the Pacific from 1942 to 1945.

Mr. Webber is survived by his wife, Joan Wray Malloch of Wilmette, and his children: Leland Duer of Marlborough, Massachusetts; James Randall of Wilmette, Illinois; Ellen Robinson of Madison, Wisconsin; and his grandchild, Ellen Duer. Mr. Webber was preceded in death in 1974 by his first wife, Ellen Gowen Duer.—*Willard L. Boyd.*

A visiting physicist from China with Lee in 1978. 82858


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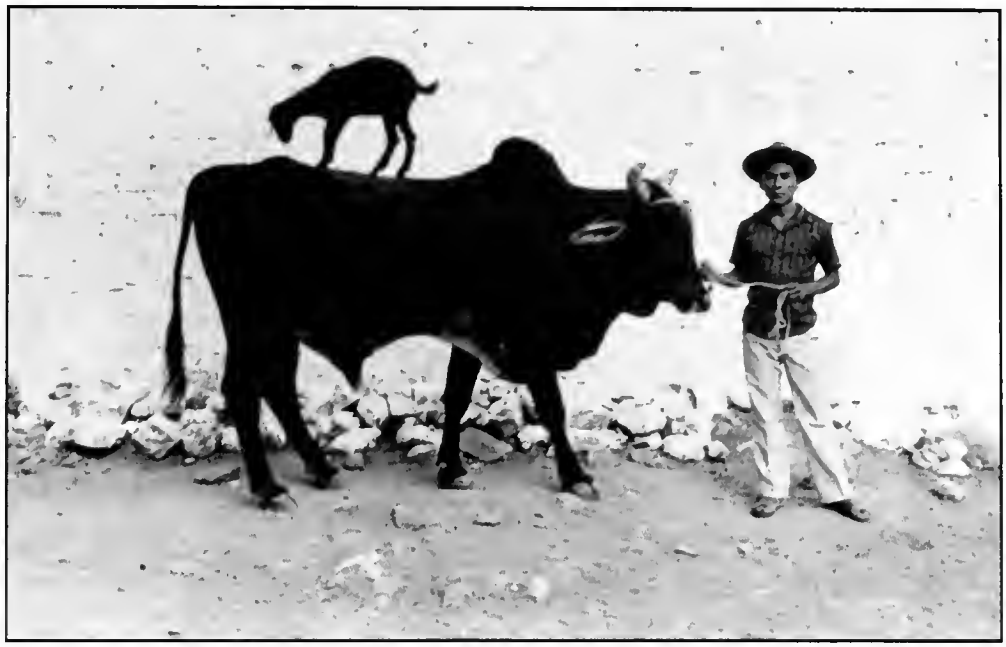

A collection of approximately 50 black and white photographs that reflect photographer Flor Garduno's interest in the traditions of her native Mexico. One important tradition captured in these photos is the role played by animals in the lives of Mexican people and the underlying belief that all human beings are born with an animal as a personal guide.

Flor Garduno's photographs exist simultaneously as documents of individuals and communities alive today and as mirrors into a culture with a legacy so complex and distinct from mainstream western society that it is generally misunderstood except by the most astute observers. By isolating moments of celebration and ritual with such clarity, Garduno's imagery offers the possibility of comprehending the connection between the past and present, the real and fantastic, in traditional Latin American life.

In Mexico, photography as a document of common people has been inseparable from its development as an art form. That photography could record historic events as momentous as the Mexican Revolution as well as interpret the diverse cultures of the nation gave impetus to use of the medium early in its existence by journalists and artists alike. Perhaps because of the very richness of the culture and its remarkable visual products, Mexican artists seized the opportunity offered by the camera to create a form of expression that melded documentation with visual poetry. The tradition that developed with this use of photography is perhaps best known through the work of Manuel Alvarez Bravo; it has evolved and remained vital among subsequent generations of artists that include Mariana Yampolsky, Pedro Meyer, Graciela Iturbide, and most recently, Flor Garduno.

Garduno has traveled extensively to those areas of Mexico where popular traditions persist. The photographs reproduced here were made in the 1980s in Guerrero and Puebla, states which precariously accommodate communities of both modern and traditional populations. The indigenous Indian people that are Garduno's subject live in the shadow of alien ways that aggressively encroach upon them; the fiercely guarded traditions that foster meaning in their individual and communal lives are at once the fuel for their vitality and the cause of their vulnerability in the contemporary world. Her photographs could be valued solely because they illustrate disappearing customs but they are not dispassionate documents. Rather, they suggest why tradition endures—even at the end of the twentieth century—and can be valued in and of itself.


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THE MUNICIPALITY
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EVER SEEN IN AMERICA.
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Field Museum to Participate in Chicago Day 1990

On Sunday, April 29, the Field Museum will participate in **Chicago Day 1990** — an event uniting eleven Chicago cultural institutions in a celebration of the city's heritage of art, architecture, music, theatre, social reform, and education.

Chicago Day is sponsored by AT&T and is based on a similar celebration which took place at the 1893 Columbian Exposition — nearly 100 years ago. At that time, citizens of Chicago boasted of the city's rise from the ashes of the 1871 fire and celebrated with a free admission and open house day at this world's fair. Similarly, participating institutions will be opening their doors free of charge to the public during **Chicago Day 1990**.

Chicago Day 1990 on April 29 is a special highlight of a five-year period of centennial celebrations taking place between 1989 and 1993. Free admission, special programs, and behind-the-scenes tours will be offered at the Field Museum and at the following institutions: Art Institute of Chicago, Auditorium Theatre/Roosevelt University, Chicago Botanic Garden, Chicago Historical Society, Chicago Symphony Orchestra, Frank Lloyd Wright Home & Studio Foundation, Hull House Association and Jane Addams' Hull-House Museum at UIC, Illinois Institute of Technology, University of Chicago, and Visiting Nurse Association of Chicago.

There will be a special bus service linking these institutions on **Chicago Day;** however, it will not serve participants in Oak Park and Glencoe.

For more information on **Chicago Day,** contact Field Museum's Public Relations office at (312) 322-8859.

Lithograph poster (original in color) announcing the first Chicago Day, Oct. 9, 1893, held during the World's Columbian Exposition. Courtesy Chicago Historical Society.

PACIFIC ENCOUNTERS

Island Memories of World War II

March 7 through June 3

World War II swept into the Pacific islands with incredible speed and force. The story of the massive, cross-cultural encounters and social disruption that islanders experienced during the war is documented through this interesting exhibition of 70 black and white photos, taken in the Pacific islands between 1942 and 1945.

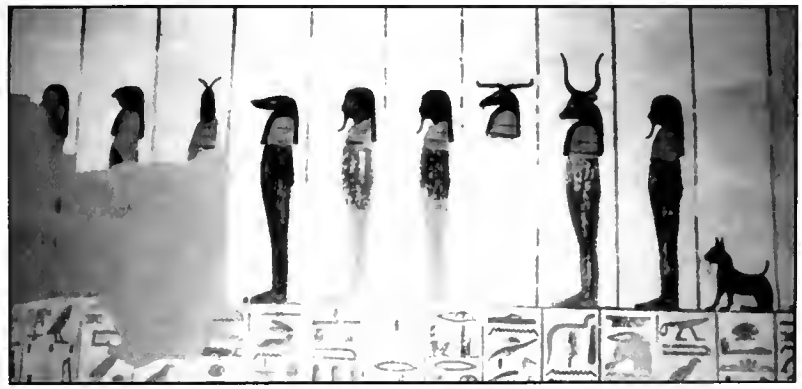
The sheer magnitude of the war would be enough to ensure its place in island memories. On the island of Guadalcanal, for example, the number of Allied and Japanese who *died* on the island in just nine months of fighting was nearly double the total indigenous population of 15,000. But, for most islanders, the events which unfolded between 1942 and 1945 amounted to much more than a massive military confrontation; they marked a turning-point in the history of race relations and the development of island nations. It is this story of massive cross-cultural encounters and social disruption, which is the main focus of this exhibition.

The war came at a critical moment in the history of many island communities struggling to define their relations with colonial authorities and the wider world. For some people, the war presented opportunities for improved status and government involvement; while for others it offered new ideas and skills which could be used to challenge entrenched colonial regimes. In areas where Islanders had become increasingly restless with domineering colonial officers, the encounter with powerful, exotic, and often friendly military personnel was a catalyst for change.

Like any major event in the history of island societies, wartime experiences have been incorporated in local oral traditions—historical "archives" which depend for their existence on the memories of a disappearing generation of Pacific islanders. This exhibition is designed to use these oral traditions plus photographs from the war era to portray contributions that islanders made to the war effort (on both Allied and Japanese sides), as well as something of the meaning of those events for islanders themselves. Although mostly taken by foreign military personnel, the photographs capture many of the activities and scenes which recur in island recollections of the war. The selection of photographs is necessarily limited to the topics and events which suited the purposes of Allied and Japanese photographers. So, for example, ceremonies of all kinds—awarding medals, conducting church services, and the like—were highly photogenic, whereas there is little photographic record of the experiences of village women and children who struggled to survive while whole villages of able-bodied men were recruited as laborers and fighters.

The Cat and Ancient Egypt

by Frank J. Yurco, Egypt Consultant



1. The "Great Cat" (right) among the 75 other manifestations of the sun-god, Re; tomb of Pharaoh Siptah, Valley of the Kings, Thebes, Egypt; Dynasty XIX. F. J. Yurco photo.

The domestic cat, *Felis silvestris familiaris* (or *maniculata*), is a relative latecomer among the various domesticated animals associated with humankind. Representations of it won't be found in the cave and rock paintings of prehistoric Africa and Europe, nor does it appear for certain among the domesticated animals of the early Neolithic period in the Middle East. It is in ancient Egypt that the pictorial and inscriptional evidence first comes together to make certain that the domesticated cat is present; and indeed, in Egypt the cat attained a very lofty status, becoming associated with divinity in the personae of the goddess Bastet and in one manifestation of the solar deity.

Small catlike carnivores like *Felis silvestris libyca* proliferated in the North African environment of ancient times.[1] The Sahara has passed through cycles of dry and wet periods within recent geological time (the last 12,000 years), and during the arid periods such large carnivores as lions and leopards could not sustain themselves in that environment. Their niche was occupied by smaller carnivores, including jackals, hyenas, wild dogs, and, among felines, by several possible ancestors of the domestic cat. In the wild state, the small felines like the cat focus their hunting on small animals, birds, reptiles, and occasionally insects. As this group of prey includes rats and mice, such small felines had a natural inclination to associate with humans, especially once humans began the large-scale storage of foods, cereal grains in particular.

Grain storage bins were appealing to small rodents, including rats and mice, and these were included among the regularly hunted prey of the small felines. This may well be how the ancestors of the domestic cat were drawn first to associate with humans. Grain storage on a large scale first appeared among the ancient Egyptians of the late Predynastic era, the Sumerians in Mesopotamia, and the peoples of the Indus Valley and China. All these civiliations produced grains on a large scale (wheat, barley, or rice) and had occasion to store surpluses, for export, or as a reserve against years of famine. It is in those civilizations, then, that the ancestors of the domestic cat likely would appear first. Indeed, at Haçilar and Jericho, sites in what are now southwestern Turkey and northern Israel, respectively, bones of small felines have been found among the remnants of early farming villages of the 6th and 5th millennia B.C.;[2] but whether these bones represent domesticated ancestors of the cat is uncertain. Likewise, bones of catlike felines have been found at Egyptian Predynastic sites (5000-3100 B.C.);[3] but again, lacking pictorial or incriptional evidence, it is not certain which of the small feline carnivores these remains represent.

It is in Egypt that the pictorial and inscriptional archive for the domestic cat eventually becomes quite well documented. In the language of ancient Egypt,

2. Cat, as bailiff, brings bad boy before mouse judge. Oriental Institute limestone ostracon, painted, no. 13951; Deir el-Medinah, Egypt; Dynasty XIX-XX. Oriental Institute photo.

the word for cat is  *miw*, "meow," with a picture of a seated cat as determinative, or word classifier.[4] The earliest dated literary references are from the Middle Kingdom (*ca.* 2040-1786 B.C.), in the earlier part of the period.[5] Earlier pictorial representations do occur, but they are somewhat ambiguous. Small felines, or felinelike animals are represented on Early Dynastic (*ca.* 3100-2770 B.C.) objects.[6] The problem lies in that these depictions are not labelled *miw*, or are so fragmentary that establishing just what feline is involved is difficult.[7] Add to this situation the fact that the ancient Egyptians venerated a variety of felines ranging from lionesses to leopards and panthers, as well as smaller felines, and the complexity of the evidence becomes understandable.

With the coming of the Middle Kingdom period, the mystery begins to clear up. In this period, as seen above, inscriptions certainly refer to the *miw*, and the pictorial references make it certain that the domestic cat is present beyond doubt.[8] Once attested, the cat speedily made itself well adjusted to Egyptian culture. Besides becoming a cherished pet, it was a relentless mouser, helping to protect granaries and other food storehouses; and further, its daring in challenging serpents won for it much additional veneration.

The ancient Egyptians recognized divinity in many aspects,[9] and various felines found themselves included in this development. Very early in pharaonic history, one such feline was recognized by the name Mafdet.[10] She is represented on a vase fragment, on a mud jar-sealing, and on the royal kinglist known as the Palermo Stone; usually she is shown in full feline form scampering up the pole of an execution device.[11] This depiction linked Mafdet with the execution of evildoers, and in this guise she became popular in Old Kingdom religious cult. She was also known for battling serpents, and this won her great respect. Scholarly opinion is divided on whether Mafdet should be seen as the domestic cat,[12] as some other feline,[13] or as a mongoose.[14]

In favor of the domestic cat, Sir Alan Gardiner recounted an incident at Abydos, where a cat belonging to two English scholars working there in the 1930s, killed horned vipers, a very deadly type of serpent, by pouncing on them, holding them down with its claws, then biting them.[15] From my own experience in Egypt, I recall a domestic cat confronting, although not attacking, a cobra. Likewise, in religious texts the

3. Statue of Sekhmet, black granite; Temple of Mut, Karnak, Egypt; Dynasty XVIII. F. J. Yurco photo.

ancient Egyptians recognized this serpent-killing ability of the cat. Both in the funerary papyri known as *Books of the Dead* (chapter 17) and in tomb paintings of the New Kingdom Period (*ca.* 1570-1080 B.C.), a tomcat, titled as "the Great Cat who dwells in Heliopolis," is depicted and described as cutting off the head of the dangerous serpent, Apophis, entwined around a Persea tree.[16] This tomcat, whether the short-tailed jungle cat or the domestic cat, usually is shown with a spotted coat and ringed legs and tail; he was so venerated that one of the 76 manifestations of the sun-god was represented as a tomcat (fig. 1). The ability of modern Egyptian cats to tackle vipers or other serpents lends support to the idea that the Great Tomcat of Heliopolis was indeed a domestic tomcat.[17] This aspect of the cat—the ability to tackle serpents—assured its status in Egypt, for while a cat that is a good mouser is both useful and desireable, a cat that takes on serpents can be, absolutely, a lifesaver.

In the New Kingdom period and later, the domestic cat achieved widespread popularity. Frequently the subject of tomb paintings, it is shown in hunting scenes helping catch marsh birds from its owner's papyrus skiff,[18] or else sitting or lying down under the chair of the lady of the house.[19] Its position as a cherished pet is well attested. A son of Pharaoh Amenhotep III (1386-1348 B.C.), Prince Thutmose, was so attached to his cat that when she died he had her embalmed and fitted out with a small sarcophagus (now in the Cairo Museum), complete with reliefs showing the cat and funerary texts.[20] She is called "The Osiris, Ta-Mit," the kitty's name evidently being simply the feminine form of *miw.* At the head and foot of the sarcophagus, she is under the protection of Isis and Nephthys, so that just like a human, she was envisioned as gaining eternal life through Osiris. The prince included his own titles and name, so we learn that he was the elder brother of the

4. Head, from Sekhmet statue, black granite; Field Museum no. 31720; from Mut Temple, Karnak, Egypt; Dynasty XVIII. Dave Walsten photo.

prince who later became Pharaoh Amenhotep IV (Akhenaten); he was High Priest of Ptah, stationed in Memphis, and also crown prince and royal heir, but evidently predeceased his own father, Amenhotep III.

Most painted depictions of cats in the New Kingdom show them with brown tabby markings, in various attitudes and modes of behavior familiar to anyone owning a domestic cat. More and more in this period, the domestic cat was identified with Bastet, and it even entered into literature and humor. On one papyrus, cats are shown acting as servants at a mouse-king's court.[21] They carry baby mice wrapped in swaddling clothes and serve their mouse masters in various ways.

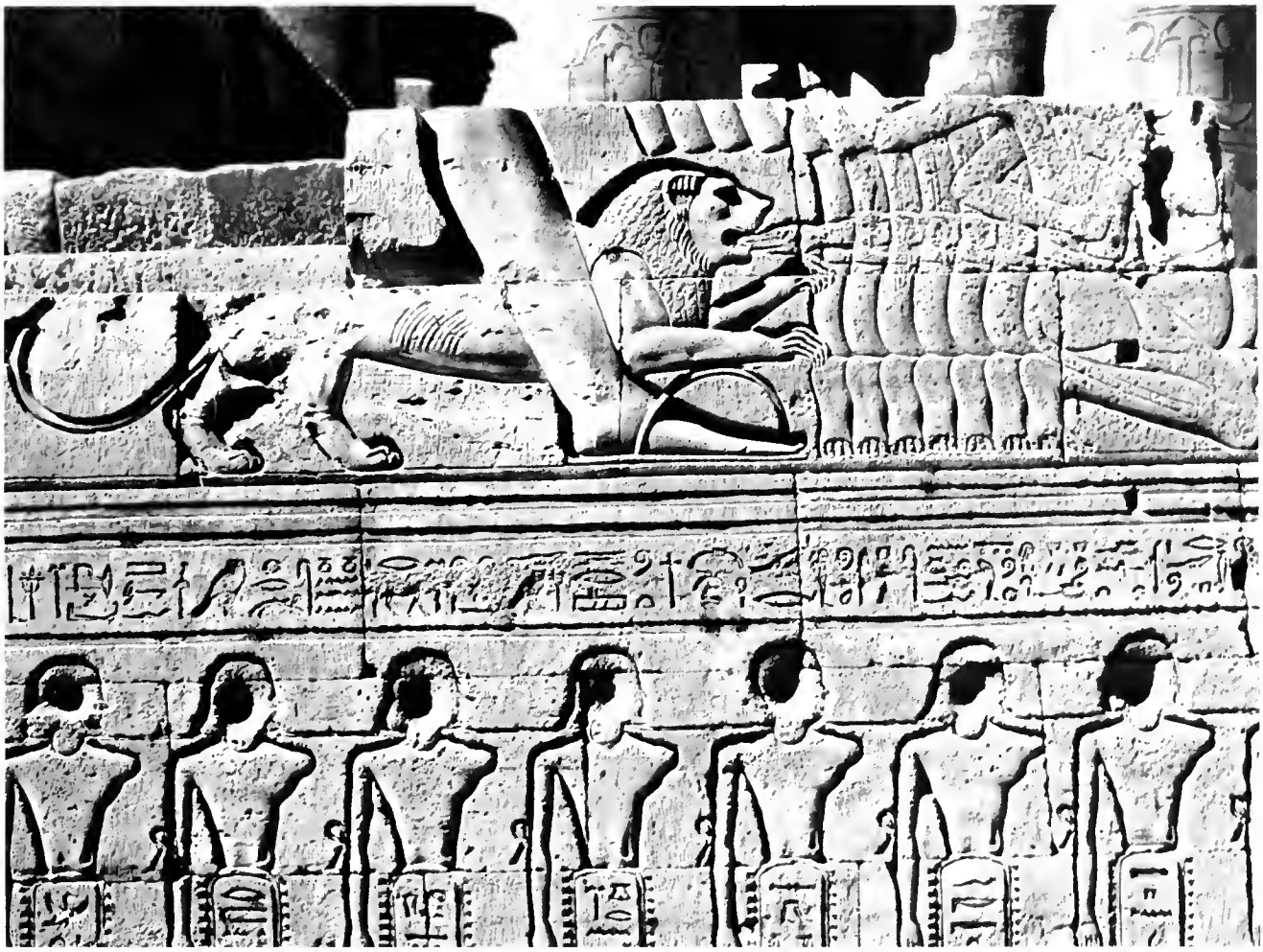
5. Miyisis, or Mahes, son of Bastet, bronze figures; cats. 30282 (left) and 30283; Late Period; negs. 8067, 8069.

