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In the Field

**EXCLUSIVE!
BUSHMAN'S
BABY PICTURES**

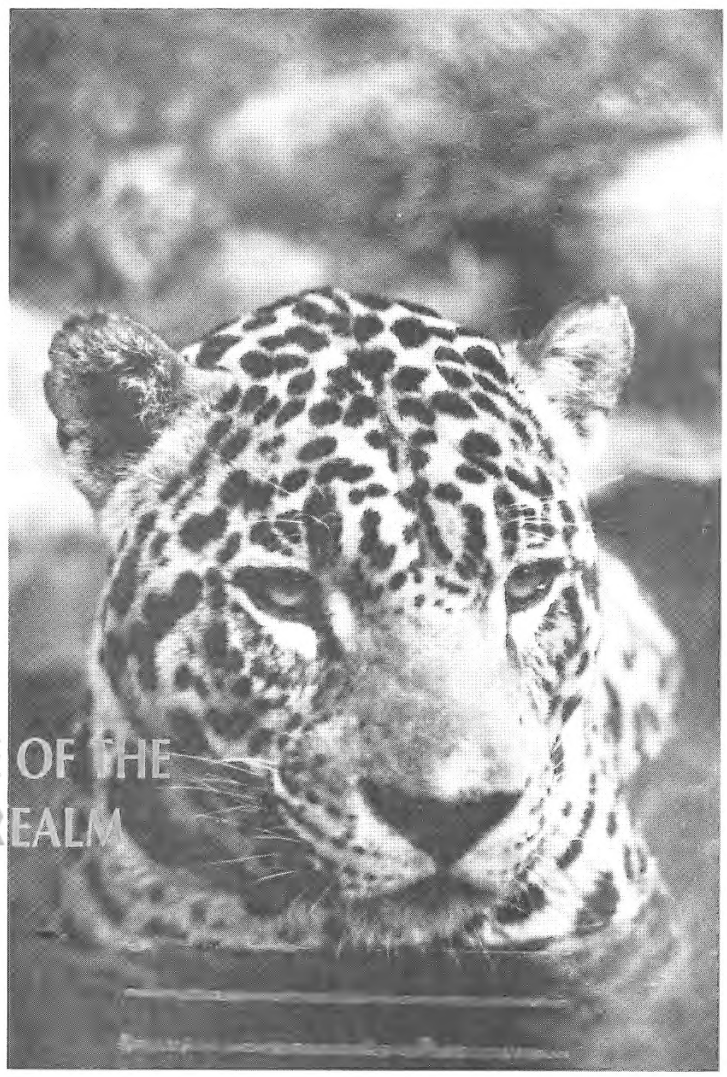
Bulletin of the Field Museum of Natural History January/February / 1992

**EARLIEST
NEW
WORLD
POTTERY**

**OCTOPUS
GARDENING**

**A SEPARATE
VISION:
MODERN
NATIVE
AMERICAN
ART**

**WILDLIFE OF THE
MAYAN REALM**



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In the Field

The Bulletin of the Field Museum of Natural History

January/February 1992

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The Museum goes "Into the Wild" with the help of Garfield, Ronald McDonald, and other notables.

5

New exhibits: Issues in Native American contemporary art; wildlife of the ancient Maya lands

8

A complete schedule of music, dance, storytelling, and other free programs for Museum visitors

9

Rafting the Colorado River on a Museum tour reveals plants and animals of many ecosystems.

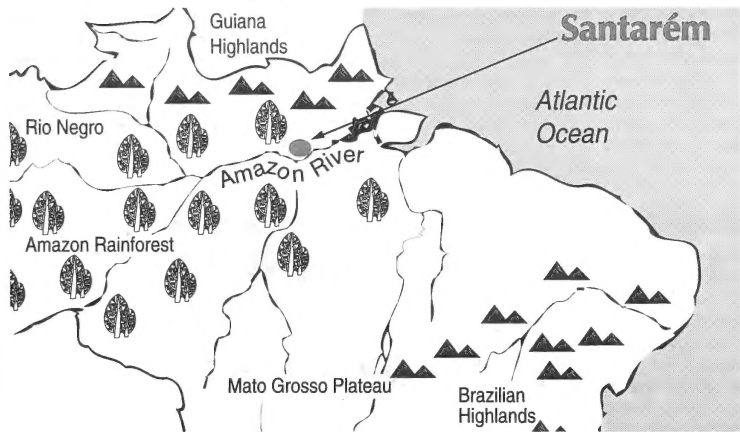
BUSHMAN'S BABY PICTURES

Bushman, in death as in life, captivates all who see him; the famous gorilla is as much a part of Chicago history as Jane Addams or Al Capone. The Museum has received new-found photographs of his days as an orphan in Cameroon.

Story, Page 3



OLDEST WESTERN HEMISPHERE POTTERY IS FOUND IN AMAZON



The earliest pottery ever found in the Western Hemisphere has been unearthed in the Amazon basin by a team headed by Anna Roosevelt, newly appointed curator of archaeology at the Field Museum. The pottery is a significant piece of evidence supporting a controversial argument: that complex human societies can play a productive and sustaining role in the balance of nature over thousands of years.

The discovery of the ancient vessels is reported in the December 13 issue of *Science*. The fragile, red-brown pottery fragments have been reliably dated, by radiocarbon and thermoluminescence analysis, at 7,000 to 8,000 years before the present. That makes them at least 1,000 years older than the oldest pottery found in northern South America, and 3,000 years older than the earliest pottery from the Andes and Mesoamerica (Mexico, Guatemala, and Belize).

For many years, the tropical forest habitat of Amazonia had been considered too resource-poor to nourish long-term cultural evolution. But Roosevelt leads a new generation of researchers who, with persistence and sophisticated analytical techniques, have overturned that view. Her latest discovery indicates that, far from being held back by their environment, the people of the Amazon were leaders and innovators, achieving technological and aesthetic advances long before the cultures of the Andes, such as the Inca civilization.

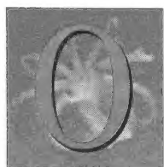
The discovery of the pottery came as part of a larger project to uncover the history of human occupation in Santarém, Brazil, a tropical region in the flood plain of the Amazon.

"This region has a very long history of habitation, with many changes in population (Continued on page 11)

Field Museum
1992
13
ARTICLES

OCTOPUS GARDENING

By Janet Voight
Assistant Curator of Zoology



Octopuses are voracious predators of fishes, crabs, and shrimps, to name just a few of the animals they subdue and consume. Prey are poisoned and enshrouded in the web that stretches

between the octopus's eight arms, to be carried to the octopus's den and devoured. Despite the grisly aspects of this behavior, it is remarkably efficient.

It's easy to understand why people associate the octopus with menace and evil. Any animal that can turn from black to white in a fraction of a second, and that when irritated spews out clouds of ink and disappears into an impossibly small crevice, is a ready candidate for demonization. Popular culture, from Jules Verne to Peter Benchley, has solidified these associations; it was no accident that in *The Little Mermaid* the villainess was the octopus. But in the real world, people eat more octopuses than vice-versa.

In an effort to replace the mysteries of octopus biology with scientifically sound data, I study octopus field biology and the evolution of the group, which numbers more than 100 species. Octopus behavior is unusual and counter-intuitive in many ways. Given their famous ability to learn and adapt to new situations, you'd think they would survive for years in the wild, learning better with each passing day how to improve their chances of survival. However, octopus lives are short.

Hatchling octopuses reared in the laborato-

ry grow for months at phenomenal rates. Then they stop eating and die. Wild-caught octopuses maintained in captivity, even in ideal conditions, soon wither away. Octopuses appear to have timed senescence: At adulthood, release of a hormone signals the beginning of the end of the octopus's life. At this time, females produce a single clutch of eggs which they brood. Females refuse food during brooding and die at about the time the eggs hatch. Male life spans equal those of females.