Another satirical and humorous papyrus in Turin, Italy, shows cats defending a fortress under attack by a pharaoh-mouse in a chariot drawn by dogs.[22] In another scene on this papyrus, and on another in the British Museum, cats act as shepherds herding a flock of geese.[23] At the Oriental Institute in Chicago, a limestone ostracon (fig. 2) shows a cat acting as bailiff who brings a miscreant boy into court before a mouse acting as judge. All of this suggests that the cat had secured for itself a familiar and comfortable niche in the milieu of ancient Egypt.

In the Middle Kingdom and New Kingdom periods the domestic cat became more firmly associated with the feline deity, Bastet, mistress of Bubastis. Bastet was originally a lioness, with a cult center also at Heliopolis, where she was "daughter of Atum," and at times she was identified with Tefnut.[24] The existence of other feline deities, such as Sekhmet (figs. 3, 4) of Memphis, and Pakhet of the Beni Hasan area in Middle Egypt, gave her entrance to cults in those areas, when she was identified with the resident felines. Both Pyramid Texts and a Middle Kingdom hymn associate Bastet with the crown and make her a protectress of the king and of the Two Lands (Egypt).[25] Clearly, the ferocity of the lioness was stressed in Bastet in these aspects. In the New Kingdom, Pharaoh Ramesses IV (1151-1145 B.C.) forbade the hunting of lions on the various feast days of Bastet.[26] These associations reinforced the image of Bastet as an aspect of Sekhmet, and she was even thought to have given birth to a lion diety, Miyisis, or Mahes, who became a warrior god, guardian of pharaoh and of sacred sites (fig. 5), and the one who mauls the foes of pharaoh (fig. 6).[27]

Bastet, though, had another nature, as shown by a text that calls her "ferocious as Sekhmet, and as peaceful as the domestic cat."[28] In these two guises she typifies the ability of Egyptian deities to be manifest in differing aspects, something seen in almost all the references to deities discussed here. The magnificent bronze figure of Bastet in the Field Museum's collection (no. 31642) well illustrates these dual aspects (fig. 8). Majestically seated on a throne, she has the head of a lioness, but in her right hand she holds an instrument called a sistrum, and texts on the throne identify her as Bastet. The sistrum is associated with music-making, more in keeping with the character of Hathor (fig. 9), goddess of love, music, dance, and festivity.[29]

Increasingly, in the Post-New Kingdom era (1080-664 B.C.), Bastet came to be associated with the domestic cat rather than the lioness. A major boost to her popularity came in Dynasty XXII-XXIII (945-712 B.C.), when pharaohs of Libyan ancestry made Bubastis, home of her principle shrine, their royal city. Large temples to Bastet were built, and she became a national ranking deity. Perhaps it was in this period that commenced the feasts and pilgrimages, replete with feasting, dancing, and merry-making, that were mentioned by Herodotus, the Greek historian, who visited Egypt in 448 B.C.[30] It was also in this period that vast numbers of small and medium-sized bronze images of Bastet, shown either as a female human with a cat's head, sometimes with kittens standing before her or held in a basket, or simply shown as a cat, were produced as votive gifts to the goddess (figs. 9 and 10). These have been found in areas with shrines devoted to Bastet and often are inscribed with prayers. The presence of kittens stressed another aspect of Bastet, that of protectress of family and children. That indeed was the environment in which the domestic cat was often found.



6. Miyisis as a lion, mauls foes of pharaoh; wall relief, sandstone; Temple of Kom Ombo, Egypt; Roman Period. F. J. Yurco photo.

By the Late Period (664-332 B.C.) and the subsequent Ptolemaic Era (332-30 B.C.), the sanctity of Bastet was extended to cover all domestic cats. This is demonstrated in the now-growing practice of mummifying and burying all dead cats in cemeteries attached to the various shrines associated with Bastet. Vast numbers of cats were thusly interred, at Bubastis, at Memphis (where recently the enormous cemetery adjacent to Bastet's shrine has been discovered intact with thousands of mummified cats), and at Beni Hasan (whence large numbers of mummified cats were extracted in the 19th century).[31] Most of the Field Museum's mummified cats (fig. 11) probably came from the Beni Hasan cemetery. Yet, so numerous were the cat mummies that all but the finest were unwrapped summarily. Their linen bandages were exported to the United States during the American Civil War (1861-65) to a New England factory that turned them into linen-based paper.[32] The cat mummies were shipped to England, where, pulverized, they were used as plant fertilizer!

Stories from the Ptolemaic era recount how highly cats were regarded in Egypt. According to Herodotus, if a house caught fire, the inhabitants rushed in to save the cats, or ringed it to keep the cats out.[33] Diodorus Siculus recounts that at Alexandria, when a visiting Roman dignitary accidently killed a cat in 60-59 B.C., an outraged mob gathered and lynched him.[34]

If not earlier, then certainly in the Late Period, domesticated cats spread beyond Egypt to surrounding Mediterranean lands. Roman period mosaics and murals depict the cat. The use of cats aboard ships to keep rats under control no doubt helped Egyptian cats to spread abroad. So, many European, and by extension American cats may have some genes derived from the *miw* of ancient Egypt. Indeed, cat fanciers identify one breed, the Abyssinian, as descended directly from the cats of ancient Egypt. More certainly, the current

7. Above: *Hathor playing castanet, column relief, sandstone; Temple of Dendera, Egypt; Roman Period. W. J. Murnane photo.*

8. Left: *Bastet enthroned, with lioness or panther head, bronze; cat. 31642; perhaps Dynasty XXVI; neg. 108334. Dave Walsten photo.*

9 Bastet as a cat, bronze with gold, silver, and copper details. cat. 30286; perhaps Dynasty XXVI; neg. 111081. Photo by Ron Testa and Diane Alexander White.

11. Cat mummies; cats. 111503 and 111512; Ptolemaic Period; neg. 71309.

10. Left: *Bastet as cat-headed female, bronze; cat. 30287; Late Period; neg. 8068.* Right: *Cat with kittens, votive to Bastet, bronze; cat. 30285; Late Period; neg 1358.*

fascination with the domestic cat mirrors that of ancient Egypt.[35]

The tameability of small felines makes it difficult to assess the question of who first domesticated the cat. Was it in one locale or in several, for small felines fill an ecological niche worldwide? Egyptian paintings and reliefs of the New Kingdom Period show us cats on board ships, and Egyptian ships were plying the Mediterranean and Red Seas from the Old Kingdom period (fig. 12) and probably earlier. The bones and statuette found at Hacilar and Jericho might argue for multiple domestication places, but the bones found in Predynastic Egyptian sites, and the presence of *Felis libyca* on the prehistoric Sahara make certain that Egypt was one of the domestication sites also. The Abyssinian breed derives from *Felis libyca*, and it is found in modern Egypt alongside more common varieties. In the Ptolemaic Period and later (after 118 B.C.), Egyptian ships sailed to India and the Far East for trade; did the *miw* accompany them on those voyages? Probably, but there are again small felines indigenous to the Far East that may have been independently domesticated.

Certainly, in Egypt proper domestic cats never lost their popularity. Roman, Byzantine, and Islamic Egypt all document their presence, and today they occur in every Egyptian city, town, and village. No doubt the continued presence of mice, rats, and serpents, and the cat's ability to tackle them all, assured its place even after the worship of Bastet waned with the spread of Christianity. **FM**

12. *Egyptian ships arriving from Syria, wall relief, limestone; causeway of Unas Pyramid complex, Saqqara, Egypt; Dynasty V. F. J. Yurco photo.*

Footnotes

1. Banks, Kimball M. *Climates, Cultures, and Cattle:* The Holocene Archaeology of the Eastern Sahara (Dallas: Dept. of Anthropology, Southern Methodist Univ., 1984), pp. 16, 51 (table III:1), 119, 164 (table V:9), and 232-233.

2. Petzsch, Hans, "Zur Problematik der Primärdomestikation der Hauskatze (*Felis Silvestris 'Familiaris'*)," in Janós Matolcsi, ed., *Domestikationforschung und Geschichte der Haustiere* (Budapest: Akademiai Kiadó, 1973), pp. 109-113; Helck, Wolfgang, "Katze," in *Lexikon der Ägyptologie*, Band III (Wiesbaden: Otto Harrassowitz, 1978), pp. 367-369. The Haçilar find included a statuette of a woman playing with a cat.

3. Brunton, G., and G. Caton-Thompson. *The Badarian Civilization* (London: British School of Archaeology, 1928), p. 94; Janssen, Jacques and Rosalind. *Egypt.an Household Animals*, Shire Egyptology, vol. 12 (Princes Risborough: Shire Publications, 1989), pp. 14-19.

4. Erman, Adolf and Hermann Grapow. *Wörterbuch der Ägyptischen Sprache*, Vol II (Leipzig: J.C. Hinrichs'sche Buchhandlung, 1928), p. 42.

5. *Ibid*, including the feminine form, *Ta-Mit*, "Kitty" used as a personal name for a woman in Dynasty XI; see too Neville Langton, "Cats in Egypt," *The Antiquarian Quarterly* I, no. 3 (September, 1925) 69, and Paul Remecki, "A Cat in Bronze," *Field Museum of Natural History Bulletin* 46, no. 6 (June, 1975) 8-13.

6. Petrie, William M. F. *The Royal Tombs of the First Dynasty*, Part I (London: Egypt Exploration Fund, 1900), p. 20, and pl. VII, no. 4; pl. XXXII, no. 39; Petrie, William M. F. *The Royal Tombs of the Earliest Dynasties*, Part II (London: Egypt Exploration Fund, 1901) p. 25, nos. 7 and 10, pl. VII, nos. 7 and 10.

7. The feline is identified, in fact, as Mafdet; see Lurker, Manfred. *The Gods and Symbols of Ancient Egypt* (London: Thames and Hudson, 1980), p. 78, and figure at lower left. Opinions vary about whether the domestic cat is involved here.

8. Besides Langton's article and the Wörterbuch citation (notes 4 and 5 above), see William C. Hayes. *The Scepter of Egypt*, Vol I (New York: Metropolitan Museum of Art, 1953), pp. 223-224, and fig. 140 (lower right); see too Jacques and Rosalind Janssen, *Egyptian Household Animals*, p. 16 (referring to an XIth Dynasty representation of a tomcat crouching under a chair, on a stela in the Petrie Museum, University College, London).

9. Hornung, Erik. *Conceptions of God in Ancient Egypt*, translated by John Baines (Ithaca: Cornell University Press, 1982), pp. 109-125.

10. See notes 6 and 7, above.

11. Lurker, *The Gods and Symbols of Ancient Egypt*, p. 78, figure at lower left.

12. So, Gardiner, Alan H., "The Mansion of Life and Master of King's Largess," *Journal of Egyptian Archaeology* 24 (1938) 89-90.

13. For instance, Lurker, *The Gods and Symbols of Ancient Egypt*, p. 76, considers Mafdet as a leopard.

14. Gardiner, 89, "The Mansion of Life and Master of King's Largess,' surveying the various opinions.

15. Ibid, 89-90.

16. Lurker, *The Gods and Symbols of Ancient Egypt*, p. 38, figure at lower left.

17. The Egyptians themselves called him *miw '3* "Great (Tom) Cat," see for instance, Lise Manniche. *City of the Dead:* Thebes in Egypt (London: British Museum Publications, 1987), p. 64, fig. 51; Hornung, *Conceptions of God in Ancient Egypt*, p. 120, fig. 12.

18. Manniche, *City of the Dead*, p. 36, fig. 28 (where the cat paws its owner in a manner familiar to all cat owners); also James, T.G.H. *Egyptian Painting in the British Museum* (London: British Museum, 1985), p. 27, fig. 25.

19. For instance, Jacques and Rosalind Janssen, *Egyptian Household Animals*, p. 15, fig. 8.

20. Corteggiani, Jean Pierre. *The Egypt of the Pharaohs at the Cairo Museum* (Paris: Hachette Blue Guides, 1986), no. 58, pp. 99-100, pl. on p. 100. Amenhotep III's family may have been cat lovers, see Desroches-Noblecourt, Christiane. *Tutankhamen:* Life and Death of a Pharaoh (New York: New York Graphic Society, 1963), p. 118, fig. 59, where the prince's mother, Queen Tiy, is shown sitting with a cat underneath her chair.

21. See Omlin, Josef A. *Der Papyrus 55001 und seine Satirisch-Erotischen Zeichnungen und Inschriften.* Catalogo del Museo Egizio di Torino. Serie Prima-Monumenti e Testi, Vol. III (Torino: Edizioni d'Arte Fratelli Pozzo, 1971), pl. XXb.

22. *Ibid*, pp. 30-31, pl. XI, x + 11; XIII, and XIV.

23. *Ibid*, p. 30, and pl. XI, x + 9; XIII, XIV, and XXa.

24. Otto, Eberhard, "Bastet," *Lexikon der Ägyptologie* I, pp. 628-630; Lurker, *The Gods and Symbols of Ancient Egypt*, p. 32.

25. Otto, "Bastet," *Lexikon der Ägyptologie* I, pp. 628-630.

26. *Ibid.*

27. Lurker, *The Gods and Symbols of Ancient Egypt*, p. 32.

28. Otto, "Bastet," *Lexikon der Ägyptologie* I, p. 629.

29. Lurker, *The Gods and Symbols of Ancient Egypt*, pp. 59 and 112.

30. Herodotus. *The Histories*, translated by Aubrey de Selincourt (Baltimore: Penguin Books, 1954), pp. 125-126.

31. Conway, William Martin. *Dawn of Art in the Ancient World* (London: Percivalt and Co., 1891), pp. 182-183; Remeczki, "A Cat in Bronze," pp. 9-10, and note 9.

32. El-Mahdy, Christine. *Mummies, Myth, and Magic* (London: Thames and Hudson, 1989), p. 33.

33. Herodotus, *The Histories*, p. 128.

34. Diodorus Siculus. *Diodorus on Egypt*, translated by Edwin Murphy (Jefferson, N.C.: McFarland and Co., 1985), p. 108.

35. Recently cats surpassed dogs as the most widely kept pet in the United States; see Margaria Fichtner, "Life with a cat," *Chicago Tribune* 143, no. 21 (Jan. 21, 1990) Sect. 15, p. 15.

The Mystery of the Monster

by Bret S. Beall

Forest of the Coat Age diorama in Hall 38. Recreated here is a forest of the Pennsylvanian Period, a quarter-billion years ago, showing a number of species that occurred then in the Mazon Creek area—about the time that the Tully monster is believed to have flourished. As a marine animal it occurred in nearby coastal waters. 75400

The weathering piles of gray shale dotting the landscape of Grundy, Will, and Kankakee counties in northeastern Illinois have yielded some of the most spectacular fossils known to science. Collectively known as Mazon Creek fossils because they were first found along the banks of that small creek in Grundy County, they are often exceptionally well preserved, revealing rarely seen clues to life of the past.

Other specimens are spectacular as objects of mystery, because their relationships and identity continue to frustrate paleontologists, though they are well preserved. Perhaps the most mysterious of these fossils, and one whose mystery has long intrigued researchers at Field Museum, is the so-called Tully monster, which achieved enduring fame on January 1 of these year, when it became Illinois' official state fossil.

The mystery begins 300 million years ago, during the Pennsylvanian Period, or Coal Age. Illinois lay near the equator then, and was covered by a warm, shallow sea. The seacoast crossed what is now Will, Grundy, and Kankakee counties. When the plants and animals in that region died, many were buried by mud. As they decayed, the chemical environment surrounding the organisms allowed iron and carbonate to form a gel that cemented the mud around the plants and

Bret S. Beall recently served as curatorial coordinator of Mazon Creek Paleontology at Field Musuem. He is currently engaged in free-lance research on arthropod evolution and non-marine paleoecology, consultation, and scientific illustration. His article "The Tully monster and a new approach to analyzing problematica" will appear in the forthcoming *The Origin of Metazoa and the Significance of Problematica*, edited by A. Simonetta and S. Conway-Morris (Cambridge University-University of Camerino Press).

animals. With time, the mud cemented by the gel hardened into round structures known as concretions. When split, these concretions reveal the Mazon Creek fossils at their centers.

In 1955, Francis Tully, a private collector, was looking for fossils on the so-called strip piles—great mounds of waste from coal-mining operations in Will and Kankakee counties. He found several elongate concretions that contained bizarre wormlike fossils that were totally unlike anything he had ever found. In 1958 Tully took the specimens to the late Dr. Eugene S. Richardson, then Field Museum's curator of fossil invertebrates. Richardson had spent years studying both living and extinct animals and plants, so he was in an excellent position to identify the specimen, but Tully's beast had him stumped also.

To honor its discoverer, Richardson gave the mysterious creature its evocative name, *Tullimonstrum gregarium*, meaning "Tully's common, or abundant monster." Within a few years several hundred specimens of the monster were deposited in Field Museum's collections, and private collections held several hundred more, providing Richardson with an excellent sample for his investigations.