This knowledge of octopus life history is based almost exclusively on laboratory studies. As would be the case with any nocturnal, intelligent animal that has the ability to change color at will, octopuses are notoriously difficult to study in nature. Instead of maintaining permanent territories or home ranges, they are nomads. They move into new areas frequently, staying in one location for a week or two at most.

Biologists who have marked individual octopuses find that at least half of the marked animals are never seen again. Whether the octopuses abandon the area or learn to avoid divers and traps is unknown, but the end result is the same. When so few marked animals are recaptured, it suggests that handling so stresses the animals that any data obtained are suspect and cannot be used. Even identifying individuals by marks such as missing arms is unreliable because octopuses regenerate missing parts, often very quickly.

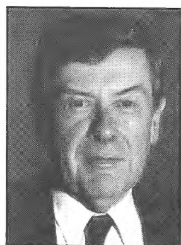
(Continued on page 10)

Diane Alexander White / GNB8107.10



OFF WE GO: Vine cutting opens "Into the Wild." Officializing were, from left, Ronald McDonald; Cirillo McSween, representing the Ronald McDonald Children's Charities; Michael Spock (rear), Field Museum vice president for public programs; Ed Reilly, grant coordinator of the Daniel F. and Ada L. Rice Foundation; and Willard E. White, Museum vice president for development and external affairs. (See page 4.)

THE RIGHT TO CARE, THE DUTY TO CARE



By Willard L. Boyd
President, Field Museum of Natural History

The year just ended was the bicentennial year of the Bill of Rights. The year just beginning marks the quincentennial of the arrival of Columbus in the New World. The juxtaposition of these anniversaries prompts reflection on the diversity of the American people, on our rights, and on the responsibilities we have toward one another.

In his book *Puritan Boston and Quaker Philadelphia*, E. Digby Baltzell describes the unique American practice of private philanthropy as the "rational response to social conditions," with the emphasis on rational in contrast to the spontaneity and emotion of "charity." He considers philanthropy as the devotion to caring without sentimentality. That sounds puritanical, sounds like a call to duty in an era when we are calling for rights, not duties. Perhaps that is why the *Christian Science Monitor* recently ran an editorial entitled "The Right to Care."

Whether a right or a duty, "caring" is a basic human characteristic, both psychologically and sociologically. Psychologically, we

need the nourishment of others. Others give meaning to our lives. Sociologically, almost every religious and social norm, written or unwritten, admonishes us to care for one another.

"Caring" is more than a warm and fuzzy feeling that we can turn on and off when it suits our individual mood. "Caring" is a full-time commitment which demands much of us. It is truly a devotion to others. I was moved by the television account of the people of a French town who together took the initiative to protect strangers during the Second World War, each citizen taking part in the protection of Jewish refugees from the Holocaust. The citizens did so because their Huguenot faith holds there is a "duty to act."

Ethics is the means by which we personally stipulate our conduct as individuals and as citizens. A code of ethics inhibits our freedom to act solely for our own pleasure and demands of us a sense of responsibility, a sense of caring for others.

Who are these others we are supposed to care for? We care for our friends because we know them. Our friends tend to be like us. They have similar, hence familiar, backgrounds. It is harder for us to care for strangers, yet we —

like the Huguenots — have a duty to help strangers, those with whom we are unfamiliar, those whom we cannot even imagine.

Unfamiliarity is a form of ignorance, and ignorance breeds prejudice. Prejudice breeds hostility and hostility breeds conflict. It is imperative that we care for people who are unfamiliar to us, people whom we consider different. We need to connect with others. To connect with others we must understand and respect the cultural traditions of all people, however diverse. Caring eliminates ignorance, eliminates prejudice, eliminates hostility, eliminates conflict.

During the bicentennial year of our Bill of Rights, we focused on expanding our civil rights. We should also concentrate on expanding our civil duties. Civil attitudes are the glue of a democratic society.

Each of us must be affirmative about others, be interested in others, and be committed to others — especially to strangers. As an institution concerned with diverse cultures of the world, the Field Museum has a special responsibility to be a community center for cultural understanding and mutual respect.

Library Friends
Valerie Metzler and
William Minter, with
son Ezra, examine
rare works of botanical
illustration.



John Weinstein / GN86063.19

The Friends of Field Museum Library met October 24 to view the temporary exhibit "Flora Portrayed" and hear a short discussion on botanical illustration and literature. The Museum's newest special-interest support group, the Collections Committee, held its first meeting December 11 for an introduction to the work of anthropology curators and an overview of the Museum's ethnographic collections.

At the Library Friends event, Ben Williams, associate librarian, exhibited a number of interesting and important botanical works from the Mary W. Runkles Rare Book Room. These included the original illustrations by Charles Millsap for his work, *Medicinal Plants*, published in 1892. It was on the basis of this work that Millsap was chosen to help organize the botanical aspects of the World's Columbian Exposition of 1893, which in turn led to his appointment as Field Museum's first curator of botany.

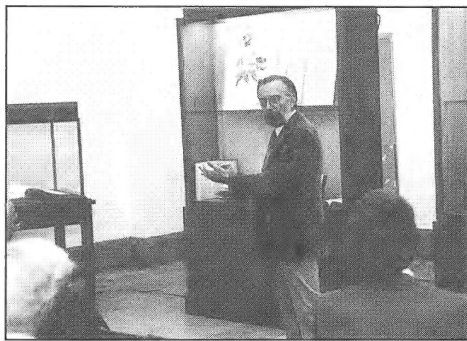
William Burger, curator of vascular plants in the Museum's Botany Department, continued the program, pointing out that modern scientific botanical illustration is a direct descendant from the earliest printed herbals of the 15th century. Like those early books, which were devoted largely to medicinal and poi-

LIBRARY FRIENDS
AND COLLECTIONS
COMMITTEE MEET

sonous plants, modern illustrations help to identify particular species and to disseminate botanical knowledge.

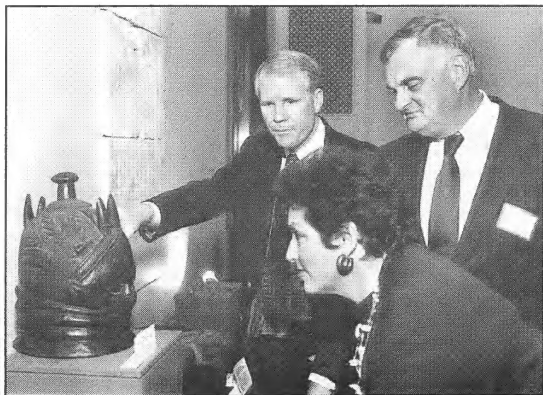
Museum members interested in joining the work of the Collections Committee or the Friends of the Library are invited to call Heidi Bloom in the Development Office at (312) 322-8874.

John Weinstein / GN86063.31



William Burger
talks about the history
of botanical
illustration.

At the inaugural
meeting of the Col-
lections Committee,
Jim and Louise Glass-
er, the committee
co-chairs, admire a
Sande sculpture from
West Africa being
described by
Jonathan Haas, vice
president for collec-
tions and research.



John Weinstein / GN86131.7

In the Field

January/February 1992
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BUSHMAN'S BABY PICTURES

By Ron Dorfman
Editor, *In the Field*

The Field Museum has received two photographs of Bushman taken when the famous gorilla was an infant being cared for in a missionary camp in West Africa. He grew up — to six-feet-two and nearly 600 pounds — in Chicago's Lincoln Park Zoo and his body has been on display in the Field Museum since his death in 1951.

John Fletcher Allen of Belle Mead, New Jersey, son of the Chicago-based Presbyterian missionaries, said his wife, Nancy, discovered the Bushman baby pictures in a family album.

Although one version of the family lore, published in the *Field Museum Bulletin* in February 1987, had it that the baby gorilla wandered into the camp

in Elat, Cameroon, in 1928 and that the local people were unable to find its mother, Mr. Allen's recollection, fortified by copies of his parents' letters to friends and colleagues, is considerably less sanguine.

"The truth of the story is that Bushman's mother was killed by African hunters in Mbalmayo, about 50 miles south of Yaounde, and the hunters found the baby nearby and brought it into camp," he said.