In a paper published in 1966 he described *Tullimonstrum* as having a wormlike body, with a long, flexible proboscis bearing a toothed "claw" or "jaw" at one end (probably the anterior, or front), and a pair of flexible, horizontal fins at the other. Most bizarre of all was a rigid bar that traversed the body's supposed anterior; at each end of the bar was a puzzling rounded organ, which Richardson hesitantly interpreted as an eye. Being a careful scientist, Richardson chose not to assign *Tullimonstrum* to a particular phylum (the next largest classification category below "kingdom").

In 1969 Richardson collaborated with Dr. Ralph G. Johnson, a professor at the University of Chicago and research associate of Field Museum, in expanding his earlier description of the Tully monster. They had more specimens, and the addition of Johnson's impressive expertise in marine invertebrates greatly enhanced the likelihood of their solving the monstrous mystery. Johnson and Richardson took measurements, constructed models, drew diagrams, and considered a wide range of alternative interpretations of *Tullimonstrum*.

They believed that a light-colored feature along the midline in some specimens was the alimentary canal (part of the digestive system) and that certain transverse lines were mesentery (internal supportive tissue), which kept the alimentary canal suspended within the body cavity. Though they considered Tully monster to be similar to nemertines (a phylum of wormlike animals), to chaetognaths (arrowworms), and to echiurans (a phylum related to annelids—the segmented worms), they again argued that *Tullimonstrum* was so different from anything else that it could not be assigned to a known phylum. The mystery continued.

In 1978, Dr. Matthew Nitecki, also a curator of fossil invertebrates at Field Museum, organized a symposium on the Mazon Creek deposit at the North Central regional meeting of the Geological Society of America, held at the University of Michigan at Ann Arbor. One of the symposium participants, Dr. Merrill Foster, professor at Bradley University, discussed similarities between *Tullimonstrum* and certain mollusks called heteropods. Like *Tullimonstrum*, these shell-less relatives of snails have an elongate, flexible proboscis, a broadened body, eyes in the same position as the transverse bar's terminal organs, and a flattened tail. *Tullimonstrum's* "teeth" are quite similar to the minute rasplike, radular teeth of heteropods. Foster argued that the "claw," or "jaw" could be interpreted as an unnatural condition not found in life, but a consequence of the cylindrical oral region having been

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compressed after death. The fossil evidence is extremely consistent with interpreting *Tullimonstrum* as a mollusk, and the differences in the monster—such as internal segmentation, absence of a swimming fin, and a rigid bar connecting the purported eyes—were not enough to rule out classification as a mollusk. The mystery was solved. Or was it?

Foster's arguments are compelling, but other investigators questioned whether Richardson's reconstruction of Tully monster was correct. Mary Carman, former paleontology collection manager at Field Manager, believed that *Tullimonstrum* could be interpreted in yet another way. In particular, she thought that the transverse bar and its terminal organs might have been on the animal's upper, or dorsal surface, instead of on the lower, or ventral side, where Richardson had placed them. She also thought that the trunk's segmentation might be a condition intermediate between the clearly segmented state reconstructed by Richardson and the strictly internal segmentation of Foster's model.

I entered the story while Carman was working on her reconstruction. Being responsible for curating the world's largest collection of Mazon Creek fossils (one of Field Museum's most famous resources), I had the opportunity to examine them all. In studying nearly 2,000 specimens of *Tullimonstrum*, I noticed that at least one aspect of previous reconstructions was probably incorrect. The tail fins of most Tully monsters are preserved horizontally. Interestingly, these same specimens have a large crease extending diagonally from the anterior edge of one fin into the body. Foster had suggested that the crease may have been caused by twisting a tail that had vertical fins, but he believed the evidence to be equivocal. Two lines of evidence support another interpretation. First, the crease is exactly as expected if the tail were twisted 90 degrees. Secondly, the tail fins are slightly asymmetrical; if they were oriented horizontally, *Tullimonstrum* would have swum in circles! Clearly, the evidence favors a tail with vertical fins.

Richardson, Johnson, Foster, and Carman were all correct; their reconstructions were consistent with the fossil evidence. The problem is that much of the morphology of *Tullimonstrum* remains ambiguous. For example, since it is impossible on the basis of known evidence to determine whether a particular surface of the animal was dorsal or ventral, the function of the bar

The late Francis Tully, who found the first of these enigmatic fossils in 1955. He holds an especially fine specimen. Ron Testa photo. 84794

The late Eugene S. Richardson (left), curator of invertebrate fossils, and Field Museum artist Tibor Perenyi, as they regard the Tully monster reconstruction fashioned by Perenyi; 1964 photo. 82825

organ cannot be determined. Were those terminal structures eyes, as Johnson and Richardson had proposed? Or was it possible, as Carman suggested, that they were statocysts (equilibrium organs) for balance while swimming? Were they structures to support the animal on the sea bottom? Or, as Nitecki suggested, were they copulatory organs similar to those of certain modern annelids? All of these interpretations were possible on the basis of information available, but could all be used as clues to the solution of the Tully monster mystery? I thought that they could.

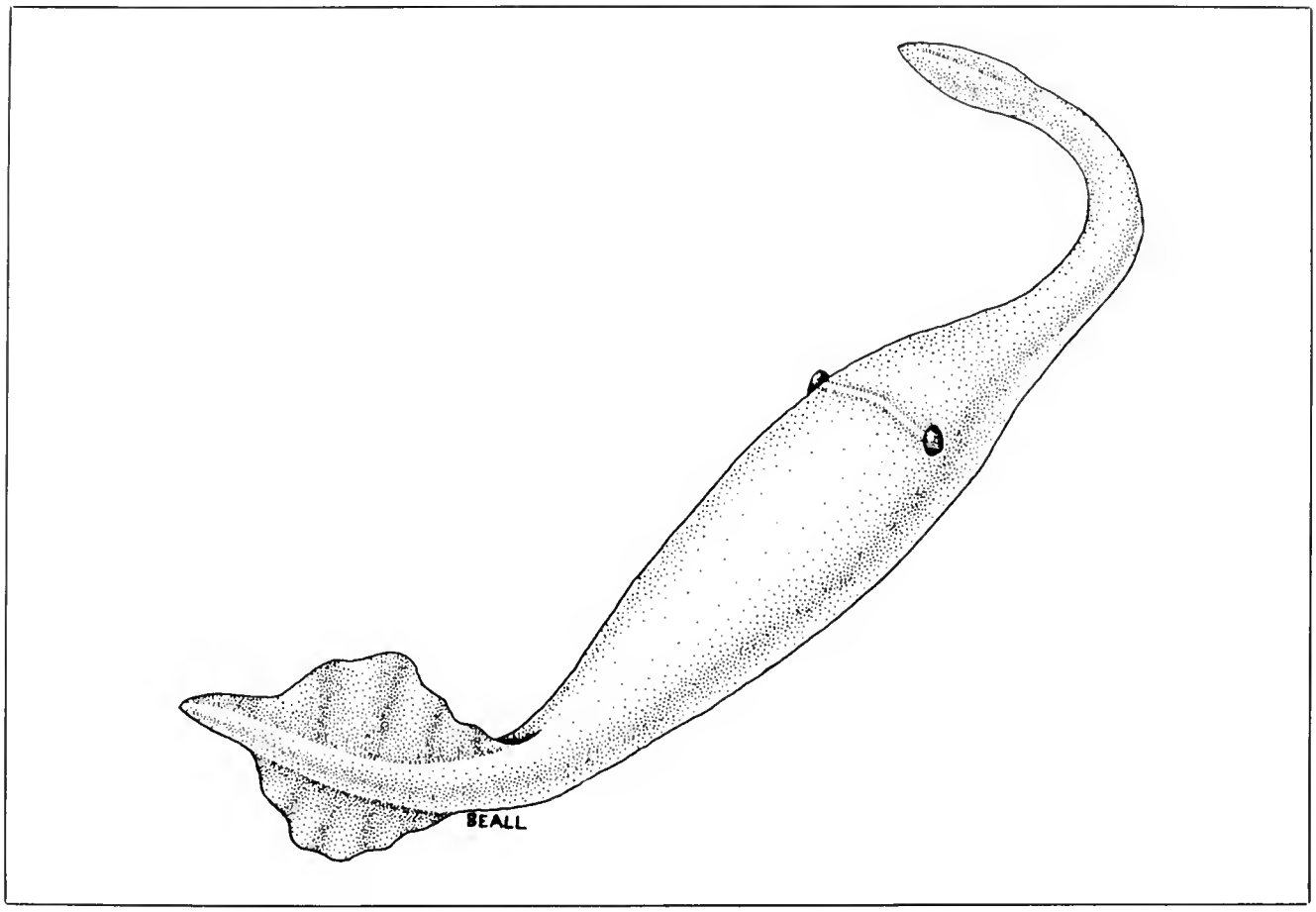
The problem to solve was "To what organism was *Tullimonstrum* most closely related?" Richardson, Johnson, and Foster had each used arguments that were generally similar to suggest the closest relatives of *Tullimonstrum* (or the lack thereof). This method of approach, known as *phenetics*, is one of the two primary ways of inferring relationships between organisms. The other method, known as *phylogenetic systematics*, or *cladistics*, groups organisms together according to the recency of their common ancestry; organisms that are similar because of more ancient ancestry tend not to be grouped. Since the cladistic approach had not been used to interpret the affinities of *Tullimonstrum*, it could be used to test the existing, as well as new, hypotheses of relationship. However, the variety of interpretations that had been put forth and the absence of important information about Tully monster added a unique challenge as well as special difficulties to this problem.

In order to search for the closest relatives of *Tullimonstrum* by means of the cladistic method, I chose Dr. David Swofford's (Illinois Natural History Survey) sophisticated computer program called PAUP (Phylogenetic Systematics Using Parsimony). Parsimony as a philosophical term refers to simplicity, postulating that, in the absence of contrary evidence, only the simplest solution to a problem is acceptable. This does not mean, however, that the simplest solution is necessarily 'correct.' Indeed, it underscores the limitations of inference imposed by the incompleteness of the data. PAUP analyzes the data and provides the simplest path(s) connecting the organisms in the data set. This approach indicates that in our particular search there are two main data components: (1) those organisms that qualify for comparison with *Tullimonstrum*, and (2) the parts of their bodies to be compared. These two components provided the unusual twists to the analysis.

The organisms in the analysis can be called *taxa* or *operational taxonomic units* (OTU's), which I selected from suggestions in the scientific literature about Tully monster's affinities as well as from my own observations. I compiled a list of 13 OTU's, or viable candidates, and then determined which parts of the organisms were appropriate for comparison.

My first PAUP analysis revealed two most likely candidates for close relationship with *Tullimonstrum*: Foster's mollusk and an almost equally intriguing organism known as the conodont animal. Conodonts and their placement in the animal kingdom have also frustrated paleontologists. Conodonts are microscopic toothlike structures that have been known for more than a century, but only in the last decade have examples of the animals to which they belong been discovered. There are thousands of types of conodonts, but only three types of animal bodies associated with the conodont structure are known so far. There is no reason, then, to think that the range of variation embraced within the conodont animal group might not include a creature like the Tully monster. The PAUP analysis merely says, however, that *Tullimonstrum* is more closely related to conodont animals than to any of the other 12 OTU's. Dr. Derek Briggs, a University of London paleontologist who spent several months at Field Museum as a visiting scientist in 1983-84, wrote of the history of searching for the bearers of conodonts in the July-August 1984 *Bulletin*. After studying more conodont animals, Briggs and his co-workers con-

Two specimens of concretions containing *Tullimonstrum gregarium* fossils. 85336.4, 85335.12



The author's reconstruction of *Tullimonstrum gregarium*.

cluded that these organisms were primitive vertebrates related to modern hagfish and lampreys, which are themselves primitive fish that have changed little over many millions of years. With that mystery solved, it is possible to use what we learned from that case to solve other mysteries, including the identification of relatives of the Tully monster.

I used the results of my first PAUP analysis to modify the data for a second analysis. The most significant modification was combining the conodonts with the chordates for a more general comparison. The chordates include vertebrates (such as hagfish) and a few invertebrate relatives. The second analysis again provided almost equal support for both the mollusk and chordate hypotheses.

Is *Tullimonstrum* a mollusk similar to recent shelless snails, or is it a chordate related in some way to hagfish and lampreys? With the information that we have now, it is impossible to choose one suspect over another. The jury is hung on this case, and without additional data, will remain hung. The intrigue of the Tully monster continues. **FM**

Additional Reading

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FIELD MUSEUM TOURS

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Turkey and
The Greek Islands

April 26 - May 7, 1990

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Leader: William C. Burger, Ph.D.

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We hope you will join us this spring as we visit these historic sites where western civilization was born.

Crow Canyon

September 16 - 22, 1990

Field Museum tours will be conducting an exciting tour to Denver's Crow Canyon Archaeological Center. The tour will offer a splendid opportunity not only to view, but to participate in an archaeological dig. At Crow Canyon you encounter the excitement of archaeology first hand. Here adults and students of all ages—most with no previous archaeological experience—excavate, analyze, and learn side by side with archaeologists.

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Jungle Rivers of South America: Puerto Ordaz, Venezuela to Manaus, Brazil

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Leader: Barry Chernoff, Ph.D.

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the mouth of the mighty Amazon River and begin our exploration upriver. Each day we will make excursions in Zodiac landing craft, which make it possible for us to visit isolated villages, view colorful birds and butterflies, fish for unusual species, and take hikes into the jungle itself. Join us for an adventure to two of the world's greatest rivers.

The Galapagos Islands

March 2 - 13, 1990

Leader: John Flynn, Ph.D.

On many world maps it's difficult to find the tiny specks which appear off the coast of Ecuador in the Pacific Ocean. Yet, the Galapagos Islands are unique in their isolation. They contain mountains, forests, beaches, and bays unlike any others on earth. These islands lie 600 miles west of Ecuador, 800 miles south of Panama and almost 3,000 miles east of the nearest Pacific landmass. Most are relatively isolated from one another; a perfect setting for the evolutionary lab they would eventually become.

The first land inhabitants were windblown seeds that drifted into lava crevices and took root. The next were birds, perhaps also windblown, who stayed to breed. The last were reptiles, mainly lizards and iguanas, who rode tangled mats of river vegetation cast off the South American coast. But there the trend stopped. Few mammals arrived, and none who did was a predator. The result was a world which resembles earth's past. Birds ruled the air, reptiles the land. Furthermore, since there were no hunters, most species lived in peace. Life on these islands remains very much the same today.

We invite you to explore with us one of the world's greatest living laboratories of natural history. The primeval beauty of the area's colorful landscapes and wildlife excite the senses, and the remarkable tameness of the animals affords superb opportunities for wildlife study and photography.

We will fly from Chicago to Quito, Ecuador for three days, then on to Guayaquil/Baltra, where we will board the beautiful MV *Santa Cruz* and cruise comfortably to the islands of: Bartolome, Tower, Isabela, Fernandina, North Seymout, Hood, Florena, Santa Cruz, and James.

Our stay in highland Ecuador provides a stimulating contrast in geology and wildlife. Dr. John Flynn, associate curator in the Department of Geology at Field Museum looks forward to sharing with you this unique experience unmatched by any other destination in the world.

Naturalist in Alaska

Circa July 10 - 25, 1990
(15-day tour)

Leader: David E. Willard, Ph.D., ornithologist
Accompanied by: Dan L. Wetzel, naturalist and tour operator

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We begin our trip in Anchorage and move on to the Kenai Fjords, where we will experience the 38-foot bore tides, the second highest in the world, and a marked contrast to the one-foot tides of Prudhoe Bay where we complete our expedition. Our route includes Seward, Denali State Park, Denali National Park, Fairbanks, Coldfoot, and Sagavanirktok River. The Naturalist in Alaska Tour was created to bring the natural world of Alaska within your grasp. Let us send you more information about this unique opportunity.

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Special cicada exhibit to coincide with May/June emergence of these fascinating insects.
On view in the North Gallery.

CONTENTS

May/June 1990
Volume 61, Number 3

COVER

The Indiana Dunes in the first lush greenery of summer. Saturday, May 18 is the day to join the Field Museum's hiking outing to the Indiana Dunes, one of many outdoor activities offered by the Department of Education. Under the leadership of Maryanne Kalin-Miller, of the Francis Parker faculty, hikers will experience one of the most ecologically diverse areas in the Midwest. $22 for members, $27 for nonmembers. Call 322-3854 for additional information.
Photo by Dave Walsten.

Field Museum's Public Programs Support Group
will host its second annual benefit on Saturday, June 23, with a cruise along Lake Michigan aboard the new luxury yacht, *Anita Dee II*. Cocktails, a buffet supper, and dancing to music by the Stanley Paul Orchestra will be featured. Tickets are $100 per person, and proceeds will go to the Museum's Community Outreach Program. For information please call 922-9410, ext. 858.

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EVENTS

World Music Programs

Weekends in May and June
1:00pm and 3:00pm

☐ *May 5, 6*
1:00pm—Listen to the blues harmonica of Chicago Beaux.
3:00pm—Join Eli Hoenai for a program of African Percussion.

☐ *May 12, 13*
1:00pm—The Chinese Music Society of North America demonstrates instruments from the Chinese orchestra.
3:00pm—Henry Huff presents a program of music for the harp.

☐ *May 19, 20*
1:00pm—Enjoy the sound of classical Spanish guitar with Librado Salazar.
3:00pm—Join Fan Wei-Tsu as he demonstrates the *zheng*, a Chinese zither.

☐ *May 26, 27*
1:00pm—The Chinese Music Society of North America demonstrates instruments from the Chinese orchestra.
3:00pm—Join Eli Hoenai for a program of African percussion.

☐ *June 2, 3*
1:00pm—Enjoy the sound of classical Spanish guitar with Librado Salazar.
3:00pm—Join Fan Wei-Tsu as he demonstrates the *zheng*, a Chinese zither.

☐ *June 9, 10*
1:00pm—The Chinese Music Society of North America demonstrates instruments from the Chinese orchestra.
3:00pm—Join Eli Hoenai for a program of African percussion.

☐ *June 16, 17*
1:00pm—Listen to the blues harmonica of Chicago Beaux.
3:00pm—Join Raices del Andes as they perform traditional South American folk music.

☐ *June 23, 24*
1:00pm—The Chinese Music Society of North America demonstrates instruments from the Chinese orchestra.
3:00pm—Experience the sound of flutes from Japan and Australia with Douglas Ewart.

☐ *June 30*
1:00pm—Join Eli Hoenai for a program of African percussion.

The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a CityArts grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

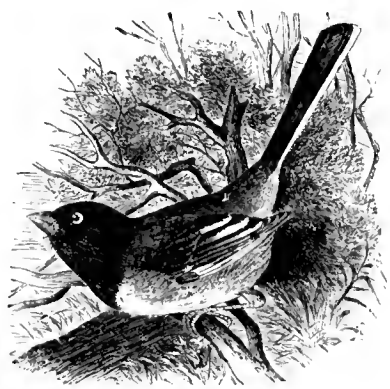
Programs for Adults

One-Day Field Trips

A variety of one-day field trips are offered in May. From an invigorating hiking trip along the Indiana Dunes to a study of the archaeology of Aztalan, there are trips to match every interest. For further information, consult the March/April/May Adult Program Brochure or call the Department of Education at (312) 322-8854.