Other accounts vary in important details, or simply omit them. Floyd S. Young, then director of the Lincoln Park Zoo, wrote in 1939 that when Bushman "was captured by J.L. Buck, of Camden, N. J., on a bend of the N'Ja River . . . he was a nursing baby. That was early in the spring of 1929." No word there of what or whom he was nursing on. Timothy J. and Magdalene Wise Tuomey, who have written extensively about Bushman, recount that the gorilla "was a mere babe when a village chieftain wounded his mother, driving her deep into the forest." The Tuomeys, writing in the *Chicago Tribune* in 1978, said that the chief took the infant home and "hired a nursemaid" to care for him. A missionary, identified by the Tuomeys as "Dr. W.C. Johnson" but perhaps Rev. Dr. W.J. Johnston, field secretary of the Yaounde District of the Presbyterian mission, bought the animal from the chief to keep as a pet, and later agreed

to allow Buck to sell him to an American zoo for a share of the proceeds, according to the *Tribune* account.

Mr. Allen's parents were James Blaine and Annie Mary Allen, missionaries from the Fourth Presbyterian Church on Michigan Avenue. James Allen was an architect who built several churches in Cameroon, including one in the capital, Yaounde. He used the mission's \$500 from the sale of Bushman to commission a stained-glass window for the Yaounde church by a Chicago artist.

The window is on the theme "Suffer the little children to come unto me" (Mark 10:14), and the Christ figure is depicted with African features, "which was a little avant-garde for 1930," said John Allen, who was baptized there in 1932. James Allen died that year, apparently of a poisonous insect bite, when John was seven months old.

Neither the archives of the Fourth Presbyterian Church nor those of the Presbyterian Board of Foreign Missions record the name of the artist, and efforts to reach church officials in Yaounde could not be completed before this issue of *In the Field* went to press.

"Mother wrote a diary, and I wish I could find it," John Allen said. After his father died,

John and his older sister, Barbara, returned to Chicago with Mrs. Allen, who became "girls' work director" at Fourth Church. He recalls going with his mother to visit Bushman in the Lincoln Park Zoo, and later seeing the mounted gorilla in the Field Museum with his own sons, now grown.

"In Chicago, we lived on the Near North Side, and Mother would take me to see Bushman at the Lincoln Park Zoo," he said. "One day she was talking to him in Bulu, the local Bantu dialect, and one of the guards came along and asked what she was doing. She explained that she had raised Bushman in the Cameroons and the guard took her to see Marlin Perkins [then director of the Zoo]. Mother and Mr. Perkins had a long chat about the care and feeding of low-land gorillas."

Annie Mary Allen and the children returned to Cameroon, then a French colony, in 1939, and were en route when World War II broke out in Europe. They

remained in Africa for the duration of the war, and John kept another young gorilla and a chimpanzee as pets. Years later, on visits to Chicago with his sons David and Bruce, Mr. Allen would bring them to the Field Museum to see Bushman. He recalls them saying mischievously, "There's your brother!"

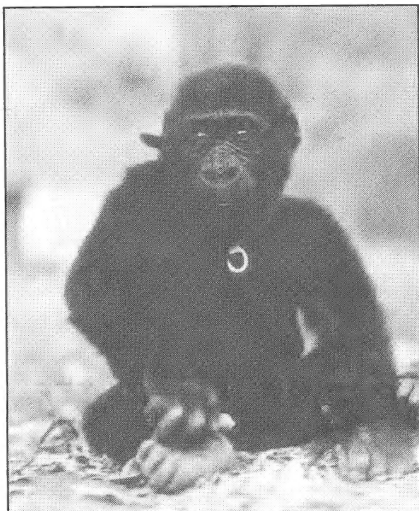
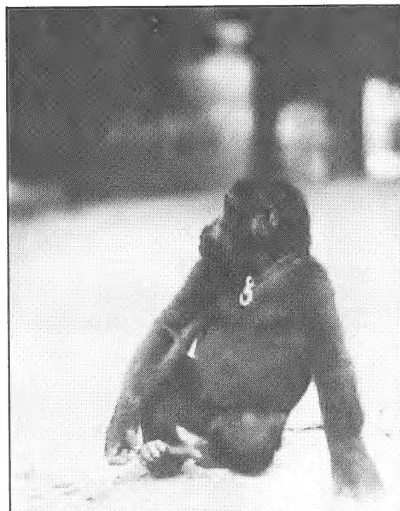
Now 59, John Allen is assistant distribution manager for Westvaco Corp. in New York City.

Bushman died on January 1, 1951 at the age of 23. The next day, his body was accessioned by the Field Museum as specimen No. Z-9815, "1 gorilla in the flesh (Bushman)." A value of \$1,000 was placed on the specimen, which was a gift of the Lincoln Park Zoo, although estimates of Bushman's worth when he was alive ranged to \$250,000. The American Association of Zoological Parks and Aquariums once declared him "the most outstanding animal in any zoo in the world and the most valuable."

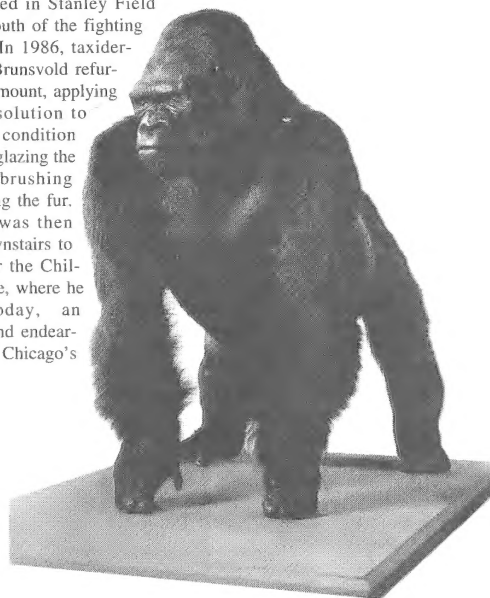
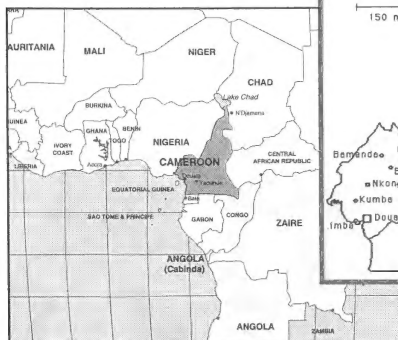
The hide was prepared by Field Museum taxidermists Leon Walters and Frank Wonder for a model sculpted by Joe Krstolich.

The finished mount, in its now-familiar pose, was loaned to the Zoo for temporary exhibit in October and November of 1951. There was a flurry of newspaper speculation that the Zoo would refuse to return it to the Museum. In a memorandum for the record, Museum Director Clifford C. Gregg reported a conversation with George Donoghue, general superintendent of the Chicago Park District, who assured him that this was not the case: "He pointed out that Mr. Perkins did not desire to keep the animal permanently, even if it were available, and that a mounted specimen would be out of keeping with the rest of the Zoo and in competition with the young gorillas now at Lincoln Park."

On December 5, 1951, the Bushman case was installed in Stanley Field Hall just south of the fighting elephants. In 1986, taxidermist Paul Brunsvold refurbished the mount, applying a lanolin solution to soften and condition the skin, reglazing the eyes, and brushing and combing the fur. Bushman was then moved downstairs to a post near the Children's Store, where he stands today, an enduring and endearing part of Chicago's history.



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EXHIBIT OPENS TO WILD APPLAUSE

The Museum's stunning new exhibit "Into the Wild: Animals, Trails & Tales" opened in November to excellent press notices and public enthusiasm. Among the activities accompanying the exhibit opening in the Daniel F. and Ada L. Rice Wing were a special breakfast tour for Chicago cab drivers, two nights of members' previews, a preview for the press, and the grand opening featuring Ronald McDonald. And in December, the wild cat himself helped give away "Garfield's Wild Embassy Suites Party" in conjunction with WUSN-FM.