Family Programs

Family field trips begin in June and run through August. These one-day, weekend trips are designed for children ages 6 and up who are accompanied by an adult. Go fossil collecting, take a night hike, discover techniques for insect collecting, or learn the basics of birding. For further information, consult the June/July/August Children and Family Program Brochure or call the Department of Education at (312) 322-8854



Children's Workshops

Have fun while learning about ancient Egypt, amazing owls, mighty dinosaurs, or the deep, dark ocean. An exciting selection of children's workshops begin in June and run through July. The two-hour programs are scheduled Saturdays through Tuesdays and are designed for children age 4 through eighth grade. For further information consult the June/July/August Children and Family Programs Brochure or call the Department of Education at (312) 322-8854.

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Tigers Without Their Stripes

by David M. Walsten

Mother Nature is commonly represented as a lady of caprice, if not malice. The fact is that animals hideous or bizarre enough to foster such superstition are sometimes created as the result of genetic mutation or by injury to the organism early in its development.

One such aberration is the gynandromorph, which exhibits male as well as female characteristics. Accidents of this sort have been observed in a wide range of animal life, but are perhaps commonest among the insects. Those shown here are all specimens of the tiger swallowtail (*Papilio glaucus*), a common North American butterfly. In these butterflies the male-female difference occurs not just in the visible characteristics, such as wing pattern, but may also involve the internal organs of reproduction. In some gynandromorphs (also called gynanders) one side of the body may have a testis while the other side has an ovary.

The condition of gynandromorphism is ordained shortly after fertilization of the ovum, or egg, and such individuals always develop from a male egg; that is to say, one with two X chromosomes—a configuration known as XX. (Eggs destined to develop normally as females have an X chromosome and a Y chromosome—a configuration known as XY). Only birds and Lepidoptera (moths & butterflies), it is believed, have this configuration. In most other animals, the female egg is XX and the male is XY. For reasons that are not fully understood, an accident of

some sort may occur to one of the X chromosomes, resulting in an XO configuration. Such a cell gives rise to tissues with male characteristics. After a normal fertilized XX cell undergoes its first division, the two resultant cells both have an XX configuration. If an accident occurs to an X chromosome in one of these two cells, the configuration of that cell becomes XO or, in effect, female, while the unaffected cell remains male. As embryonic development continues, all the cells from the XX cell inherit and transmit male characters; those from the XO cell inherit and transmit female characters. The resulting mature insect, known as a *bipartite* gynandromorph, is exactly 50 percent male and 50 percent female.

If the accident occurs to one of the cells during the four-cell stage, the resulting individual is 25 percent female and 75 percent male. The later the accident occurs, the less obvious are the female characters. Butterflies in which the accident occurs at the eight-cell stage or subsequently, may show a splattered, or "mosaic," effect in the wing pattern. The specimens illustrated here show the effect of that accident occurring at various stages in the early development of the embryo.

In some insects the fertilized egg may sometimes be *binucleate* (*i.e.*, with two nuclei instead of the normal complement of one). If one of these two nuclei is female (XY), while the other is male (XX), the resulting individual will be gynandromorphic. This phenomenon has been observed particularly in adults of the commercial silkworm (*Bombyx mori*). The production of a greater number of gynandromorphs in certain wasp species has been artificially induced by subjecting the female insect to a temperature of 37°C, before she lays her eggs.

The specimens shown here are from the Herman F. Strecker collection, acquired by Field Museum in 1908. Though not on public exhibit, the Strecker specimens have been much studied and photographed by geneticists and insect physiologists. **FM**

G. Alan Solem

1931 - 1990

by Rupert L. Wenzel
Curator Emeritus of Insects

With the death, on February 26, of Dr. G. Alan Solem, curator and head of the Division of Invertebrates, Field Museum lost one of the most active and productive members of its scientific staff.

A world authority on the anatomy, classification, biology, evolution, and distribution of land snails, Solem began his career quite unpredictably. His father was a physician, his mother was active in church and community work in Oak Park, Illinois, where Alan lived for most of his life. An uncle, on returning from service with the Navy Seabees in World War II, gave Alan a small collection of shells that he had made on Midway and Tinian Islands.

These piqued Alan's interest, but he was unable to identify them from the books available. His mother, who had an interest in birds, went with him to Field Museum, where he compared the shells with specimens in the systematic shell exhibit. Because he could not find some like his, he assumed that the Museum did not have any, and he gave them to the receptionist as a gift to the Museum.

He received a note of thanks from Dr. Fritz Haas, then curator of Lower Invertebrates, who pointed out that only a fraction of the Museum's collection of shells was on exhibit, and he invited him to visit the division. From there, the connection is not clear, but in the summer of 1946, just before his 15th birthday, Alan became a volunteer in the Division of Insects(!). It was quite obvious from his behavior that this very bright and brash young man had no heart for insects. In 1949 he worked as a volunteer with Dr. Haas and with Karl P. Schmidt, chief curator of Zoology. Haas, a world expert on bivalve molluscs, and Schmidt, a distinguished herpetologist who inspired many younger scientists and colleagues, greatly influenced Alan's future. While in college, Alan continued to work periodically as summer assistant to Dr. Haas.

He obtained his baccalaureate, *summa cum laude*, from Haverford College in 1952, and his M.A. (1954) and Ph.D. (1956) from the university of Michigan, under the direction of another noted malacologist, Prof. H. Vander Schalie. During his University years, Alan spent considerable summer time at the Academy of Natural Sciences in Philadelphia, working with Dr. Henry Pilsbry, one of the foremost world authorities on snails. Few students have had the opportunity, as Alan did, to be closely associated with such a group of noted specialists in their chosen field. In 1957, he was appointed assistant curator of Lower Invertebrates, and in 1959, he succeeded Dr. Haas as curator, a position he held for the remaining 31 years of his life.

Solem's field work and research dealt with molluscs of many parts of the world, but his most important work focused on snails of the Pacific islands and the Australian Region. His dissertation, published by Field Museum in 1959, was a treatise on the systematics and biogeography of land and fresh water molluscs of the New Hebrides. Later, this was followed by a two-volume monograph of the endodontid land snails of the Pacific Islands.

He became interested in the problem of how numerous closely related species, presumably from a single or only a few colonizations, could evolve on one small island, possibly as a result of conditioning to specific food resources and microniches, leading in turn to microgeographic and reproductive isolation, followed by differentiation into species that differed in their feeding specializations.

This "flowering" of species was exemplified by the endodontid snails (as well by weevils) on the tiny Pacific island of Rapa and appeared at variance with accepted biogeographic theory on island colonization and establishment of biotic equilibrium. It also conflicted with then widely accepted doctrine—formulated chiefly from the study of vertebrates—that new species did not form in the absence of (macro) geographic isolation. Solem's concern with these problems led him to pursue detailed analyses of differences in the feeding mechanism of snails, correlating them with differences in reproductive anatomy and niche and food specialization. These analyses are essential to delineating their evolutionary relationships and to exploring the history of their distribution through geologic time. Solem pioneered in applying scanning electron micros-

copy in such studies in malacology. Through his efforts the Museum obtained its first electron microscope with a grant from the National Science Foundation.

In 1964, at Solem's request, Dr. William Turnbull, the curator of Fossil Mammals, collected some snails in Western Australia. These and other specimens that came to his attention greatly excited Solem because it was evident that they represented a largely unknown fauna and seemed to pose questions similar to those encountered in his studies of island faunae. In some ways they proved to be even more interesting because isolated "islands" of vegetation possessed clusters of species that could interact for feeding and reproduction only during the scarce and very short periods of rain. Between rains, they underwent long periods of dormancy.

After seeing additional material collected by an Australian colleague, Solem resolved to pursue intensive collecting in the ancient arid areas of Western Australia. In 1973, he asked the Museum for "seed money" to finance preliminary field investigations. The monies were provided, and the field work was carried out in 1974.

The exciting results of this trip led to the Western Australian Field Program of 1976-77, a major interdisciplinary expedition supported by the National Science Foundation, Field Museum, William and Janice Street, and the Western Australian Museum. It involved as many as 30 people in the field at one time, including specialists in such diverse disciplines as malacology, parasitology, mammalogy, botany, and acarology (the study of spiders, mites, and ticks). Many of the specimens they collected are still being studied and published on, and will be for years to come.

Solem's Australian field work did not end there. Seven additional field trips to Australia and/or New Zealand added much more material and raised additional questions concerning the evolution and relationships of the snail fauna to that of the rest of the world. Five monographs by him have been published on the Camaenid land snails of Western and Central Australia and two others, as well as a two-part monograph on those of Southern and Eastern Australia, are in press.

At the time of his death, Solem and Dr. John Kethley, associate curator of Insects, were actively planning further studies which would involve the use of newer sophisticated techniques to assess evolutionary relationships and augment (or alter) the conclusions based on work done and in progress, or even provide whole new ways of looking at the data.

1979 view of Alan Solem at work in his laboratory

Solem's published work includes more than 150 technical and scientific papers, totaling about 4,500 pages. They set new high standards for the study and description of molluscs as well as for analysis of the data. In these, he described dozens of new genera and several hundred new species and subspecies, a remarkable output, but in itself not as important as the generalizations as well as other research which they make possible. He also wrote about 50 popular articles—many of them for the *Bulletin*—and articles for encyclopedias, chapters for textbooks, and a popular book.

Solem was noted for his ability to obtain financial support for his research program and for his division, including nearly $800,000 in grants from the National Science Foundation, the National Geographic Society, and the Office of Endangered Species, as well as

funding and support from private individuals. He was responsible for the growth of his division and its collections to a position of international importance.

He was active in scientific organizations here and abroad and served in numerous capacities, including president of the American Malacological Union. He served on the editorial boards of a number of scientific journals and on several national systematics panels and councils. He was an invited speaker and participant in many national and international congresses and symposia. He was a research associate of the Western Australian Museum. He held faculty appointments at the University of Chicago and Northwestern University. One of his students, Dr. Betty Lou Girardi, also specializes in Pacific land snails.

The above recitation recounts some of Alan's work and achievements, but says little about him as a person. In matters of his personal life, Alan was a very private individual. He was very sensitive. He could hold strong opinions and be very stubborn in holding to them when he felt that he was right. He often played the devil's advocate. Yet, he had a well-developed sense of humor, droll and sometimes quixotic.

It is self-evident that he had enormous energy and drive. He was a perfectionist, methodical, and expected excellence from those under him, but at the same time he instilled in them the confidence to achieve it. They held him in esteem and affection. He was kind and caring. It was probably for these reasons that he was able to attract and hold a group of loyal and devoted employees and volunteers, some of whom assisted him for many years. He was proud of his children.

Alan cared strongly about the Museum and its future. He also cared for his community. He served on the library board of Barrington, Illinois from 1970 to 1976, and played an important role in obtaining a new library for that village. The research collections and facilities which he built are a monument to his dedicated efforts. His publications, especially his monographs, will be used for generations to come.

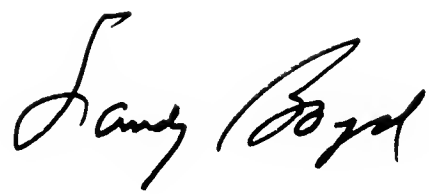
Dr. Solem is survived by his wife Sylvia, a son, Anders, a daughter, Kirsten, and his sister, Elizabeth (Mrs. George) Dutton.

A Tribute to Dave Walsten Editor

We pay tribute to a person who, for seventeen years, has been the "voice" of Field Museum to you, our Members, and to our many friends across the country and beyond its borders. We have all benefited from Dave's broad knowledge, integrity, writing, editorial and publication expertise which resulted monthly in the *Field Museum of Natural History Bulletin.*

His focus on items and issues brought to the forefront Field Museum's great collections, scholarly research, and informative public exhibitions. Early in his career at the Museum, Dave initiated and produced a page in the *Bulletin* devoted to environmental issues, and later he instituted the "Events" section to alert readers to the diversity of participatory opportunities for adult and family learning. He also produced an annual calendar to illustrate specific Museum collections on exhibition. As an articulate reporter on scientific research activities, Dave covered the Museum's past, present, and future. Under his Editorship, the *Bulletin* ran personal accounts from various scientists and letters from the field, together with a wide range of scientific and programmatic historical documentation. His keen eye for photographic excellence, and proficiency as a practicing photographer, illuminated many articles which added to their inherent appeal. Dave's love of travel, personal desire for exploration and discovery, and opportunity to ply his craft in a larger arena are part of his legacy.

We thank you, Dave, for communicating the purposes of Field Museum so well and for so long. We will chart new courses to communicate with our constituency as you did, providing current information and sharing our challenges and continuing opportunities for involvement. We wish you continued success. Our Members and colleagues join in these good wishes.



A CENTURY OF BIRDS

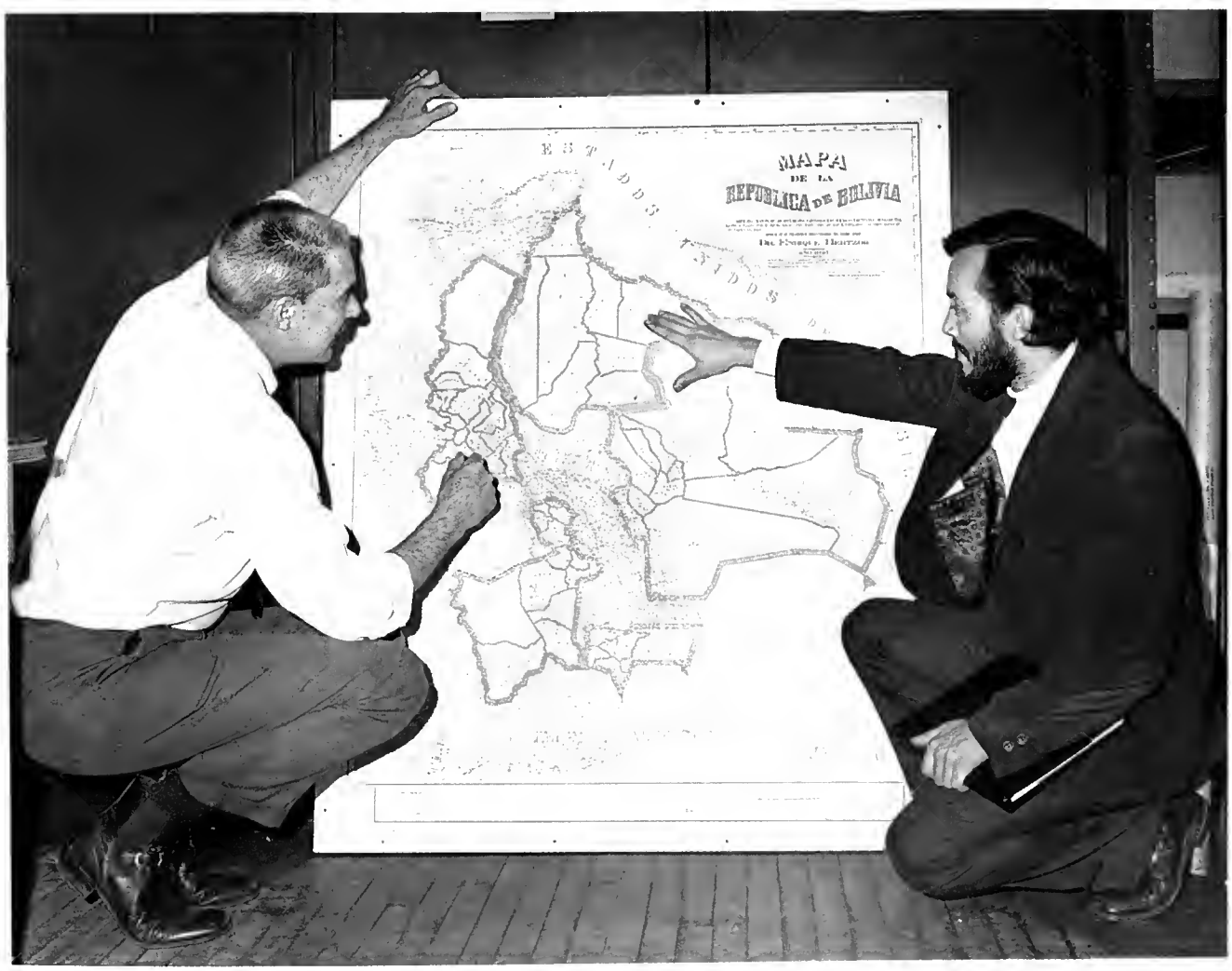
Curators Emmet Blake and Melvin Traylor And Their Prodigious Contributions To Field Museum and the Science of Ornithology

by Susan Nelson

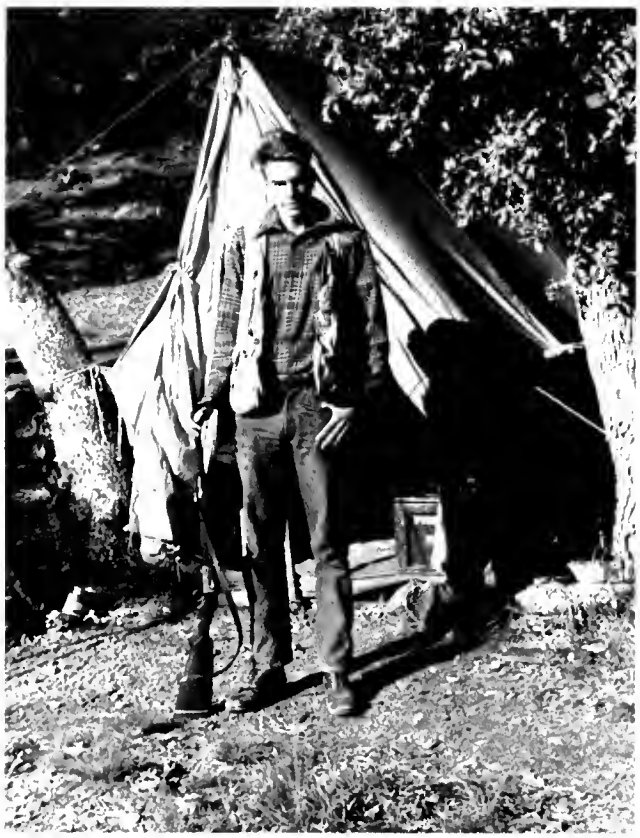
The Field Museum of Natural History has the fourth largest collection of birds in the world. Packed carefully away in countless drawers in the Division of Birds are some 375,000 specimens, collected during a period of more than a century.

The collection is beyond price. Its carefully skinned, cotton-stuffed bodies of birds include several that have become extinct because their habitats have been destroyed. It reveals, because specimens are meticulously tagged, distributions of species, sometimes showing that birds thrived where cities

Susan Nelson is a Chicago writer whose most recent contribution to the *Bulletin* was a profile of curator Bob Stolze. (Jan/Feb, 1990).



Mel Traylor (l.), with visitor, viewing South American collecting area.



Mel Traylor during his 1941 collecting trip to the Southwest with Bob Blake.

now stand. The plumage of urban birds, for that matter, are often dulled by the air pollution of the time they were collected.

The birds in the Museum's collection are studied by scholars from around the world. The collection has been used to help lay the foundation of ornithology; today, using blood and tissue sampling techniques, its birds are providing answers to yet more complex questions.

And, of all the people at the Field Museum who are associated with all those feathers, two are known and respected as rather rare birds themselves.

They are Emmet R. (Bob) Blake, 81, and Melvin A. Traylor, 74. Both are curators emeritus, which means that, though they draw no salary, they continue to do research in their offices at the Museum, surrounded by science and colleagues.

Blake joined the Museum staff in 1935 as an assistant curator, who had already done collecting for the Smithsonian and the Carnegie Museums.

Traylor first became associated with the Field Museum in 1937, as a recent college graduate who went on a trip to collect birds in the Yucatan. Like Blake, he was a bird-watcher from childhood. Unlike him, Traylor worked for years as a volunteer at the Museum until there was an opening as assistant curator of birds, in 1956.

Together, Blake's 38 years on staff and 17 years of emeritus status, and Traylor's 24 years on staff and 10 of emeritus—plus his dozen or so years before he was paid for his work—come to better than 100 years.

During that time the two explored remote areas and collected thousands of birds for the Museum. They returned from their field trips and meticulously identified their findings, in perhaps two dozen cases discovering they had collected species or subspecies no one before them had seen to name. They have published scores of scientific articles, which has earned them the respect of their peers and election as fellows of the 1,500-member American Ornithological Union.

Blake and Traylor took one three-and-a-half-month expedition together, in 1941, to watch, photograph, and collect specimens of nesting birds of the Southwest. Blake later wrote about the scientific highlight, spotting and photographing more than 15 pairs of Colima (Mexico) warblers in the Chisos Mountains of Texas, where the birds had first been identified in 1928 and not seen since 1933.

There are differences between Mel Traylor and Bob Blake, to be sure. But the similarities are striking. Most obviously, both are 6′1″ and wear neatly trimmed mustaches. Both spend several days most weeks of the year in their offices in the Museum, working at old, solid wood, rolltop desks they insisted on keeping when new steel desks were made available to the staff. Above his desk, each man has a painting of several of the birds he has been the first to identify, Traylor's painted by the director of an African museum and art gallery, who was also an ornithologist, and Blake's by a missionary-collector in Peru. Both enlisted in World War II and rose to the rank of captain in the field, Traylor as a Marine who lost an eye in the Gilbert Islands, Blake as an Army counterintelligence agent who nearly lost a hand in Germany.

They speak of having built their life's work upon a bachelor's or, in Blake's case, a master's, degree rather than upon the Ph.D., which major museums now require of their curators.

Each seems quietly proud of the contributions he has made in laying the foundation of ornithology and speaks of retirement as the time he decided to step aside to make room on the staff for one more member of the new breed of young ornithologists.

They also seem grateful to be able to have schedules that let them see their projects through and also spend more time with their wives. Both men married young, to women who did not share their enthusiasm for ornithology. Both also married a second time, Blake in 1948 to a physician, Margaret Bird, who was a neighbor of Traylor, and Traylor, in 1970, to a mathematics teacher and birder, Marjorie Sharp, who came to visit other good friends who introduced the two.

Both have two grown children, no pets to worry about but backyard birds at feeders, and homes in the suburbs north of Chicago. Traylor generally drives to work after walking four miles with Marjorie, an exercise regimen he began in the early 1980s, after a heart attack.

The way to Traylor's office is marked by an occasional taped-up Gary Larson "The Far Side" cartoon spoofing *Homo sapiens* and serious scientists. Traylor settles into a chair near his desk. In the office is a computer terminal he acknowledges might have been helpful in the series of 13 "gazetteers" to the countries of South America that will be completed soon with a volume on Brazil. His co-author is another esteemed birdman, R.A. Paynter, Jr., of Harvard's Museum of Comparative Zoology.

The books, which are used by scientists other than just ornithologists, are specific-location, country-by-country guides to every published identification of species of birds.

"We went through all the literature we could lay our hands on to research the guides," which Traylor further says are "guaranteed to be as boring as anything. But," he adds, "I don't know how most people survive without them." Having such a book eliminates the need to look up such tedious details a second time.

The series, mentions David Willard, Ph.D., manager of the bird collection, is an example of what he calls both Traylor's and Blake's "fairly ego-less, altruistic contributions to ornithology that really are drudge work to produce."

Scott Lanyon, Ph.D., head of the Division of Birds, mentions that the work for Blake and Traylor and others has established the foundation of ornithology. "Now we can ask *why* birds are where they are and how things came to be—the more theoretical end of the science," he says.

Traylor is self-disparaging about what others in his department call his meticulous attention to detail, and he speaks lightly of an early life that made few demands of him.

He was born December 16, 1915 in St. Luke's Hospital and lived in the South Shore community until 1922, when his parents and sister moved to the North Side. He spent idyllic summers with his family in rural Wisconsin, where he fished and learned about birds and, later, golf.

In defining himself, Traylor speaks of his father, Melvin A. Traylor, Sr.: born in a log cabin in south-central Kentucky; got a teaching certificate after high school and saved money for train fare to Hillsboro, Texas, where an uncle lived; became a volunteer fireman so he could sleep in the firehouse at night; read law and became licensed in Texas; while delivering groceries, met a young woman who became his wife. Her uncle was a banker, and through him the senior Traylor was posted to one little bank and then another. He moved to St. Louis, where he became president of Livestock Bank, and came to Chicago in 1913 to be president of that bank here. Eventually he became president of Chicago's First National Bank. In the 1932 national Democratic convention he was the favorite son candidate of Kentucky, Texas, and Illinois.

He died in 1934, when Mel Jr. was 18 and a student at Harvard. The boy earned a bachelor of art's degree with a major in biology in 1937. One class in ornithology proved helpful that summer, when he went with a Chicago friend, "a boy genius in anthropology, Bill Andrews," who planned to spend the summer at Chichen Itza in the Yucatan, studying Mayan hieroglyphics for the Carnegie Institute of Washington. Andrews was also going to collect snake specimens for the Field Museum and suggested, because Traylor liked birds, that he go along to collect Mexican birds.

The Museum, Traylor says, chuckling, probably figured it had nothing to lose and dispatched the two with a double-barreled shotgun, very fine "dust shot," and assorted tools for skinning and borax powder for preserving bird skins. They left from New York, stopped in Havana, and continued to the Yucatan.

Traylor collected fewer than a hundred birds during two months, but he found work he liked. No job was open at the Museum, so he decided to enter the foreign service, studying birds wherever he might be sent. He went to Georgetown University in 1938-39 and did well on written exams but failed the orals. He was told, he says, that he had led a cushioned life and should "Go out and be a reporter for a couple of years and then come back."

Instead, he returned with Andrews to the Yucatan in the fall of 1939 for seven months as an unpaid collector for the Field Museum. This time Traylor brought back about 600 birds, more carefully prepared than before: He had sought and received advice from a young staff member, Bob Blake, "who taught me everything I know about skinning birds," Traylor says now.

He returned to Chicago and resumed work as an unpaid associate in the Division of Birds. He wrote a paper about the birds he had collected and then, in the first three months of 1941, was asked to go on an expedition led by Leon Mandel of Mandel Brothers department store.

He had been back for only a few weeks when he and Blake took off in Traylor's DeSoto coupe, carrying 800 pounds of camping and collecting equipment that would take them nearly 7,000 miles from the King Ranch in Texas, where they stayed, into the mountains outside Denver.

Upon his return, Traylor talked a couple of friends into enlisting with him in the Marine Corps. In rapid order he went to boot camp in San Diego, came home and got married, and was shipped out to Samoa as an engineer with the first group readied for action after Pearl Harbor. His artillery unit was sent to reinforce Guadalcanal. After rest and recuperation in New Zealand, he was sent to Tarawa in the Gilberts, where a bullet that hit his carbine sent fragments into his left eye.

He was shipped back to San Diego, and after he left the hospital he met someone from Scripps Institution, where Traylor served out the end of the war. In 1946 he was named project officer of a survey of the fish on Bikini, before and after atom bomb tests, and he was advanced to the rank of major.

Traylor returned to Chicago and the Field Museum in 1946. Still a volunteer, he went on a collecting expedition in 1948 to Veracruz, Mexico. "I continued to be a gentleman scientist—until I found out I didn't have enough money to *be* a gentleman scientist," he says. He left in 1952 to run a small towboat business along the Chicago and Mississippi rivers, until 1956, when an assistant curatorship of birds opened and he returned to the Field Museum as a paid employee.

At that time, to complement the Central and South American work of Blake, Traylor turned his attention to the Museum's Old World collections. He had already studied extensively the African bird collections from Gabon and Angola; his next expedition, in 1959, was to Egypt and the Sudan, where he worked with a medical zoologist, Harry Hoogstraal, to track a particular species of tick as it traveled on kestrels that migrated from Africa to Europe and Asia.

Bob Blake during his 1937-38 collecting trip to British Guiana and Brazil. Here he is shown with rhea eggs in Mato Grosso, Brazil.

Back in Chicago, Traylor continued his studies of African birds, identifying several new species or subspecies from the British colonies. "The British colonial service was one of the major factors in the world's knowledge about birds." he explains. "A lot of colonial officers were very interested in birds, and they studied them wherever they were sent."

In 1961 Traylor went on a six-month field trip to northern and southern Rhodesia (now, respectively, Zambia and Zimbabwe) and Bechuanaland (Botswana). He arrived, bought a Land Rover, was lent a guide named Jali Makawa—"a wonderful, magnificent collector who would whistle up birds"—and set out to collect some 1,600 birds he would bring back to Chicago and then study and

write about, becoming one of the world's experts on relationships of birds in Africa. His final expedition was to the southern Sudan, in 1977. He retired to emeritus status at the end of 1980, when he completed three years as chairman of the Department of Zoology and numerous nonscientific administrative roles for the Museum.

Traylor and his wife have revisited places he has especially enjoyed, the Galapagos Islands and the Yucatan among them. They returned to Guadalcanal in the summer of 1989, and later this year they will attend an international ornithological congress in New Zealand.

Mel Traylor is also known, says John Fitzpatrick, Ph.D., executive director of Archbold Biological Station in Florida and curator on leave from the Field Museum, for his work on New World flycatchers, the largest family of birds in the Western Hemisphere. "He is the first in history to produce a coherent taxonomy of this huge, 375-species family of birds."

The work, which Traylor characteristically minimizes, consists of grouping closely related species into subfamilies and genera, which simplifies the work of other scientists. In addition, he has written dozens of articles and edited one volume of *Peter's Check-list of Birds of the World* (Harvard University Press) and contributed, as did Blake, to several others.

Bob Blake joined the Museum with a reputation for expeditions into wild places. His skill and flair at collecting and his general derring-do made him "among the stalwart travelers throughout the hinterlands of South America during the '30s, '40s, and '50s," says John Fitzpatrick admiringly. "He literally charted boundaries of countries—he was part of a boundary survey team for Brazil, for instance—and is one of the get-out-and-rough-it, get-collections-into-the-Museum curators."

He also, Fitzpatrick says, "is by far best known for the enormous amount of work he has done on birds of the New World tropics and perhaps most famous for having written the first guide to the birds of Mexico."

Blake's office is especially orderly and has three prominent decorations: a plaster-of-paris dodo bird on the highest ledge; a poster-sized photograph of himself in bush clothes including pith helmet, with his wife dressed as his "demure native assistant, Peg" at a party soon after Blake's return from six months in Peruvian jungles; and a quotation: "The meaning doesn't matter/If it's only idle chatter/Of a transcendental kind."

"That quote's just a gag," Blake says brightly, tapping tobacco into one of three corncob pipes on his desk and then lighting it. "I'm loaded with gags around here." A trace of a Southern accent meshes with his slightly courtly manner.

It is quickly apparent that, while this man may kid about himself, his work as a naturalist is quite another matter. Several 8-by-10, black-and-white framed photographs are arranged on two other walls: a camp in Guatemala, Blake in dugout canoe reading a book on the Orinoco River, a clutch of rhea eggs. On the back of each photo is a summary of that particular expedition—dates, birds and other animals collected, personnel including native guides, a brief narative, and the cost. ("I could go to South America for a few hundred dollars," he says. "Now it might take 20 *thousand* dollars.")

Organization seems natural to Blake. In 1949 the Museum published a 38-page booklet, *Preserving Birds for Study,* that was a best-seller among museum collectors around the world. The same sort of clear, expository writing is evident in his 1953 book *Birds of Mexico: A Guide for Field Identification* (University of Chicago Press), the first illustrated guide for bird-watchers, which, though out of print after seven editions, is still considered the standard reference, says curator Scott Lanyon.

Blake got the idea for the Mexican book, he says, when he was in the army overseas, working, as he puts it, "as a spy-catcher in the Counter Intelligence Corps."

"One day I thought, 'What will I do when I get back?'" He looks up from relighting his pipe. "I'd been studying Mexican birds for years; I knew it was time for *somebody* to do a guide. 'I think I'll crank out a field guide.'"

After it was published, he took a belated trip throughout Mexico to double-check his research. Several times, he says, he ran across groups of Americans with binoculars—and his book. He looks up again, delighted. "I'd approach them and ask, 'What are you doing?' They'd tell me, and I'd say, 'But there's no bird guide, is there?'

"And they'd say, 'Oh, yes, we have this one,' and hold it up. 'And I'd lay it on: 'Oh, *Blake.* He's kind of a dopey guy; he doesn't know anything about Mexican birds.'" He laughs heartily.

"Eventually I'd tell 'em who I was, and then I'd autograph their books."

Having a sense of humor is obviously important to Blake. "I'm the 13th—the smartest and prettiest and, yes, particularly the most modest—from a large

family," he says, and reaches for another photograph.

"This is a family photo, 1903. I came from Scotch-Irish Presbyterian stock. What a *grim*-looking crowd," and he points out specific stern-faced people who surround a smiling bride and groom. The occasion was the marriage of his father to his second wife, Blake's mother. The first wife had died, as would seven of Blake's siblings, "three in one week, from typhoid fever, years before I was born."

Looking again at the photograph, he says, "that gives you an idea of the people I came from. People have been working on my soul ever since." He adds, mischievously, "I didn't buy it from Day One."

Bob Blake in his lab, *ca.* 1980

Blake was born November 29, 1908 in Abbeville, South Carolina. When he was 5, the family moved 15 miles away, to Greenwood. His father owned an insurance company and had a family farm, Blakedale, three miles out of town, where Blake remembers trapping muskrat and mink and doing other "Huck Finn and Tom Sawyer" kinds of things. "In my day the Blakes were people of some local consequence," he says softly. But the Depression was not kind to his family.

As a boy he knew he wanted to be a naturalist, even though the only museum he ever visited was a relatively small one in Charleston. A distant cousin who had married Ernest G. Holt, a National Geographic explorer, came to visit one day, and she showed Blake how to skin a bird and prepare it as a museum specimen.

While he was a student at Presbyterian College of South Carolina, 40 miles away, Blake turned a vacant dormitory into a small museum for specimens he had collected. It was science from an early age, he knew: "I flunked almost everything but biology and science" on his way to a bachelor of arts degree in 1928.

He also knew he would have to go north for any exposure to real museums. To earn money for graduate school, he traveled throughout the South with a carnival as its "meet-all-comers" prizefighter. In 1929 he started out for Carnegie Institute of Technology, in Pittsburgh, where he was to study art, the field in which a grandfather had been successful and Blake showed talent.

"I rollerskated up there—had two dollars and sixty-five cents and went 900 miles," he said. "I slept by the side of the road, and took my skates off at night. The first day I made 113 miles, from Charleston almost to the North Carolina boundary. After that I skated only at night—couldn't do it during the day because of the traffic and heat."

He mentions that someone wrote about him in a column like a "Ripley's Believe It or Not" and admits that he enjoyed the attention. He reached Pittsburgh before his college records arrived and before taking a job as a YMCA lifeguard, "so I slept a week or 10 days on newspapers with the other bums in Schenley Park, between the University of Pittsburgh and Carnegie Tech."

In August 1930, he went as the assistant on a year-long National Geographic Society expedition

to Brazil. The team helped to map boundaries of Brazil, collected specimens of some 3,100 birds, 98 mammals, and 115 reptiles, and thousands of pressed plants. On his own, Blake climbed previously unscaled mountains, saw and was observed by primitive people, and found that he was, after all, better suited to be a naturalist than an artist.

He returned to Pittsburgh in August, began work on his master's degree in biology at the University of Pittsburgh, and was off to Venezuela again, on a December 1931 to April 1932 expedition sponsored by Chicagoans Leon and Fred Mandel. He led a second Mandel expedition to Guatemala, between October 1933 and May 1934. Between them he completed his master's; in February 1935 he led an expedition for the Carnegie Museum to British Honduras (now Belize). Their guides, Mayan *cargadores,* deserted and Blake became severely ill from parasites. He found passage to Belize and returned to the field after being hospitalized 10 days. The next month, July 1935, he reported to work at the Field Museum as assistant curator of birds.

In 1937 he led a year-long expedition to British Guiana (now Guyana) and Brazil. In 1938 he returned to British Guiana and survived the most harrowing of his adventures, when his boat hit a submerged boulder and sank in the Corentyne River. Nearly 500, or half, of the bird skins were saved, but many more specimens of birds, mammals, and insects were lost.

Blake's final South American expedition was to Amazonian Peru between May and November, 1958. He brought back more than 1,000 bird specimens as well as collections of reptiles, fish, and mammals.

The work has obviously fulfilled his boyhood dreams. "But science has now moved on into different areas," he says, mentioning DNA and other high-tech research. "We have some very brilliant young men working here, the Young Turks, I call them," he says and laughs.

"They leave me alone; I leave them alone; we're both happy. They might come up with the right answers; they may not." After a pause, he says, "Mel and I represent a past generation of ornithologists and may now be a bit obsolete by present-day standards."

Asked about the absence of a computer terminal, Blake chuckles. "I don't even *type.* I had a secretary most of my life. My books? I do 'em in longhand."

He moves to a cabinet and opens drawers that contain lovely, four-color illustrations of birds by Guy Tudor for volume 2 of his landmark *Manual of Neotropical Birds* (University of Chicago Press), a series of several volumes that will include all birds recorded in tropical America, or more than a third of the world's total species. It is a work his juniors at Field Museum hail—and seem somewhat amazed by.