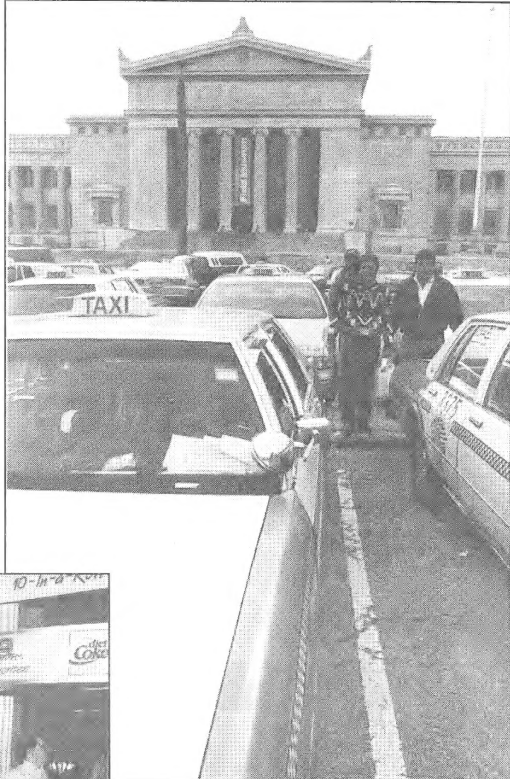


Diane Alexander White / GN68108.21



Diane Alexander White / GN68061.16

Curator of birds Scott Lanyon is interviewed by CBS Radio reporter John Hultman at press preview (above). Cabs filled the North Parking Lot for Taxi Day (right). Below, 11-year-old Scott Rosen of Deerfield, in a wheelchair after surgery on his leg, was the winner of "Garfield's Wild Embassy Suites Party," a six-hour bash for 25 of his closest friends, raffled during a special promotion by country-music radio station WUSN-FM. With Garfield and Scott are other members of Boy Scout Troop 50 and their scoutmaster, Howard Rosen, who is also Scott's dad.



James Redomas / GN69105.19

Above, Steve Robinet, technical assistant in the division of insects, shows visitors some of the Museum's collection during opening festivities, while others (below) examine the curious contents of coughed-up owl pellets. Bottom left, John Wagner of the Department of Education demonstrates the live video imaging of the animal activities in a drop of water, and Ronald McDonald (bottom right) introduces kids to the bears that don't play in Soldier Field.

"Into the Wild" is located in the Museum's Daniel F. and Ada L. Rice Wing. The Rice Foundation provided major funding for the exhibit. The Ronald McDonald Children's Charities contributed funds to help enhance the exhibit as a family experience.



Diane Alexander White / GN68139.36



Diane Alexander White / GN68109.20



Diane Alexander White / GN68003.26



Diane Alexander White / GN68107.27

A SEPARATE VISION

A Separate Vision" explores the tension between tradition and individuality, and between art and craft, in the work of four contemporary Native American artists. The exhibit is in the Webber Gallery, January 24 through April 5.

The four artists work in different mediums. They are Baje Whitethorne, a Navajo landscape painter; Nora Naranjo-Morse, a Santa Clara sculptor; John Fredericks, a Hopi kachina carver; and Brenda Spencer, a Navajo weaver.

In addition to showcasing the innovative work of these artists, the exhibit documents problems facing Native American artists that "mainstream" artists never encounter.

Every artist seeks to convey a personal vision of the world.

Modern Native American artists, however, also feel responsible for preserving and transmitting their traditions and cultures. Each of the artists in this exhibit has developed a unique way of resolving this tension.

It is this separate vision that makes the four controversial. Collectors of Indian art often insist on seeing the same types of art that

they first encountered perhaps 50 years ago. But Native American artists today need to draw not only on traditional values and forms but also on their personal experiences as young people in the last decades of the 20th century.

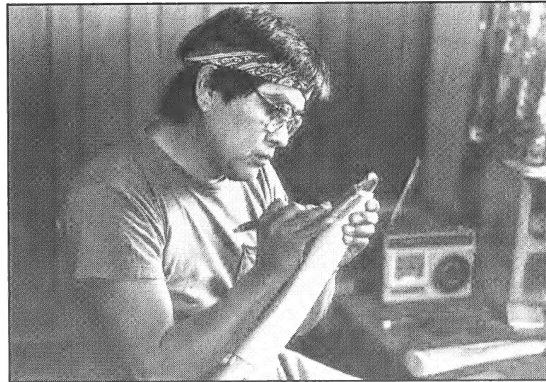
Each of the four artists claims three main influences: the Native American heritage; a distinct tribal culture; and his or her individuality.

The exhibit explores how these separate yet interlocked components play vital roles in their art.

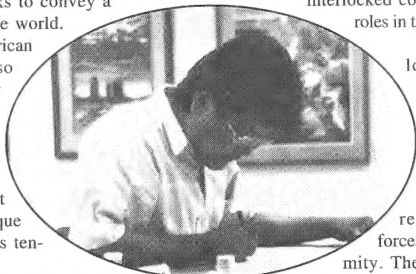
The exhibit also looks at how the artists deal with outside pressures that would limit their power of expression to traditional modes. All four have resisted art-market forces that reward conformity. They have also weathered controversy that ensued as they ignored both outsiders and those among their own people who insisted that they create "stand-

ard" Native American art.

The exhibit, conceived and produced by Dr. Linda Eaton, a curator of ethnology at the Museum of Northern Arizona, was funded by the Flinn Foundation of Phoenix, Arizona. It includes some 30 pieces of original art as well as photos and text. There is also a 40-minute video that documents the artists' work.



John Fredericks (near left), Hopi, works on a kachina sculpture; Baje Whitethorne (in oval), Navajo, paints in his studio. Photos by Janet Dean.



LAND OF GREEN LIGHTNING

In The Land of Green Lightning: Wildlife of the Mayan Realm" features photographs by conservationist/biologist Thor Janson. It opened in the South Gallery December 31 and runs through March 8.

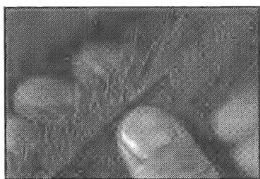
Janson, who lives in Guatemala, designed the exhibit in such a way that visitors are taken on a journey through the diverse tropical ecosystems of "Mayaland," Janson's term for the ancient realm of the Maya Indians in what are now southern Mexico, Belize, Guatemala, Honduras, and El Salvador.

There are at least 12 distinct ecological zones in the region. Janson's photographs cover everything from coastal mangrove forests, jungles, and swamps to volcanic peaks, savannas and deserts. Each ecosystem plays host to a variety of interesting occupants, including many endangered species.

Janson captures on film the jaguar, the margay, the manatee, and the resplendent quetzal, whose tail feathers were sacred to the Mayas and were used as currency. Even today,



The legendary quetzal bird (above) and a quetzal feather (below)



a Guatemalan coin bears its name.

The first Mayan people probably arrived in Central America over 5,000 years ago, where their culture soon flourished. They developed a complex social structure, a system of hieroglyphic writing, and an advanced mastery of mathematics and astronomy. They were also the architects of enormous, majestic pyramids and sprawling cities, the ruins of which can be seen in the exhibit.

Janson has included photos of the spectacular Mayan ruins found in areas like Yaxilan, Tikal, Palenque, and Copan, so that viewers can at least get an idea of the complexity and beauty of Mayan architecture.

Today, there are several million Maya in Mexico and Central America, speaking more than 30 dialects of their distinctive language.

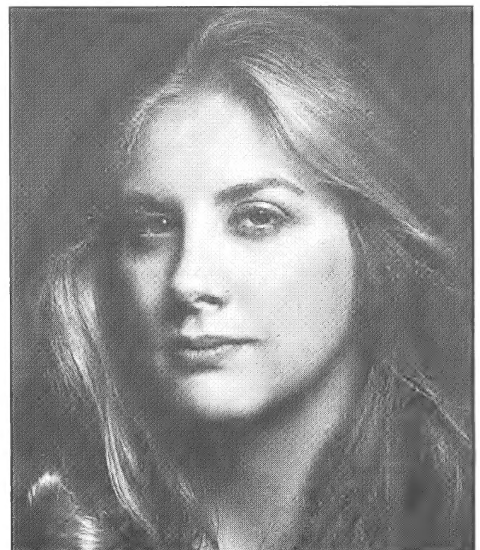
The naturales, or "Natural People," as they prefer to be called, still live much as they have for thousands of years, and the exhibit includes photos of the modern-day Mayan people and their lifestyle.

PERFORMING ARTS OF MANY CULTURES

Song, dance, and storytelling of many cultures are featured in February's programs. Free performances relating to African and Afro-Caribbean heritage, Norwegian folk traditions, the Chinese New Year, Jewish klezmer music, Brazilian folklore, and more are scheduled each Saturday at noon and 2 p.m. in Stanley Field Hall. The complete schedule is included on the "Visitor Programs" page.

Visitors may also attend Wednesday morning performances for school groups.

Jamie O'Reilly performs Irish folk songs February 15.



JANUARY/FEBRUARY EVENTS

1/1 Wednesday
New Year's Day

Museum is closed.

1992

2/15 Saturday
Freilach

2 p.m. in Stanley Field Hall. The Maxwell Street Klezmer Band plays the traditional music of Eastern European Jewry.

1/8 Wednesday
Caving

Windy City Grotto of the National Speleological Society meets at 7:30 p.m. Use the West entrance. This program begins the Caving Information Series lectures. The public is welcome to come and learn more about caves and cave exploration. Meetings are on the second Wednesday of each month.

1/19 Sunday
Latin beat

Listen to the Latin-Caribbean sounds of Freddy Concepcion. 1 p.m.



1/10 Friday
Departure

Museum tour group led by Dr. Janet Voight leaves for Baja California. The group returns January 18.

2/19 Wednesday
Lecture-discussion

First of three Wednesday programs (7-9 p.m.) on the ecology of the rain forests of Central and South America. Brian Fisher of the Division of Insects conducts the tour. \$35 (\$30 members). Call (312) 322-8854.

1/13 Monday
Dragons & drums

Primitive Art Society meets at 7:30 p.m. Use the West Entrance. Slide-lecture by Tovya Wagner on the ethnic-minority cultures of southern China. Primitive Art Society meetings are on the second Monday of each month.

1/24 Friday
Exhibit opening

"A Separate Vision." Works by four contemporary Native American artists from the Southwest. Through April 5 in the Webber Gallery.

2/29 Saturday
Performance



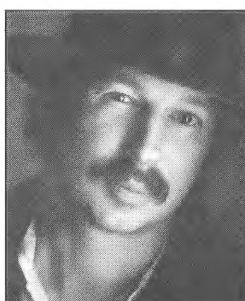
"An Evening with Ossie Davis and Ruby Dee." 8-9:30 p.m. Dramatic readings and reflections on the minority experience in America by the celebrated actors. \$18 (\$15 members); \$12 students and seniors. Call (312) 322-8854.

2/17 Monday
Presidents Day

Museum is open.

2/8 Saturday
Overnight

Bring the kids (grades 1-6) and sleep over at the Field Museum. Science workshops, flashlight tours, entertainment, a midnight snack, and Continental breakfast in the morning. \$30 per adult, \$25 per child. Call (312) 322-8854.



1/18 Saturday
Lecture

2 p.m. "Islandgods: Exploring the world's most exotic islands." Join renowned world adventurer, river explorer, and author Richard Bangs for a slide-illustrated trip to ten distant worlds. \$10 (\$7 members). Call (312) 322-8854.

2/10 Monday
Indian textiles

Primitive Art Society meets at 7:30 p.m. Slide-lecture by Elli White on the Field Museum's Hopewell Collection of Woodland Indians' textiles. John White tells a story about the origin of the art of weaving told to him by his great aunt, a Cherokee-Shawnee Indian.

2/29 Saturday
Outreach Council

The Council, a diverse group of young professionals who support the Museum's Community Outreach Program, hosts a reception for Ossie Davis and Ruby Dee in Stanley Field Hall at 9:30 p.m., following their performance. WMAQ-TV anchor Warner Saunders is the evening's emcee. Tickets for the performance and reception are \$40. Call (312) 322-8858.

'SIZES' IS RE-SIZED

A new "Sizes" exhibit, designed to give visitors a different perspective on the sizes and shapes of living things — including themselves — has opened in the First Floor arcade at the southeast end of Stanley Field Hall. "Sizes" had been displaced from its former location by the installation of "Into the Wild."

A variety of hands-on components has been added to help explain the reasons for the diverse shapes and dimensions of creatures in our complex world. One such factor is gravity, and a computer in "Sizes" tells visitors how much they would weigh on the different planets of our solar system. You merely plug in your height and weight, and the computer will tell you what you would weigh on Jupiter, the Moon, Saturn, etc. The same computer will also chart your height and weight, letting you know where you stand in comparison with other visitors who have worked with the computer that day.

Other new elements of "Sizes" that seem to be popular with visitors include: a work

area where different-sized blocks can be weighed, showing how size is proportionate to weight; microscopes that give visitors an up-close view of some of the world's smallest inhabitants, including a flea and an amoeba; and a video of a bison and an antelope running side by side, so viewers can see how these animals, due to their differing physical makeup, use similar body parts in different ways to propel themselves.

The old favorites are still in "Sizes" as well, including the jumping mat, where visitors can see if they can jump their own height, and the pants and shoes displays, where the largest and the smallest sizes of each item are on view — as well as many sizes in between. The huge table and chair set is back too, capable of transporting adults back to a time when they were toddlers, and the world seemed a much bigger place.

Mr. and Mrs. Oscar Mayer, through the Oscar G. and Elsa S. Mayer Charitable Trust, generously provided the funding that made the improvements to "Sizes" possible.

WINTER PROGRAMS FEATURE NATIVE AMERICAN CULTURES

The Museum's Department of Education is offering a variety of educational programs for adults and families this winter. Several featuring Native American cultures are listed here. Pre-registration is required. Call (312) 322-8854 for a brochure and registration information.

Adult Courses

Native American Basketry
Saturday, January 18 / 9 a.m. – 3 p.m.
\$35 (\$30 members)

See fine examples of Native American baskets in the Museum collections and weave your own twined basket.

Native American Nations of the Southwest: Historical and Cultural Perspectives
Tuesdays, February 11 – March 3 / 7 – 9 p.m.
\$12 (\$10 members) per evening.
\$45 (\$38 members) for all four lectures.

Co-sponsored with Native American Educational Services (N.A.E.S.) College. Guest lecturers provide a diversity of perspectives. Topics are "An Archaeological Overview" (Winifred Creamer); "Cultural Continuity and

Change" (Carlos Peyneta); "Southwestern Connections" (Raymond Fogulson); and "The Navajo: Crossing Cultural Boundaries" (Tricia Neztosie Poleski). Moderator is Terry Strauss.

Mound Builders of the Eastern United States
Tuesdays, February 18 – March 24 / 7 – 9 p.m.
\$65 (\$55 members)

Investigate the development, organization, and decline of major mound-building cultures.

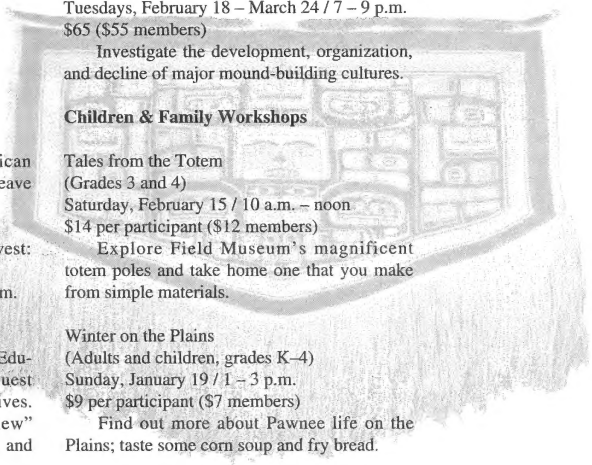
Children & Family Workshops

Tales from the Totem
(Grades 3 and 4)
Saturday, February 15 / 10 a.m. – noon
\$14 per participant (\$12 members)

Explore Field Museum's magnificent totem poles and take home one that you make from simple materials.