"People tell me I should at least publish the pictures; they are that exceptional. I'm so far behind with the text and come in so irregularly now, that I probably never will be finished with it." His schedule was recently interrupted by health problems of his wife, he mentions. She is doing better now.

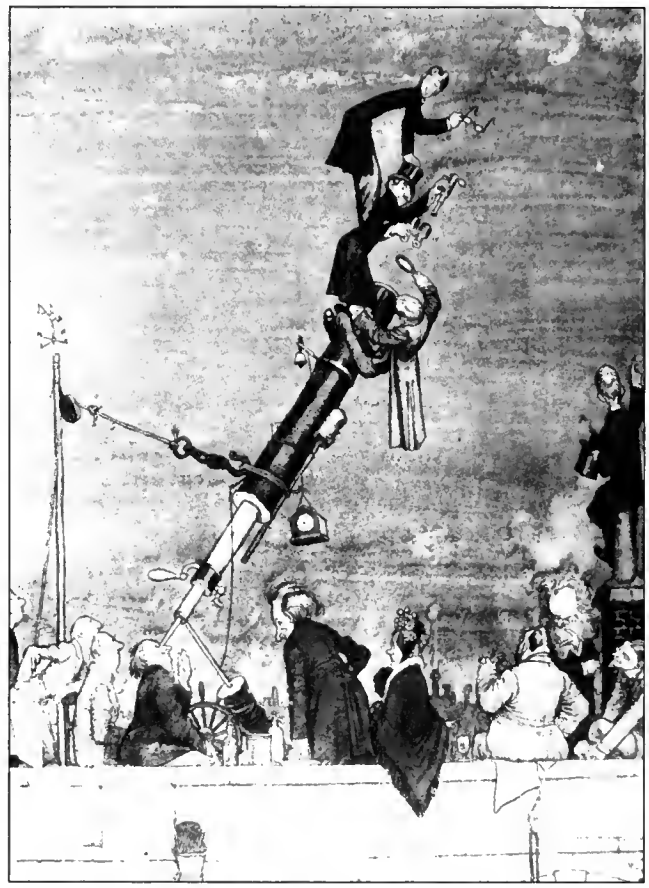
"We did travel a bit," he says. "She joined me in Mexico on one occasion and was ready to bring the babies to Peru when I was there," he says. They have made trips together in recent years, mainly to Europe.

Blake says he wouldn't care to go back to Mexico, or most of the other countries he's explored, because of the pollution, the overpopulation, and the destruction of habitat. Yet, both he and Traylor look back on their travels with fondness.

"I'm glad I saw things when I did and got the traveling out of my system when wilderness areas were relatively pristine. I have no regrets now about a lifetime spent in the world of birds and natural history museums."

The Message from Halley's Comet

What We Learned from the Space Probes



19th-century cartoon, "Searching for Halley's comet, at Greenwich Observatory," by Heath Robinson.

by Edward Olsen
Curotor of Minerology

The far reaches of the Solar System are regions of strangeness. Seemingly empty space, utterly silent, but filled with physical forces. Streams of atoms and subatomic particles ejected from the sun—the "solar wind"—cross other streams of similar stuff coming from distant sources in our galaxy — galactic cosmic rays. Electromagnetic radiation—light, radio waves, x-rays, ultraviolet and infrared rays—come from all directions. And gravity, also in waves, permeates the space between the planets. Gravity from the planets, gravity from small asteroids, gravity from near and not so near stars and, most important of all, gravity from the sun. In this region of silent forces, one object of fascination to mankind only a few years ago, Halley's Comet, moves swiftly along its graceful, elliptical path. It aims toward an empty point in space around which it will swing and again begin its return journey toward the sun, appearing in our sky in the year 2061.

The sun's gravity swings planets, asteroids, and comets around it. Ancients knew this and wrote of the seeming perfection of it all. Spheres swing about a central sphere. Spheres were, to them, esthetically perfect bodies. And equally perfect was the circle. It was inconceivable to them the universe could run on any pattern other than that which was esthetically perfect.

Perfection, of course, is in the eye of the beholder. Time passed and it became clear that perfect spheres and circles are rare in nature. Indeed, the planets and all the solid bodies of the Solar System are quite "imperfect" shapes — flattened ellipsoids, slightly tetrahedral, even lumpy and irregular. And the paths they follow are not circles but ellipses; and because of gravitation from bodies other than the sun the ellipses are themselves not ideal.

Except for the odd little planet Pluto, the elliptical paths of the other eight planets are only a bit off being circles. Most of the objects with really elongated elliptical paths are the periodic comets. Although dim comets pass through our sky at regular intervals, bright comets, ones we can see by eye, are not so common.

Five years ago excitement surrounded the appearance of Halley's Comet. It was the first time it returned, along its elliptical path, to our part of Solar System space since 1910. The first time since we had entered the age of space exploration. More could be done than merely watch and make measurements of its peculiarities through the imperfect window of our surrounding gaseous atmosphere. We could launch vehicles to race out to encounter this famous comet and measure more of its features than would ever be possible from the ground.

Japan and the Soviet Union each sent off two probes to make measurements at moderate distances — as close as 5,000 miles. The European Space Agency (ESA), a consortium of European nations, sent the heavily instrumented probe called Giotto. It passed within 375 miles of the comet's head, or nucleus.

So much publicity four years ago. So many books published. So many television interviews of scientists about this new adventure—a spacecraft encounters this bright, famous comet. And since then, almost utter silence! What came of all this? Why don't we see the same scientists on television telling us the wondrous facts of their new finds? This is potentially exciting, imaginative science. Yet, the comet is four years departed and totally out of the public mind.

After data came pouring in, there followed a flood of published technical results, talks given at international meetings, and press releases. An issue of the scientific journal *Nature** published 38 reports (107 pages) while the outward-bound comet was not so far gone that it could still be seen with a small telescope. Little of this has come to the popular media, in strong contrast with the hoopla that preceded the comet's arrival.

All we learned from early newspaper and news magazine accounts is that the comet is not a sphere (many scientists never believed it was). It is a lumpy, potato-shaped object 10 miles long by 5 miles wide and about 5 miles thick. It rotates around one of the smaller (5 mile) axes once every 53 hours. Little else was reported about the mass of new information because all of it was very specialized, terribly abstruse, and difficult to translate into popular terms. An early press release, for example, was titled, "The D/H and $^{18}O/^{16}O$ isotopic ratios in Comet Halley." This is not the sort of stuff to compete with the latest activities of Princess Di—and an awfully lot harder to popularize than some newly found dinosaur bone. But it is still not too late to try to describe some of the more tractable results—to say whether all this effort by so many nations produced anything we didn't already know. I'd like to try. Hang on!

The Dirt of the "Dirty Snowball"

Certainly every space scientist would agree that a big result was the direct confirmation of the "dirty snowball hypothesis." Since ancient times men have speculated about the physical state of comets. Why does a comet have only a small tail when first seen far out in space, and gradually "grows" a longer tail as it approaches the sun? When it swings around the sun the tail points always away from the sun so that it moves back out into space tail first, the tail gradually decreasing in size.

There have been many ideas about them, some pretty ingenious, some fanciful, some plain nuts. The two that emerged in the twentieth century were "the buckshot hypothesis" and the "dirty snowball hypothesis," invented by Harvard astronomer Fred Whipple.

According to the buckshot hypothesis a comet consists of zillions of separate stone and ice granules all traveling together through space, the way buckshot travels after being blasted out of a shotgun. The granules themselves were thought to be porous and to contain trapped gases of several kinds, in their pore spaces. As the bunch of grains approaches the sun, the sun's radiation warms them and the gases boil out. Solar radiation causes some gases to emit light, and some dust grains to reflect light; hence, the tail. The closer to the sun, the stronger this effect and the longer the tail. And, the tail must always point away from the sun.

With a bunch of tiny grains, spread out through a volume of space, the hypothesis suggested that the density of matter within any part of the whole mass is very low. In fact, the old joke used to be that "a comet is as near to nothing as you can have, and still have something." It's kind of a neat idea—but wrong!

Fred Whipple found that some features of comet

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behavior were difficult to explain with the buckshot hypothesis. Decades ago he suggested a different picture. A comet consists of pieces of rock, some large, many small, and most of them tiny granules and dust particles, all held together in ice. The ice is mainly the ice we all know so well from our refrigerators and ice machines—frozen water. The word, "ice," however, is used here in a broader sense to cover every liquid or gas that is frozen to a solid condition. Carbon dioxide, we know, can be frozen to ice, called "dry ice." So can methane, ammonia, and other compounds be frozen as ices if it is cold enough, as indeed it is in the far reaches of the Solar System. So the ice of Fred Whipple's snowball is a mixture of ices. The whole thing is as if you scooped up a handful of snow that lay on a gravel driveway. The snowball you make would have lots of gravel, sand and clay mixed in it—that is, a "dirty snowball."

As the dirty snowball approaches the sun, melting ices (on the surface) release their molecules, which react with the sun's radiation and glow. Dust and stony granules are also let go, and they can reflect sunlight. Again, the tail forms and grows as the snowball rounds the sun. Each time a comet passes around the sun it loses a lot of mass by melting. If it doesn't have much mass at the start it can be destroyed the first time. If it has a lot of mass, like Halley's Comet, it can make repeated trips, getting smaller each time until it finally wastes away.

The cameras aboard the Giotto probe recorded a solid comet nucleus (head). The nucleus was clearly releasing gas and dust. It is a real dirty snowball. The probe photographs indicate that the mass of this snowball is around 100 billion tons! The output of dust is between 3 tons per second and 10 tons per second. Taking the higher estimate (10 tons/sec), this means the nucleus of Halley's Comet can, under the worst scenario, suffer over 300 total years of close exposure to the sun. But it loses material at this rate only for a few months every 76 years. So Halley's Comet can last for over 90,000 years before being wasted away completely.

But something new appeared in the probe pictures. A slowly rotating snowball, being "cooked" by the sun—like a leg of lamb being roasted on a spit in a Greek restaurant—would be expected to give off a cloud of dust and gas mainly on the side facing the sun. But no such general cloud was seen. Instead, the cameras recorded distinct sharp jets of gas and dust spurting from only about 10 percent of the sunny side's surface. The rest of the surface was quiet. Ground-based observations of other comets, over many years, led some space scientists to conclude that such jetting occurred. The Halley images suggested this may be the main mechanism expelling matter from a comet nucleus.

The dust held some surprises, as well as some unsurprises. Space scientists long ago formed mental models of what to expect from a comet. The models are based on two bodies of facts. The first is what is known from meteorites, the main solid objects we have from Solar System space beyond the region of the Earth and the moon. The second is what we know about interplanetary dust. First, about meteorites:

There are about 30 different kinds of meteorites if you take into account all the subtle differences in composition, structure, and mineral make-up. Most meteorite types are obviously fragments of asteroids of various sizes and complexities*. Generally, they have been transformed by well known geological processes into compositions and structures different from the pristine state in which they formed originally, 4.6 billion years ago when the Solar System was formed. Two kinds of meteorites, though, do not appear to be much changed. They are two of the carbonaceous meteorites, types 1 and 2—or C1 and C2 in meteorite jargon. Both kinds appear to be largely primitive agglomerations of mineral grains derived from several early Solar System processes. The main process is direct formation of mineral grains from the cooling gas cloud that surrounded the newly formed sun. This process is called *condensation from the solar nebula.*

A C1 meteorite, for example, is just what you would expect to find in a dirty snowball. It has about 20 percent water tied up in mineral structures. It has tarry organic macro-molecules and trapped gases of many kinds. A C1 looks like a rock that has sat in a damp place for a long, long time.

A C2 is quite similar to a C1, but has about half the C1's water content and about 50 percent of grains of minerals that are formed by condensation from the solar nebula. These mineral grains are very small and were the first dust grains to form as the high temperatures of the early solar nebula began to drop. C2 meteorites also contain trapped primitive gases, a large variety of organic molecules (including numerous amino acids, the building blocks of proteins) and tarry organic macromolecules. The C2 meteorites also show signs of a good soaking. Mineral grains are corroded and have taken up water to different degrees. Again, here is a meteorite type one might suspect of having been the "dirt" of a melted-away dirty snowball.

Now, about interplanetary dust. Over a decade ago a

*Asteroids are extremely small planets ranging from a few hundred feet to a few hundred miles in diameter.

program was begun to collect the small particles that permeate the space between planets. You can think of these dust particles, if you wish, as extremely small meteorites. They have been known for centuries. On a dark, clear night (especially in March) away from manmade lights you can observe a faint glow in the western sky long after the twilight of sunset has disappeared. It can best be seen from latitudes nearer the equator. The same glow also precedes dawn in those latitudes and is most noticeable in the month of September. Both glows are broad, wedge-shaped streaks against the background of constellations, which make up the zodiac. The glow is called the *zodiacal light.*

The glow of the zodiacal light is caused by reflection of sunlight off zillions of dust grains circulating around the sun, like so many microplanets. They cannot be dust grains left over from the first days of the Solar System because the larger of those grains have long ago been swept up by gravitational attraction into the sun, and the smaller grains of these have all been pushed out of the Solar System by the solar wind. If all the original dust is gone, one way or another, the fact there is dust there now means it must be constantly renewed. If they were not renewed by addition of about one ton of dust per second the whole dust mass would be gone in only 100,000 years and there should be no zodiacal light. The source of the new dust must be from the many comets, including Halley, which pass through the inner Solar System periodically and episodically, spewing out jets of dust grains that trail along in their wakes. By capturing some of this dust we should be able to form a better idea of what comets are like.

It was in the 1970s that successful collections of interplanetary dust were first made, using sticky panels deployed from aircraft flying at over 60,000 feet. Later, another source turned up when summertime melt puddles on the Greenland ice cap were found to contain interplanetary grains. These grains originally drifted down through the atmosphere and were frozen into the ice. Slight melting of the surface ice in the summer formed rivulets of water, which drained into low spots. Many, many years of this left small pockets of space dust along with some terrestrial mineral grains.

Interplanetary dust is harder to study than meteorites. Typical dust particles are less than 60 micrometers (two thousands of an inch). They are made up of very porous, delicate clusters of mineral grains, each of which is less than one-tenth of a micrometer (forty millionths of an inch). Microhandling techniques, electron microscopy, and microanalysis instruments were finally successful and a body of knowledge about them gradually grew.

Contrary to expectations, some mineral grains turned out to have significant differences in compositions from the same minerals in the carbonaceous meteorites. It was possible to see similarities between them, and a few mineral grains did look very much like miniclumps of the water-bearing minerals in the C1 and C2 meteorites. The conclusion is that the "dirt" of the dirty snowballs, while similar to some of the things seen in carbonaceous meteorites, is just a bit more primitive then even the most primitive type 1 carbonaceous meteorite—what we might think of as a "type zero" carbonaceous meteorite—one never sampled as a meteorite that survived falling to Earth. Such a meteorite would probably never make it through the Earth's atmosphere as a large chunk because it would be so fragile it would break up into tiny pieces high in the air before hitting the ground. The collected dust grains are strong candidates for the dust released from passing comets and the stuff recharging the dust belt that causes the zodiacal light.

The dust emitted from Halley's Comet exhibited some new features. Because dust came off the comet mainly in erupting jets, the distribution of dust in the space around the comet's nucleus was uneven. Ground-based observations of other comets, in times past, suggested to astronomers there should be a cutoff of dust particle sizes in the range of three-trillionths of an ounce. Particles were detected by the Giotto probe, however, that weighed only a ten-thousandth as much as this, and no cutoff size below this was detected. The smallest particles are so small it would take five billion billion of them to weigh a pound!

Although the instruments on the five space probes could not make precise measurements of the proportion of gas to dust coming from the comet, values in the range of ten to one-half were estimated. That is, the abundance of gas compared to dust is between half as much and ten times as much. Ground-based estimates on other comets, in 1957 and again in 1970, are in this same range as the measurements on Halley's Comet.

Instruments aboard the space probes measured a number of chemical elements coming from the bursting jets of matter from Halley's Comet. When compared to the composition of matter coming from the sun, oxygen and carbon abundances in the comet are very similar, but nitrogen is a little lower in the comet than in the sun. When compared to carbonaceous meteorites, nitrogen and carbon are ten times higher in Halley, and oxygen is two times higher. These differences, again, mean that this comet (and perhaps all comets) is more primitive than carbonaceous meteorites.

Dust particles coming from Halley's Comet are not

The Horsehead Nebula, a dark, dense interstellar dust cloud. Clouds such as this are the "factories" for simple and complex organic molecules.

all the same, or even similar in composition to each other. Some grains are high in carbon, hydrogen,oxygen, and nitrogen. Others are high in magnesium, iron, silicon, and oxygen. These two types of grains are not emitted uniformly from the jets on Halley's surface. Some jets appear to spurt out mainly carbon, hydrogen, oxygen, and nitrogen type compounds, while other jets appear to eject mainly magnesium-iron-silicon-oxygen grains. This is interpreted to mean that the dirt of the "dirty snowball" is not well mixed on the surface of Comet Halley.

Grains made up mainly of compounds of magnesium, iron, silicon, and oxygen are the "silicate," or inorganic, fraction. In general, magnesium silicates require very high temperatures to form originally, while iron silicates form at lower temperatures.

Grains made up mostly of compounds of carbon, hydrogen, oxygen, and nitrogen are the "organic" fraction, and these form only under fairly cool temperature conditions. We must be careful to understand that using the word *organic* doesn't mean these compounds must have been formed by living organisms. The words *organic* and *inorganic* today have different connotations from when the terms were created centuries ago. A long time ago chemists divided themselves into two main groups—inorganic and organic chemists. Organic chemistry is the study of compounds that are usually, *but not always*, produced by living organisms. These are mostly compounds made of combinations of the chemical elements carbon, hydrogen, oxygen, and nitrogen. Such compounds can be made in a laboratory without the action of any living organism. If a compound is a combination of these chemical elements, it is called "organic," whether made by a creature or made (inorganically) in a laboratory or in nature. Many organic compounds found in types 1 and 2 carbonaceous meteorites were not formed by organisms, but by inorganic processes. The terminology can be very confusing. So, grains of solid compounds and gaseous molecules trapped in ice and dust grain pores of Halley's Comet are both inorganic and organic.

Over the past decade astronomers have been able to detect many organic compounds in space. They occur along with inorganic compounds in dark, dense dust clouds that have been seen by telescope. These clouds fill regions of space between distant stars. Such compounds had to have formed in these clouds at cold temperatures. The main factor promoting their formation is a relatively higher density of matter than generally occurs in space. Formation by cold reactions is known to affect the kinds of hydrogen atoms in these compounds.

Hydrogen can occur in nature as either of two kinds of stable atoms, one weighing twice that of the other—normal hydrogen and what is called deuterium. When atoms of a single element occur in different weights, but retain the same chemical properties, they are called *isotopes* of each other. Organic compounds formed in cold dust clouds have a high percentage of the deuterium isotope in them. The organic compounds in carbonaceous meteorites have similarly high deuterium contents, and so do the organic compounds in interplanetary dust particles, described before. The organic gases in Halley's Comet also show high deuterium contents.