Winter on the Plains
(Adults and children, grades K-4)
Sunday, January 19 / 1 – 3 p.m.
\$9 per participant (\$7 members)

Find out more about Pawnee life on the Plains; taste some corn soup and fry bread.



CRANES.

In Chinese painting and poetry, cranes are emblems of longevity, which is what we wish for all our friends. Even cranes, however, leave behind the breeze that new generations can fly on.

LET'S TALK

To discuss how you can help ensure that the Field Museum's collections, research, exhibitions, and educational programs are available to future generations, please call Melinda Pruett-Jones, director of major gifts and estate planning, at (312) 322-8868.

Become a Member of the Field Museum of Natural History and receive these benefits:

- Free admission
- Free coat checking and strollers
- Invitation to Members' Night
- Priority invitations to special exhibits
- Free subscription to *In the Field*
- 13-month wall calendar featuring exhibit photographs
- Reduced subscription prices on selected magazines
- Opportunity to receive the Museum's annual report
- 10% discount at all Museum stores
- Use of our 250,000-volume natural history library
- Discount on classes, field trips, and seminars for adults and children
- Members-only tour program
- Children's "Ancient Egypt" birthday party
- Opportunity to attend the annual children's Holiday Tea
- Discount at Chicag's largest furniture wholesaler
- Children's "dinosaur" birthday card

MEMBERSHIP APPLICATION

New Members only. This is not a renewal form.

Please enroll me as a Member of the Field Museum of Natural History

Name _____

Address _____

City _____

State _____ Zip _____

Home phone _____

Business phone _____

GIFT APPLICATION FOR

Name _____

Address _____

City _____

State _____ Zip _____

Home phone _____

Business phone _____

GIFT FROM

Name _____

Address _____

City _____

State _____ Zip _____

Home phone _____

Business phone _____

MEMBERSHIP CATEGORIES

- Individual – one year \$35 / two years \$65
- Family – one year \$45 / two years \$85 (Includes two adults, children and grandchildren 18 and under.)
- Student/Senior – one year \$25 (Individual only. Copy of I.D. required.)
- Field Contributor – \$100 - \$249
- Field Adventurer – \$250 - \$499
- Field Naturalist – \$500 - \$999
- Field Explorer – \$1,000 - \$1,499

All benefits of a family membership — and more

Founders' Council – \$1,500
Call (312) 322-8878 for more information.

VISITORS PROGRAMS

Saturday, January 4
 1pm Listen to the blues harmonica of Chicago Beaux.
 3pm Fan Wei-Tsu demonstrates the zheng, a Chinese zither.

Sunday, January 5
 1pm Listen to the blues harmonica of Chicago Beaux.
 3pm Maya Marimba performs Latin American music.

Wednesday, January 8
 10am - 12 noon Bite, Tear & Chew - Find out how teeth & jaws reveal what an animal eats.
 10am - 12 noon Flight - See how birds are built for flight.

Saturday, January 11
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.
 1pm Vandy Harris plays original African American compositions for horn, wind & voice.
 2pm - 4pm Hieroglyphs - Have your name written in this ancient Egyptian alphabet.
 3pm The Chinese Music Society of North America demonstrates instruments of the Chinese orchestra.

Sunday, January 12
 10am - 12 noon Horns & Antlers - Discover the differences.
 12 noon Welcome to the Field Tour - Enjoy a sampling of our spectacular exhibits.
 1pm - 3pm Owl Pellets - Find out about the diet of owls by looking at their pellets.
 1pm Carlos Cumpian shares his poems & stories of Chicano/Mexicano culture.
 1pm - 4pm Weaving demonstration by the North Shore Weaver's Guild.
 2pm - 4pm Hieroglyphs - Have your name written in this ancient Egyptian alphabet.

Wednesday, January 15
 10am - 12 noon Bite, Tear & Chew - Find out how teeth & jaws reveal what an animal eats.

Thursday, January 16
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.

Saturday, January 18
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.
 1pm Keith Eric performs Jamaican music & stories.
 3pm Experience the original compositions of Brazilian musician, Venicio De Toledo.

Sunday, January 19
 12 noon Welcome to the Field Museum Tour - Enjoy a sampling of our spectacular exhibits.
 1pm - 4pm Weaving demonstration by the North Shore Weaver's Guild.
 1pm Listen to the Latin-Caribbean sounds of Freddy Concepcion.
 2pm - 4pm Hieroglyphs - Have your name written in this ancient Egyptian alphabet.

Wednesday, January 22
 10am - 12 noon Bite, Tear & Chew - Find out how teeth & jaws reveal what an animal eats.

Thursday, January 23
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.

Saturday, January 25
 1pm Classical flamenco guitar performance by Emory Callaway.

2pm Hieroglyphs - Have your name written in this ancient Egyptian alphabet.
 3pm The evolution of black music from field hollers & spirituals to contemporary rap music is performed by Maggie Brown.

Sunday, January 26
 1pm Tu Nokwe performs South African folk songs.
 2pm Around the Field Tour - Dinosaurs, mummies, totem poles and more will be visited during this highlight tour of Field Museum.

Wednesday, January 29
 10am - 12 noon Bite, Tear & Chew - Find out how teeth & jaws reveal what an animal eats.



Thursday, January 30
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.

Saturday, February 1
 12 noon Chinese Shadow Puppet Theater - See a performance of the Blue Unicorn.
 1:30pm Tibet Today & A Faith In Exile - A slide presentation on Tibet & Tibetan refugees in India, Sikkim and Nepal.
 2pm The children of the Chinese American Service League perform traditional Chinese dances for a delightful tribute to the Chinese New Year.

Sunday, February 2
 1pm Ari Brown plays a variety of musical styles on the saxophone.
 3pm Listen to Carmen Aguilar as she tells Latin-American stories.

Wednesday, February 5
 10:30am Maggie Brown performs her highly acclaimed rendition of "Legacy", a performance of African-American music in story & song.
 11:30am Gideon Foli Alorwoye - Watch Chief Master drummer Gideon as he teaches about African song & dance.

Saturday, February 8
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.
 12 noon Pocomania Caribbean Dance - As the song says "Come back to Jamaica!" Learn the history of Pocomania as the Caribbean dancers perform the "limbo" and "bamboo" dances.
 2pm - 4pm Hieroglyphs - Have your name written in this ancient Egyptian alphabet.
 2pm Amoke Amoleye Yoruban Children's Storytelling - Delight as you listen to Amoke tell the stories told to Yoruban children for centuries.

Sunday, February 9
 1pm Join Darlene Blackburn for a World Music performance of African dance and rhythms.
 1pm - 4pm Weaving demonstration by the North Shore Weaver's Guild.
 3pm Listen to the African drums of Prince Ravanna Bey.

Wednesday, February 12
 11:30am American Indian Center Children's Dance Company - "Oyate Un Wanzisi" means "We are Our People." Children from the American Indian Center formed Oyate Un Wanzisi Dancers and perform traditional Indian dance.
 1:30pm Viva Flamenco - Teresa y los Preferidos keeps her audiences spellbound as she demonstrates the art of flamenco dance.

Thursday, February 13
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.

Saturday, February 15
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.
 12 noon Jamie O'Reilly performs Irish folk songs, including many love songs, for a belated Valentine's Day program.
 2pm The Maxwell Street Klezmer Band performs a lively program of Jewish folk, dance & theater music.

Sunday, February 16
 1pm - 4pm Weaving demonstration by the North Shore Weaver's Guild.
 1pm Douglas Ewart plays flutes from Japan & Australia.
 3pm Chief Master drummer Gideon Foli Alorwoye demonstrates African drumming & dancing.

Wednesday, February 19
 10:30am Greek myths are introduced through stories and art by storyteller Patricia Pelletier.
 11:30am The Brazil Folklore trio celebrates Brazilian rhythms with the samba, bossa nova & the lambada.

Thursday, February 20
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild.

Saturday, February 22
 1pm The Norwegian Folk Dancers present a lively program of traditional folk dances.
 1:30pm Tibet Today & A Faith In Exile - A slide presentation on Tibet & Tibetan refugees in India, Sikkim and Nepal.



2pm Join Praise Poet Elizabeth Ncube from Zimbabwe as she performs at Field Museum during her limited engagement tour of the United States.
 2pm - 4pm Hieroglyphs - Have your name written in this ancient Egyptian alphabet.
 2pm Around the Field Tour - Dinosaurs, mummies, totem poles and more will be visited during this highlight tour of Field Museum.

Sunday, February 23
 1pm Hear the enchanting African stories & music of Shanta.
 3pm Chinese Music Society of North America performs instruments of the Chinese orchestra.

Wednesday, February 26
 10:30am Dances of Many Lands are performed by Dancers Three. Experience folk dances, celebrations & ceremonies of Japan, West Africa, Eastern Europe, and Mexico.
 11:30am Royal African Puppet Theater - Master puppeteer, Baba Alabi Ayinla, brings his puppets to life in his enchanting stories of African life.

Thursday, February 27
 10am - 1pm Weaving demonstration by the North Shore Weaver's Guild
 12 noon "El Tajin: Mythology, Art & Restoration" Explore this fascinating archaeological site, located in the Mexican State of Veracruz, and learn about the restoration work being done during this presentation by visiting archaeologist Manio Navarrete Hernandez.

Saturday, February 29
 12 noon The Polish National Alliance "WICI" group performs traditional dances and songs from Poland.
 2pm Join Praise Poet Elizabeth Ncube from Zimbabwe as she performs at Field Museum during her limited engagement tour of the United States.

VOLUNTEERS

Make good on that New Year's resolution . . . Become a Field Museum volunteer.
 Plan on attending one of the Volunteer Orientation sessions listed below for information about upcoming training programs & volunteer opportunities:
 Saturday, January 11
 10am - 12 noon
 Monday, January 13
 5:30 - 7:30pm
 or Tuesday, January 14
 10am - 12 noon.
 Winter training sessions for Pacific, Place For Wonder, Webber Resource Center (Native Cultures of the Americas), and hands-on activities begin soon. For more information and to get involved contact the Museum Volunteer Coordinator at (312) 922-9410, ext. 360.

DAILY ACTIVITIES

Webber Resource Center
Native Cultures of the Americas
 Books, videotapes, activity boxes, tribal newspapers & teacher resources about Native Peoples of the Americas are available.
 Daily 10 am - 4:30 pm

Harris Center
 Chicago Area educators may borrow activity boxes & small dioramas from the Harris Educational Loan Center. Many new materials to complement the Into the Wild exhibit are available. For more information call: (312) 322-8853.
 Harris Open House Hours: Tuesdays & Thursdays 2:30 - 5 pm
 Saturdays 9 am - 5 pm

Place For Wonder
 A special room of touchable objects where you can discover toys & clothes of Mexico in addition to an array of fossils, shells, rocks, plants & live insects.
 Weekends: 10 am - 4:30 pm
 Weekdays: 12:30 - 4:30 pm

Pawnee Earth Lodge
 Walk into a traditional home of the Pawnee Indians of the Great Plains and learn about their daily life during the mid-19th century. Free program tickets available from the South Information desk.
 Weekdays: 1pm program
 Saturdays: 10 am - 4:30pm; Free ticketed programs at 11, 12, 2 & 3.
 Sundays: 10 am - 4:30 pm

RAFTING THE COLORADO: EXPLORING A DESERT RIVER

By Barbara A. Harney
Division of Mammals

Viewed from the rim, the Grand Canyon of the Colorado River awes with its immensity and sheer panoramic beauty. Over the past five million years the grinding river has scoured its way through the uplifted Colorado plateau exposing rocks in the heart of the earth, nearly two billion years old. In the layered beds of the canyon walls you can find evidence of vast biotic communities long extinct, having vanished in a blink of geological time. Today, another diverse ecological community flourishes in this desert canyon. There's no more enjoyable way to explore this fauna and flora and their dynamic association with the river than by rafting down the Colorado.

Within the canyon environment you'll find both great diversity and amazing contrasts. The cool spruce forests of the rim give way to more heat- and drought-tolerant species. On the canyon floor beyond the river's reach only tough desert plants survive. The proximity of so many different vegetation zones increases the opportunity to see animals that can move with ease, like birds, bats, and larger mammals, at the river where they may come to feed or drink.

The Colorado drops about 2,000 feet in elevation over the 270 miles from Lee's Ferry in the east to Lake Mead in the west. Near Lee's Ferry, you'll find desert plants like sagebrush and scrubby rabbitbrush of the cool Great Basin Desert to the north. Moving west along the river, plants of the hot Sonoran and Mohave Deserts to the south and west take over. Succulent agaves and yuccas send up their towering flower stalks, prickly pear cactus and aromatic creosote bush dot the hillsides, and ocotillos and barrel cactus bear a profusion of scarlet flowers.

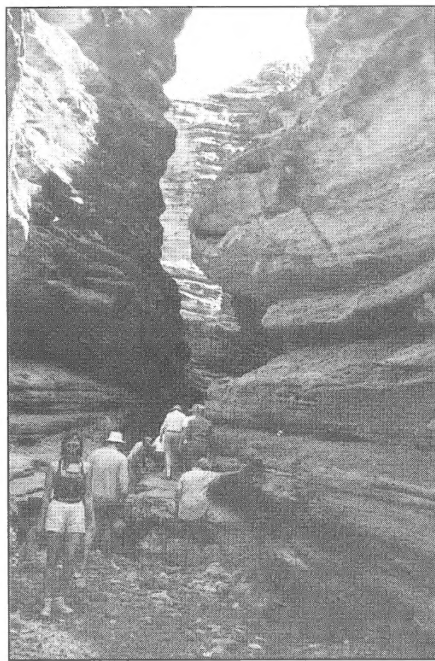
Despite the proximity of the river, only a narrow band of vegetation draws life from its icy blue-green water. This riparian zone of plants is dominated by tamarisk, an exotic weedy shrub from the Middle East that spreads like wildfire. Before Glen Canyon dam tamed

the Colorado's flows, annual floods scoured a broad terrace of the beach preventing the establishment of woody plants. Today, pink-blossomed tamarisk, seep willow, and desert broom abound on these silty terraces. Only a strip of deep-rooted native mesquite and acacia mark the high-water zone created by the raging flows of the pre-dam river.

This invasion of tamarisk has created new habitat for insects and those that feed on them, and both have increased in abundance along the river. Desert whiptail, desert spiny, and side-blotched lizards snatch flies and midges as they race through the sand, leaving sinuous tracks in their wake. Hordes of violet-green swallows and white-throated swifts strain the air for insects carried on the thermal currents that rise from canyon walls. Blue-gray gnatcatchers and black-throated sparrows dart from shrub to shrub, while up on the rock cliffs the canyon wren whistles its characteristic descending trill. From the river you can often catch a glimpse of great blue herons and spotted sandpipers scouring the shoreline or of black-chinned hummingbirds searching for nectar-filled blooms among the desert scrub plants.

The opportunity to stop and hike up small canyons from the river is a special highlight of rafting trips. Side-canyons boast not only pools of warmer water to swim and luxuriate in, but also a proliferation of delicate waterloving plants. Seeps and springs create oases for maidenhair ferns, golden columbine, vining snapdragon and crison monkeyflower, bright patches of color that burst forth from cracks in the rock walls. Besides providing protected havens for plants, these numerous side-canyons and tributary streams create corridors for animals moving down from habitats above.