The conclusion from all this is that all organic compounds found in carbonaceous meteorites and in comets come from giant dust clouds in space where they are, in a sense,"manufactured." As they form, they apparently drift out of such cloud regions and permeate space, both as gaseous molecules and absorbed into inorganic dust grains. When such dust grains drift into regions of space where new stars and planets form they are destroyed because star formation and planet formation are initially very energetic, hot, violent processes. The only places they escape destruction is where they are incorporated into small, cold bodies, such as tiny asteroids that are the sources of carbonaceous meteorites, or into the "snow-

balls" of comets. So, comets, such as Halley, are the source of surviving ancient matter from incredibly far reaches of our galaxy! In other words, Halley's Comet carries in it grains and organic compounds that are older than the Solar System!

Panspermia

Mankind has long puzzled over the origins of life. The flow of earthly life—birth, growth, death—has been an issue of deep concern in most religions and some philosophical systems. The basic sciences, chemistry and physics, while never openly avowing that understanding the origin of life is a major goal, nevertheless perform experiments from time to time, which clearly deal with this question.

Speculations about the process by which life might have started on Earth, and elsewhere in space, have usually involved extraordinary circumstances: organic molecules accidentally form in isolated environments in sufficient concentration to interact and form the sugars, amino acids, and proteins necessary for any living system. Possible, but unlikely.

In the early 1950s, Nobel laureate chemist Harold C. Urey, of the University of Chicago, became fascinated with the chemistry of meteorites, especially carbonaceous meteorites containing organic compounds, which so obviously formed by some inorganic process, someplace, sometime—out there. He reasoned that these organic compounds might be the result of some processes going on during the early stages of formation of the planets. Such times were full of energetic processes. If too much energy pervaded the system, organic compounds, if formed, would be destroyed relatively quickly, compared to the more stable inorganic compounds. But once things began to cool down, organic compounds could persist.

The atmosphere of the planet Jupiter was considered to be primitive and fairly typical of the starting atmospheres of most of the planets, which circle the sun. Jupiter's atmosphere contains hydrogen, methane (a compound of carbon and hydrogen), water (a compound of hydrogen and oxygen), and ammonia (a compound of hydrogen and nitrogen). If simple lightning discharges took place in such a gas mixture, could interesting new compounds form? (Today, from space probes to Jupiter, we know that lightning is going on all the time in the Jupiter atmosphere.) Urey's student, Stanley Miller, performed a series of experiments, sending electrical discharges (little lightning bolts) through mixtures of the kinds of gases on Jupiter. The results were astounding. A large number of organic compounds formed, including amino acids, which are the building blocks of proteins. It was one of the few times that a student's Ph.D. project was reported in national and international newspapers and news magazines. At the time it was thought possible that by similarly reprocessing the amino acids, primitive proteins might form. This never happened.

When the relative amounts and kinds of these organic compounds were later compared to the organic compounds in carbonaceous meteorites, the comparison was poor. The lightning process (called the Miller-Urey process) also failed to show the high proportion of the deuterium isotope which characterizes the hydrogen content of the organic compounds of the carbonaceous meteorites, interplanetary dust particles, and Halley's Comet. Although the Miller-Urey process could generate complex organic compounds by a pretty simple inorganic process—a process that does not require extraordinary circumstances—it failed to match the compounds which are observed. The only processes known that can produce the high deuterium contents are the processes forming organic compounds in dense, cold interstellar dust clouds, far out in the galaxy.

There is a rich variety of organic compounds produced in these dust clouds. Two of these compounds, hydrocyanic acid and formaldehyde, are very important in the chemical steps to form amino acids, nucleic acids (the acids that make up important parts of living tissue), and sugars. Among the organic compounds detected in Halley's Comet is hydrocyanic acid. Formaldehyde is probably also present, although it has not been measured directly because the sun's radiation easily decomposes formaldehyde molecules as they spurt out of the comet nucleus.

There is a very old idea, called the *panspermia* hypothesis. It states that life permeates the universe and that life began on our little planet, Earth, not by any process special to the Earth or the Solar System, but by drifting in from space on dust grains and implanting itself on any planet with a set of surface conditions suitable to allow life to survive and evolve. The surface conditions would have to be warm (but not too warm), wet, and with a nearby star (sun) bright enough with light of the appropriate wavelengths. It is possible life existed on the planet Venus long ago but disappeared when conditions changed. It is possible that life exists now on the planet Mars. The oldest known living matter (algae) appeared on Earth around 3.6 billion years ago. The Earth was still relatively young then, only 1 billion years old. It had undergone a violent formation period 4.6 billion years ago; was largely, or wholly melted for a period of time, underwent a devastating glancing blow from another ear-

ly planet (and survived), and then underwent repeated bombardment by small asteroids and comets between 4.3 billion and 3.7 billion years ago! So, in less than 100 million years (that is, 3.6 billion year ago) after all these violent, horrific events, we find that life was up and running in the form of tiny algae.

Recently a group at Cornell and Yale universities completed calculations which showed that comets, such as Halley's Comet, could have deposited up to a trillion tons of organic matter onto the infant Earth. Furthermore, comets have a high water content. They are, after all, mostly "snowballs." Analysis of the data from the Giotto probe to Halley's Comet suggests that the water of the Earth's oceans could have been brought by comets, during the vigorous period of impacts 4.3 to 3.7 billion years ago. Certainly the oceans did appear very early in Earth history. One of the oldest dated rocks on the Earth's surface can be seen as an outcrop in western Greenland. It is 3.77 billion years old. The rock is now dense and granite-like; however, it was originally a sedimentary rock, which was deposited in water. The age, 3.77 billion years, marks the date of its metamorphism from a soft sediment to a crystalline metamorphic rock. This means the original sedimentary rock was older yet. It also means, in turn, that some bodies of water were present, say 3.8 billion years ago, just when the known high bombardment by asteroids, large meteorites, and comets was winding down in intensity. The Earth was cooling off by then, and liquid water could exist on its surface, as could organic compounds.

Evolutionary biology today is happening in the laboratories of molecular biologists. The goal of molecular biology is to understand the working of molecules which govern all living processes. This research will ultimately lead to an understanding of the series of self-sustaining chemical reactions we call life.

Summing Up

The Giotto mission was a spectacular success. Although most of the scientific results are of interest only to specialists, there are results the interested citizen can appreciate and understand.

1. Halley's Comet *is* a "dirty snowball." By implication (at least until we know otherwise) all comets are probably dirty snowballs. Variations in the appearances of different comets suggest some of them may have more "dirt" or more "snow" than others, but the basic idea is a good one.
2. Dust and gas are ejected from comets mainly by jets erupting over a small percentage of their surfaces.
3. Dust particles show no obvious cutoff size, but appear to range downward to smaller and smaller sizes.
4. Interplanetary dust particles collected high in the stratosphere are very probably dust grains released from comets. If so, intensified study of these can give us more direct data on comets.
5. The organic compounds in Halley's Comet show the same enhancement of the heavy isotope of hydrogen, *i.e.*, deuterium, found in carbonaceous meteorites and interstellar dust particles. The source of such high deuterium compounds must be dense clouds between distant stars in our galaxy. This revives the panspermia hypothesis. Life on Earth may have resulted from a huge early infusion of complex organic compounds from comets. It also suggests that life in our universe is a common phenomenon on any planet with congenial surface conditions.
6. The Earth's oceans are known to be older than 3.7 billion years. It is possible ocean waters are melted cometary "snow."
7. The chemical composition of Halley's Comet shows it is more primitive than carbonaceous meteorites, which, until now, were thought to be the most primitive objects in the Solar System. Many thought that carbonaceous meteorites were the "dirt" from former comets long ago wasted away by repeated close encounters with the sun.

These are only some of the more understandable results from the probes to Halley's Comet. Data were acquired which are of meaning only to specialists in space science, chemistry, and physics. What has been learned from this project has whetted the appetite of the space science community for cometary studies in the future. Plans have been underway for the past four years.

The Future—CNSR and "Rosetta"

From time to time a group of nineteen scientists gather to plan an ambitious project—the Comet Nucleus Sample Return, or CNSR. They come from West Germany, Switzerland, France, Italy, England, the Netherlands, and the USA. The idea they work on is to send a probe to an encounter with one of 43 possible comets, chosen for their suitable orbits and apparent size. Halley's Comet is not on the list because its orbit puts it too far away for the near future, when the mission is planned.

A vehicle will be launched from Earth, or from a space station in orbit around Earth, and will ultimately move into a "parking" orbit with the chosen comet nucleus, at a distance far out from the sun. At such a cold place in space the surface of the comet will be inactive—no jets or gas, no spurts of dust. Just a cold, quiet giant "potato" cruising through space. The vehicle will collect

a core of solid material (dirty snow) and gases. The collected material will be put into a storage container where it will be kept at a temperature of 225°F below zero! The vehicle will return to Earth and the samples analyzed and compared to carbonaceous meteorite material and interplanetary dust particles. The comet sample may contain significant amounts of material that predates the formation of the Solar System.

When the Solar System formed, 4.6 billion years ago, it was composed of a mix of matter from all parts of the galaxy. This matter was stirred up well enough by the process of planet and asteroid formation that it developed a high degree of homogeneity. By study of planets and meteorites we see the mixture of chemical elements that existed at that particular time.

From Halley's Comet we now know that comets are not quite like meteorites. Comets are more primitive stuff. They could not have been intimately involved in the hot, violent processes of the early Solar System, otherwise they would have been homogenized along with the rest of Solar System matter. Comet dust particles will have different ages from different times before the Solar System formed. Some may be as old as the first solid matter to appear after the formation of the universe—the so-called "Big Bang," about 10 billion years ago!

The CNSR probe has been given the tentative name, "Rosetta." It is scheduled to go off under the auspices of the European Space Agency by the year 2000. The name refers to the famous Rosetta Stone. Long ago archaeologists discovered the hieroglyphs of ancient Egypt. They puzzled over them for a long time, but could not figure out how to translate them. Modern Egyptians had long ago abandoned and forgotten the hieroglyphic system of writing. Then the Rosetta Stone was found. It has a long inscription on it in hieroglyphs, repeated in Demotic and ancient Greek, which is well known. Comparison of this three-alphabet version led to the hieroglyphic "code" being deciphered. It opened up all Egyptian hieroglyphs to translation.

The probe to a comet is expected to be the Rosetta Stone of space research, giving mankind the code book to translate the history of the galaxy. **FM**

39th Annual Members' Night

Friday, June 22

When you visit Field Museum do you ever wonder how an exhibit was created? Who thought up the subject matter? Who chose the artifacts from the collections? Where did all these artifacts come from? How did a three-thousand-year-old necklace from Egypt or a ceremonial mask from Canada end up in Chicago, and why is a canoe from the South Pacific docked on the second floor of the Museum?

Join us on Members' Night and visit with our scientific curators, exhibit developers and preparators, and educators to find out what goes on behind-the-scenes at Field Museum. Explore the areas of the Museum that are usually off-limits, and see how artifacts and specimens are collected. Learn about the Museum's ongoing scientific research and talk to the people who create the many exhibits you see at the Museum.

There will be musical entertainment all evening in Stanley Field Hall. McDonald's will be open from 5:00 until 9:30 P.M.

Free bus service will operate between the Loop and the Museum's south entrance. These buses, marked *"Field Museum,"* will originate at the Canal Street entrance of Union Station (Canal at Jackson) and stop at the Canal Street entrance of Northwestern Station (Canal at Washington); Washington and State; Washington and Michigan; Adams and Michigan; Balbo and Michigan. Buses will begin running at 4:45 P.M. and continue at approximately 20-minute intervals until the Museum closes at 10:00 P.M. You may board the free "Field Museum" buses by showing your membership card or invitation.

Members are invited to bring their families and up to four guests. Special arrangements for handicapped persons can be made by calling 922-9410, ext. 453 beginning June 11. Behind the scenes activities will end at 9:00 P.M. Save the date — June 22 — and join us for a very special evening.

Plaza of the Church of the Socavon on a hillside in Oruro, Bolivia. Carnival participants, including their bands, as well as spectators, have gathered for the dawn mass, *El Alba*.

THE DIABLADA CARNIVAL

Each year, 2,500 participate in this 20-hour pre-Lenten festival in the town of Oruro, Bolivia

by Patricia Dodson
Associate, Department of Anthropology

photos by the author

It was 4:00 A.M. and I was attending mass in a town 12,000 feet high, listening to three dozen bands playing a total of 33 tubas in front of the church. This was the town of Oruro, in west-central Bolivia, and the 2,500 participants in the diablada carnival were massed, fully costumed, in the Plaza of the Church of the Socavon (known also as the Church of the Mineshaft). I could hear the lively, energetic *cueca* music of the devil dancers—the diabladas, the mournful dirge of the morenadas, the high-pitched, eerie panpipes of the kallawayas, and the sharp whistles of the llameros. They were all playing at once, and all with accents of drums and brass. To my ears it was cacophony, but others standing near me could actually identify the music. This was the beginning of another 20-hour carnival.

It certainly wasn't like the Brazilian carnivals I'd seen, where tropical temperatures reduce clothing to a minimum. It's so cold here in the Andean high plains, or *altiplano,* that I wore ski underwear and a down jacket. Even if the weather were hot, the carnival costumes are unlike anything in Brazil. Highly conservative mores prevail in Oruro—no near-nude swaying bodies or sexual innuendoes.

The most provocative costume I saw in the diablada parade was that of a dancer wearing a short black velvet skirt over three short ruffled petticoats, set off by mid-thigh, black velvet boots.

The main events of the Rio carnival are carefully orchestrated and meticulously staged with a new theme, new costumes, and even new songs every year. There, the political insinuations of the specially written songs delight the Cariocas, or Rio natives. The carnival in Oruro, on the other hand, carries on, year after year, the myths and traditions of the altiplano, providing a folkloric feast for eyes and ears.

Oruro, a mining town of 125,000, is two hours south of La Paz by train and Bolivia's railroad center. But now the silver mines are closing and the population declining. Many miners have left to seek work in the oil fields near Santa Cruz, 250 miles to the east.

This is the land of the Aymara and Quechua Indians, subdued by the Conquistadores in the 1500s. In this pre-Lenten carnival, Catholic rituals alternate with indigenous Indian ceremonies in recognition of Huari, god of the underground (sometimes called Supay), and Pachamama, Mother Earth, in the ten days of celebrations preceding Ash Wednesday.

This carnival probably orginated with the miners' ceremony in recognition of Supay/Huari, who watches over the mineral wealth. In Andean mythology, Huari demands regular appeasement with offerings or he will cause the mine to collapse or the silver vein to run out. The hell-fire, damnation devil of Christianity is unknown to these highland Indians.

In the 1700s the miners' cult of the Miracle of the Virgin of Socavon merged with the cult of the devil Supay. The devil dance is thought to represent a battle between darkness and light, past and present, good and evil. In the 1800s, a Spanish priest introduced the struggle between St. Michael the archangel and the seven deadly sins in an attempt to counter miners' superstitions and to eradicate or subdue the local deities. The present-day parade includes Lucifer, the chief devil, and several hundred lesser devils, along with St. Michael and China Supay, the Devil's consort.

I was told that the myth of the encounter between Huari and the Virgin Mary explains the presence of lizards, toads, and snakes on the devil dancers' masks. Angry with the local villagers, Huari dispatched a huge lizard, a toad, and a horde of ants to subdue them. The Virgin Mary, protectress of the village, cut the lizard and toad into pieces. According to legend, these pieces petrified, becoming the hills around Oruro; the ants became the nearby sand dunes. The defeated Huari returned to his underground domain. The local miners, however, continue to appease Huari on the first Friday of every month in a so-called *cha'lla* ceremony at the mine.

China Supay, the devil's consort, wearing a mask with horns, parodies Spanish court dress. She is a member of the diablada group.

The carnival calendar begins months early, with a religious ceremony on the first Sunday in November. Groups then practice and rehearse their performance every Sunday until the *entrada* at 9:00 A.M. on the Saturday before Ash Wednesday. On this Saturday morning I was in a spectators' stand on the corner of the church plaza when 200 devils led by Lucifer paraded into sight. The metal masks of the devils are two feet high, adorned with figures of lizards, toads, and snakes; they have lightbulb eyes, painted red, yellow, blue, and black; and wear deep-colored velvet tunics, metal belts with dangling coins, white pants, and shiny black boots. Lucifer wears a long, jewelled velvet cape and an especially elaborate mask. The devils dance a fast-paced *cueca*,

A young member of the kallawaya group wears an Andean poncho and a white felt altiplano hat.

leaping and twirling and entertaining the crowd, while three bands play tubas, horns, and drums.

Walking behind Lucifer, with China Supay, is St. Michael, in pale blue silk and satin; he wears an angelic mask topped by a helmet, and his silver shield bears a red cross. China Supay parodies 19th-century Spanish court dress—calf-high laced boots, a full, knee-length skirt, laced bodice, and she wears a leering mask with horns. Finally, condor and bear figures weave among the dancers.

Among the 40 groups in this parade, the largest are the four diabladas, each with 200 to 300 members, followed in size by the six morenada groups, who depict African slaves imported by the Spaniards centuries ago to work the silver mines. It is startling to see a small black face mask with buldging eyes and swollen tongue worn together with a 40-pound tunic festooned with mine owners' silver wealth. The morenada music is a mournful dirge. They dance a slow, sideways shuffle, reminiscent of slaves chained together.

A recent addition to the carnival is the 40-member kallawaya group, the altiplano medicinemen. They wear traditional woven ponchos, ear-flap hats, knee-length pants, and sandals. The small woven bags tied around their waists contain coca leaves, lime (to be chewed with the leaves), and such medicinal herbs as yerba buena and manzanilla. They play reed panpipes and Andean flutes (popularized in the United States by Simon and Garfunkel in their seventies' song "El Condor Pasa").

It was midafternoon before the grimacing faces, three-foot-tall feather headdresses and short tunics of the tobas rounded the corner. This group, dramatically leaping and swinging their spears, reminds one of the Incas' failed attempt to conquer an Amazonian tribe.

Oruro's main plaza is the site of ten hours of activities. The plaza is a block square, with trees, benches, and concrete walks surrounding a central fountain. Arcaded government buildings, banks, and shops line the four sides. Each carnival group stops at an official reviewing stand while their band plays and they perform well-rehearsed dances that show off their costumes. The parade goes around three sides of the plaza, and from my corner, at any time, I could hear the music of the approaching group, the group in front of the reviewing stand, and the departing group. Some 50,000 spectators, including foreign diplomats and other dignitaries, Bolivians and other South Americans view the Saturday *entrada.*

Although the parade is scheduled in conjunction with a religious holiday, ceremonies recognizing indigenous deities alternate with Christian rituals. A *cha'lla* ceremony honoring Pachamama, held by the Oruro Club (membership limited to those born in Oruro), is to propitiate Pachamama: "Take care of her and she will watch over you." At 8:30 P.M. 30 men and women—and myself, an invited guest—

gathered in the club's meeting room. A kallawaya medicineman, in native dress, spread a woven poncho and white cloth on the floor. Incense, herbs, white animal-shaped sugar candies, and a cotton-and-thread effigy of a llama fetus were placed in the center of the cloth. Small glasses of singani, a clear brandy, were placed at the four corners and two 4-inch hollow bronze bull decanters also containing singani were put on the cloth.

Ceremony participants sat in straight-back chairs in a semicircle around the medicineman while he chanted and prayed and added herbs and incense to his cloth. Coca leaves and singani were continually passed to us. (I chewed the coca leaves, but without lime, which releases the alkaloid, so I did not get a great sensation.)

Each celebrant, including myself, knelt in turn in front of the medicineman, added four specially selected, perfect-shaped coca leaves to the pile on the cloth, drank from the four corner glasses and the two decanters, and bowed while the medicineman prayed and touched each of the celebrant's shoulders with his two-foot carved baton. After the blessing, each celebrant hoped that Pachamama would look upon him or her with favor. When this part of the ceremony was completed, a lighted brazier was carried into the room and the contents of the white cloth and the remaining singani dumped into the flames. No one spoke or rose to leave until the last flame had died out. The only uncomfortable part of the ceremony was the smoke and heat in the closed room—almost overcoming.

When the *cha'lla* ceremony was finished, we went to the street dance in front of the market, as crowded as Times Square on New Year's Eve. Several bands with amplifiers and loudspeakers were playing American rock 'n roll, Milwaukee polkas, and Brazilian sambas. Food and beer were dispensed from numerous stands, and private bottles passed freely around. Many carnival participants partied until 5:00 A.M., but were again costumed and ready to dance when the parade began four hours later.

Sunday began with the 4:00 A.M. El Alba Mass, at the Church of the Socavon. All the participants, costumed and carrying their masks, made a sacred vow to the Virgin Mary that they would dance in carnival for three more years in return for her help in their lives. And just as on Saturday, the Sunday parade started at 9:00 A.M.—same groups, same costumes, same bands, and most of the same spectators.

A tobas warrior from the jungles at Bolivia's border.

The *despedida,* or farewell, on Monday afternoon marks the death and burial of Carnival. Each fully costumed group entered the church with their bands. The priest prayed, the bands played, and the participants shuffled along on their knees before the altar. They paused for a moment at the statue of the Virgin, stood up, and backed out of the church. Many were weeping.

Carnival in Oruro dies a very slow death. Another *despedida* is held the following Sunday. Carnival is then buried until it emerges the first Sunday the following November, when this festival cycle begins all over again.

FIELD MUSEUM TOURS

AUSTRALIAN ADVENTURE

The Great Barrier Reef from New Guinea to Tasmania

Deluxe Expedition Cruise Aboard the World Discoverer

November 7-24
Leader: Dr. Harold K. Voris
(Marine Biologist & Avid Snorkeler!)

Few people on this planet have taken such a trip! This unique cruise will proceed from the equatorial tropics of New Guinea southward along the east coast of Australia, to the edge of the Antarctic ocean—way "down under" The diverse marine life of the largest coral reef system on earth, the Great Barrier Reef, is nothing short of spectacular! Unbelievable beauty awaits snorkelers and divers from beginners to experts In the pleasant warmth of summer south of the equator, side trips at Cairns, Clarence River and Sydney will provide great opportunities to see and learn about Australia's unusual fauna and fascinating aboriginal cultures

You will find this journey greatly enhanced by the expert leadership of Dr. Harold K Voris, who served as Field Museum's vice-president of Collections and Research from 1985 to 1989 Over the past 20 years he has led field expeditions throughout Southeast Asia; however, his favorite role is that of marine biologist He'll lecture on the marine life of the Great Barrier Reef, then invite participants to join him snorkeling to make the acquaintance of reef inhabitants first hand!

Nov. 7, Los Angeles. Depart for Papua New Guinea via Guam.

Nov. 8, Guam Port Moresby. Arrive and transfer to a deluxe hotel

Nov. 9, Port Moresby board the *World Discoverer.* Before boarding our ship, we tour the National Museum, the Botanical Gardens, and the Parliament Building

Nov. 10, Cruising the Coral Sea.

Nov. 11, Lizard Island. In 1770 Captain Cook named this island for the large monitor lizards he found here We enjoy Zodiac excursions and snorkeling as well as a climb to Cook's Look, from which the great explorer surveyed the Barrier Reef

Nov. 12, Cairns Atherton Tabelands. From Cairns we motor to the remarkable Tablelands to spot rare birds such as the gold bowerbird Victoria's riflebird and the spotted catbird as well as possums, brushtails, and tree kangaroos

Nov. 13, Palm Islands. We take a zodiac [illegible] snorkeling grounds with fine [illegible] beachcomb for seashells [illegible] and parakeets

Nov. 14, Whitsunday Islands. Depending [illegible] we plan to stop at Whitsunday Island, whose beaches are among the best of the Great Barrier Reef, at Cid Harbor the staging area for the Battle of the Coral Sea, and Nara Inlet on Hook Island, where we follow a trail up to a rock "gallery" laced with ancient Aboriginal rock paintings

Nov. 15, Heron Island. Unlike its continental-type neighbors, Heron is a coral cay created by the Reef itself On a nature walk we hope to spot several of the birds which migrate here Divers enjoy the superb coral gardens full of tame undersea life. And, this evening, we expect to see nesting turtles come ashore to lay their eggs

Nov. 16, Fraser Island. On our exploration of the "world's largest sand island," we hope to spot dingoes, wallabies, and "brumbies" Birders should have their lists ready—it's easy to identify up to 40 different species at close range

Nov. 17, Flinders Reef. We enjoy snorkeling and birdwatching with Zodiac excursions to nearby Moreton Island to see one of the world's highest stable sand dunes, at nearly 1,000 feet

Nov. 18, Clarence River. We disembark to tour the Iluka Rain Forest and Yuraygir National Park, hoping to spot kangaroos, wombats and wedge-tailed eagles. At the Bundjulung Flora and Fauna Reserve, we observe emus, koalas, and wallabies

Nov. 19 & 20, Sydney. We enter the magnificent harbor at sunset and overnight aboard ship The next day we tour the city including the Opera House, the natural history museum and the Royal Botanic Garden

Nov. 21, Cruising the Bass Strait.

Nov. 22, Lady Barron, Flinders Island. We visit a wildlife reserve in hopes of spotting the muttonbirds which are migrating from Japan and Siberia and the endemic Cape Barren goose.

Nov. 23, Hobart, Tasmania Disembark the *World Discoverer.* We tour historic Tasmanian villages, such as the old penal colony of Port Arthur, and spelunkers enjoy a visit to Tasmania's numerous caves Dinner and overnight in a deluxe hotel

Nov. 24, Homeward. Board our flight homeward, via Melbourne, crossing the international date line and arriving in Los Angeles the same day

Price ranges from $5,940 to $8,980 per person (based on double occupancy), international air add-on from Los Angeles $1,400 Domestic air is additional Deposit $1,000 per person Included in the cruise cost is a $200 tax-deductible contribution to Field Museum.

CROW CANYON

September 16 - 23
Price: $1,225 per person

Sept. 16: Fly from Chicago, O'Hare to Durango, Colorado via Denver Transfer to Crow Canyon campus Evening activities include dinner and an introductory program about Crow Canyon and surrounding area

Sept. 17: Today's activities focus on an introduction to archaeological method and the Anasazi world "Culture History Mystery" is a hands-on introduction to prehistory using both artifacts and group discussion. Artifacts are analyzed to determine the food resources, subsistence pattern, settlement pattern, tool assemblage, and pottery used by Archaic to Pueblo III cultures (500 B.P. to A.D. 1300) Following lunch, tours to the excavation sites provide you with a thorough understanding of the Crow Canyon research plan. An evening lecture continues the learning experience.

Sept. 18 through Sept. 21: September 18 begins with an "Eco Hike" where you experience the ecology of the Southwest through the eyes of the Anasazi, and take part in Anasazi lifestyle activities. Try your hand at primitive technologies, including fire-starting, and spear-throwing with the *atlatl*, and watch a flintknapping demonstration. For the next 3½ days participate in unraveling the mystery of the Anasazi world Work alongside archaeologists in the field, excavating your portion of the prehistoric site. Learn proper archaeological techniques, follow the progress of your own excavation square and discuss your theories with staff archaeologists. In the lab you will wash, sort, analyze, and catalog artifacts uncovered in the field Lectures each evening enhance the learning experience On September 21 an optional tour of Mesa Verde is provided. Join staff educators as they tie together your Crow Canyon learning experience with the lifestyles of the Anasazi who inhabitated Mesa Verde from A.D. 600 to A.D. 1300.

Sept. 22: All-day excursion to Hovenweep National Monument with picnic lunch to be enjoyed on the site Return to Crow Canyon lodge for the evening.

Sept. 23: After breakfast transfer to Durango airport for the return flight to Chicago

The price includes round trip air fare and all services as outlined in the itinerary Your reservation will be held with a $100 per person deposit

TURKEY
PAST AND PRESENT

October 19-November 3
Price: $3,985

Oct. 19, Chicago Zurich.

Oct. 20, Zurich Istanbul. After a change of planes in Zurich, arrive Istanbul in midafternoon

Oct. 21, Istanbul (Byzantine Art Tour). Divided by the magnificent Bosphorus, the waterway between Asia and Europe, Istanbul is a city that spans two continents, 2,600 years, and many cultures. The tour today includes a kaleidoscope of wonders: the Kariye Museum, whose mosaics and frescoes are masterpieces of the renaissance of Byzantine art, the surprising Yerebatan underground palace, the Roman-built Hippodrome; the obelisk of Theodosius and the 6th-century St. Sophia built by the emperor Justinian to be the grandest church of Christendom

Oct. 22, Istanbul (Ottoman Art Tour). The first visit this morning is to the imposing Mosque of Suleymaniye the Magnificent, built by Sinan, greatest of Turkish architects We also tour the Museum of Islamic Art, and the famous Blue Mosque with its six minarets and blue Iznik tiles After lunch, explore the fabulous exhibits of the mysterious labyrinthine Topkapi Palace

Oct. 23, Istanbul (Bosphorous Cruise) Ankara. After lunch, tour the Beylerbeyi Palace—the personal retreat of Sultan Abdu Aziz, and later visit the private collection of the Sadberk Hanim Museum Afternoon flight to Ankara Transfer to the Hilton Hotel

Oct. 24, Ankara (Hittite Art Tour) Cappadocia Region. Ankara, set in Turkey's strategic heartland, is a modern city with a long and fascinating heritage that stretched back nearly

10,000 years. During morning exploratory tour of the city, visit the Museum of Anatolyan Civilizations; we continue to the Citadel, original fortress of the old town which offers a splendid panorama of Ankara, the Market, and Ataturk's Mausoleum. After lunch travel by motorcoach to the Cappadocia Region, viewing en route the strange phenomenon of Tuz Salt Lake. Dedeman Hotel.

Oct. 25, Cappadocia Region. Start the day with the exploration of the amazing refugee city of Derinkuyu, a vast underground complex of entire communities interconnected by tunnels, discovered accidentally in 1963. In the nearby Goreme Petrified Valley, there are 365 churches scooped out of solid rock and decorated with remarkable frescoes. Even the columns have been shaped and hewn from the soft volcanic rock. After lunch visit the Goreme Valley's quaint villages, and take a tour of the famous potters of Avanos, on horseback.

Oct. 26, Cappadocia Region/Izmir. Return to Ankara for lunch and an afternoon flight to Izmir, once known as Smyrna, also birthplace of Homer. Grand Efes Hotel or Hilton Hotel.

Oct. 27, Izmir (Ephesus). Today, explore the extensive archaeological Greco-Roman site of Ephesus. Here too are the ruins of the fabled Temple of Diana, one of the Seven Wonders of the Ancient World. We visit the remains of the Basilica of St. John and the House of the Virgin Mary, and return to our hotel in midafternoon.

Oct. 28, Izmir (Pergamum). Spend the morning at Pergamum, a center of learning and the arts, whose library of antiquities once contained over 200,000 volumes. Here visit Asclepion, the Red Basilica, the Acropolis, the Athena and Trojan Temples, the Library of the Great Theater, the Temples of Dionysos, Hera, and Demeter, and the Angora.

Oct. 29, Izmir (Aphrodisias) Pamukkale. The destination this morning is the fabled city of Aphrodisias, home of the greatest sculpting schools of antiquity. Visit the extensive archaeological sites and the exquisite museum. After a lunch break, continue to Pamukkale (Cotton Castle), a beautiful and spectacular natural site unique in the world. It is a fairylike, dazzling white petrified cascade falling from a height of 100 meters.

Oct. 30, Pamukkale Antalya. This morning drive through beautiful mountain scenery to the city, Antalya, set on the perfect crescent of the Mediterranean's Konyalti Beach. The Turkish Riviera's incomparable beauty makes it a paradise on earth, the slopes of the Toros Mountains are blanketed in green forests that dip to the sea, forming an irregular coastline of rock headlands and secluded caves of clear turquoise water. The afternoon is free. Dedeman Hotel.

Oct. 31, Antalya (Pamphylian Tour). Full-day visit to the striking Greco-Roman archaeological sites along the Turkish Riviera. Stop first at Perge, a wealthy and culturally well developed city in ancient times. After lunch continue to Side, an ancient Turkish harbor that has made a graceful transition into a lovely resort village today.

Nov. 1, Antalya Istanbul. Tour the Museum of Archaeology, take a brief orientation tour of the seaside resort, largest town on the Riviera and visit the recently renovated harbor district where there is time to see the ancient buildings. Afternoon flight to Istanbul and transfer to the Sheraton Hotel.

Nov. 2, Istanbul (Optional Bazaar and Geneseri Military Band). The last day in Turkey is at leisure, to pursue own interests. A reception in a private home overlooking the Bosphorus is followed by a festive Farewell Dinner.

Nov. 3, Istanbul Zurich Chicago. Board homebound flight this morning, arriving Chicago in midafternoon.

NATURALIST IN ALASKA

Your Personal Interaction with the Wildlife and Wildlands of Alaska

Leader: David E. Willard, Ph.D., ornithologist, accompanied by Dan L. Wetzel, naturalist and tour operator

This expedition has been designed with an emphasis on education, for the person with keen interests and curiosities about the "real Alaska." The 1,000-mile wilderness itinerary allows your personal interaction with the wildlife and wildlands of Alaska.

We begin our trip in Anchorage and move on to the Kenai Fjords, where we will experience the 38-foot bore tides, the second highest in the world, and a marked contrast to the one-foot tides of Prudhoe Bay where we complete our expedition. Our route includes Seward, Denali State Park, Denali National Park, Fairbanks, Coldfoot, and Sagavanirktok River. The Naturalist in Alaska Tour was created to bring the natural world of Alaska within your grasp. Let us send you more information about this unique opportunity.

July 14-29: 16-day itinerary $4,825 (includes air fare).

July 14-25: Optional 12-day itinerary (Kenai Peninsula, Anchorage, Denali Park, Fairbanks, Circle District/Yukon River) $3,550 (includes air fare).

BIKING TRIP

Sunday, Sept. 23-Sunday, Sept. 30

Field Museum's Leader: Dr. Scott M. Lanyon
Co-sponsors: Field Museum Tours and University of Chicago Alumni Association
Price: $1,725 per person

Join us for a week of biking and hiking in New England during its most spectacular season. We will fly into Burlington, Vermont and transfer to the Swift House Inn in Middlebury. The historic inn has been restored to the elegance of a former era and now offers superb accommodations as well as gourmet cuisine. We will stay here three nights, and each day there will be three options for excellent biking at a pace comfortable for you. There are many things to see in historic Middlebury as well as the beauty and openness of the landscape.

Next we will take the ferry across Lake Champlain to Fort Ticonderoga, where we will tour this historic site and enjoy a gourmet picnic lunch. Afterwards we will continue on to Keene Valley by van-shuttle to the resort mountain home of Dr. and Mrs. Wesley Lanyon, parents of Scott Lanyon, where we will be hosted to a cocktail party. Our final destination this day will be the Mirror Lake Inn in Lake Placid, where the next four days will be spent enjoying the ambiance of this gracious, traditional inn on the lakeshore.

Scott Lanyon, head of the Division of Birds and associate curator at Field Museum, will accompany the group throughout the week. His knowledge of the area will greatly enhance your enjoyment of this experience. Scott grew up on a research station run by New York's Museum of Natural History, and is right at home in this area. He will lead birding and hiking expeditions, as well as mountain-climbing exploration. There will be opportunities for canoeing, fishing, cycling, horseback riding, carriage rides around Mirror Lake.

The trip will be operated by Vermont Country Cyclers, and include a fully equipped bike, plus orientation and van support. The price of $1,725 includes air fare and most meals. The maximum group size is 20 participants. A deposit of $250 per person will hold your space and reservations will be accepted in the order received. We will be happy to send you a detailed itinerary upon request.

EXPLORING COSTA RICA'S National Parks and The Panama Canal

Aboard the 138-passenger M/V *Yorktown Clipper* November 22-December 5

Our voyage exploring the natural treasures of Costa Rica and transiting the Panama Canal begins in San Jose, located 3,800 feet above sea level, and considered the most charming city in Central America. Costa Rica is a leader in nature conservation. Approximately 20% of its territory is permanently protected within 28 national parks and reserves which are home to hundreds of species of birds, as well as mammals and plants. We'll have ample opportunity to explore the abundant wildlife and enjoy the gorgeous beaches.

Transiting the Panama Canal on the 138-passenger *Yorktown Clipper* brings out the advantage of smaller vessels. Along the Pacific Coast, the *Yorktown's* shallow draft and great maneuverability make it possible to explore those out-of-the-way bays and coves. The Cousteau-type landing craft will be launched to discover remote beaches and rivers. A staff of naturalists will be on hand to bring substance to your enjoyment of the unique environment.

Dr. Winifred Creamer, Research Associate in Field Museum's Anthropology department, and a specialist in the archaeology of Costa Rica, will accompany the group. Dr. Creamer spent several years conducting research in Costa Rica.

In short, this is truly a voyage in the spirit of adventure, to be enjoyed in the comfort of the beautifully appointed *Yorktown Clipper*. Cabins range in price from $2,750 to $4,050. Single Occupancy $4,425 (category 2). Cruise price includes two nights in San Jose, Costa Rica at a de luxe hotel. Air fare from Chicago is approximately $670. A deposit of $400 per person is required to confirm reservations. The price includes a $200 tax-deductible contribution to Field Museum.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

MEMBERS' NIGHT

Friday, June 22

Harry Weese & Associates