At night, the moist inner walls of side canyons come alive with the chirping of canyon treefrogs. They grip the slippery rocks with suction-cup toes and call out to attract mates. Desiccation-prone bats leave their refuges in rock crevices and under ledges to forage for flies, gnats and midges along the river channel. Bats, mostly little brown bats or



Barbara Harney

myotis, and the tiny western pipistrelle, fill the skies right before daybreak.

Larger mammals can tolerate a higher heat load than smaller-bodied mammals, and move about during the day. Mule deer and bighorn sheep often descend to the cool river down side canyons from the more temperate habitats above. Desert bighorn even thrive in the drier and more barren reaches of the lower canyon. They can quickly traverse seemingly unpassable jumbles of rock with ease, and can subsist by grazing the dry scrub and scattered grasses. Perhaps no other species is more symbolic of the rugged canyon environment than the durable bighorn.

A river trip on the Colorado offers many different kinds of experiences, from the thrill of plunging rapids to the sight of sunrise on limestone cliffs. Certainly, it's also one of the best ways to see and learn about the plants and animals that have made their homes in this desert canyon.

Members of a Field Museum rafting tour group explore the Grand Canyon. Barbara Harney will lead another rafting tour on the Colorado River May 23-30.

KID STUFF

MAGIC CRYSTALS

By Peter Laraba
Department of Education

Minerals are made of atoms of different elements such as oxygen, silicon, carbon, lead, etc. The atoms are packed together in simple patterns and the pattern is always the same in any particular mineral. It is these hidden internal shapes that give mineral crystals their characteristic shapes. And, amazingly, crystals grow.

Crystals are everywhere. Every day you wear and even eat crystals — though you may not see them unless you know what to look for. If it surprises you to think of wearing and eating crystals, that may be because you are not used to thinking of the metal belt buckles and buttons that you wear, and the salt and sugar that you eat, as being made up of crystals. The world is full of crystals and they hold many surprises. You can grow your own.

One of the simplest and most rewarding ways to grow crystals is from sugar. Here's how:

1. Carefully measure two cups of sugar into one cup of water in a pan. Heat the solution to 242° Fahrenheit. If you do not have a candy thermometer, another way to tell the

temperature of your solution as it heats is to drop a tiny bit from time to time in cold water. When the drops form a soft ball you will know that the solution is hot enough.

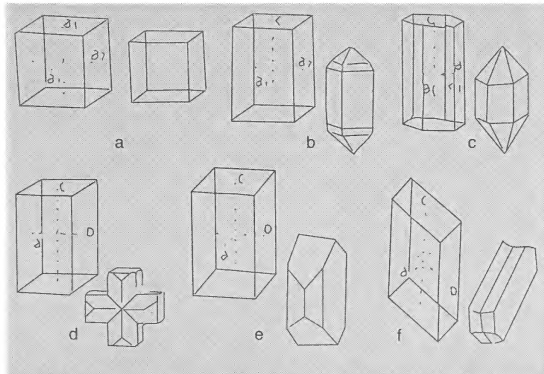
2. Now remove the solution from the heat and allow it to cool. When it has become quite cool pour the mixture into a tall, thin glass jar.

3. Take a piece of string, long enough to reach the bottom of the glass jar. Tie one end of the string to a pencil and the other to a paper clip.

4. Drop the end of the string that has the paper clip into your supersaturated sugar solution, making sure that the string does not touch the bottom of the jar. Place the pencil so that the middle of it is centered over the mouth of the jar. The string will give the sugar crystals an uneven surface on which to grow.

5. Now put the jar of solution someplace where it will not be disturbed or subjected to changes of temperature. It will probably take your sugar crystals several days to grow about an inch.

6. If you follow directions carefully you will have the satisfaction of growing your own beautiful crystals. You will also have the satisfaction of being able to eat your sugar crystals — since another name for sugar crystals is rock candy!



There are millions of possible crystal shapes, which you can see by looking at snowflakes. Some common ones are (a) isometric; (b) tetragonal; (c) hexagonal; (d) orthorhombic; (e) monoclinic; and (f) triclinic.

OCTOPUS GARDENING

(Continued from page 1)

Because individuals cannot be monitored, most studies have used population-wide sampling to estimate biological patterns, but adequately sampling an octopus population is itself a major problem. Large octopuses are captured much more frequently than small ones. In part, this is because large octopuses are most easily seen and secured.

Unfortunately for field studies, a sample



Cecil Schwalbe

biased toward large animals fails to tell us what we want to know about growth or about size variation in the population.

If we could estimate octopus age, large animals might contribute to our knowledge, but such estimates have been nearly impossible. Although octopuses are mollusks, they don't have shells like clams which show periodic growth rings. Their teeth show no wear, as they are arranged in a radula, a ribbon which is constantly replaced.

Masters of Deceit

One factor compounding sampling problems is that octopuses are masters of disguise. Each square centimeter of their skin contains thousands of minuscule chromatophore organs made up of sacs containing color pigments and surrounded by muscle. The octopus consciously controls what colors it shows by contracting the muscles to widen the sac and show the color, or by relaxing the muscles to close the sac and hide the color. These organs, supplemented by color-reflecting cells located beneath the chromatophore organs, allow octopuses to match the colors in their environment almost flawlessly — and this despite the fact that the animals are themselves colorblind. Dermal muscles also can change their skin texture from smooth to rough, breaking up the animal's outline and allowing it to blend in with coarse backgrounds.

Despite this complex camouflage system, octopuses are sometimes detected by predators. In those cases, they must rely on other means to escape capture. Octopus bodies, made almost entirely of muscle, have only a single cartilage covering the brain. The absence of hard parts means that octopuses can compress their bodies and pass through incredibly small holes. These holes, in rocky areas or reefs, provide refuge critical to individual survival. Camouflage and compression combine to make sampling octopuses difficult. With scientists unable to document biological patterns in octopus populations, the animals have remained cloaked in mystery.

Despite these problems, I have been able to study octopuses in the wild and address questions such as growth and life span.

The first thing to consider when studying a new animal is what that animal needs. Octopuses need seawater for life support, food to eat, and shelter to avoid being eaten. Because octopuses require seawater, most researchers have worked in the ocean using SCUBA gear or analyzing the contents of nets trawled across the ocean bottom. However, to avoid the expense, limited duration, and uneven sampling these methods often entail, I worked in the intertidal zone, in pools that rarely drain even during the lowest tides.

My field research was conducted in Mexico on the Sonoran coast of the northern Gulf of California. The long and narrow shape of the Gulf, which separates the Baja Peninsula from mainland Mexico, makes the tidal range in the northern Gulf among the greatest in the world — up to seven vertical meters (22 feet). Working during low tides, I could cover more area more easily than I could have if I had had to swim, without requiring a boat or having to rely on the cooperation of local fishermen.

The intertidal pools that provided the octopuses with seawater to sustain life also contained ample prey. Although octopuses are voracious predators that can eat their equivalent body weight in one sitting, the sea is rich in potential prey. Octopuses are not fussy eaters, and willingly consume virtually any mobile animal, including shrimps, crabs, fishes, snails, bivalves, and, if smaller octopuses are present, members of their own species.

Gimme Shelter

The other thing octopuses need for survival is shelter. Except for their learning ability, their elaborate chromatophore organ system is their only defense against predators. But the octopuses must be constantly vigilant to maintain crypsis, a condition requiring great expenditure of energy. To avoid being eaten, and to save energy, octopuses retreat into shelters or refuges. This may explain why most near-shore octopus species live in rocky areas or coral reefs where abundant nooks offer protection. However, a few species live in the midst of vast expanses of open sand flats. At first, these areas may appear barren, without the hard-sided shelter that could provide the security necessary for soft-bodied octopuses. However, sand flats do provide refuges, which may perhaps be even better than those available on rocky shores. In the sand flats, empty gastropod (snail) and bivalve (clam) shells provide easily defensible shelter against any predator curious enough to investigate them.

An octopus will sit in the open mouth of a snail shell and sometimes hold another shell to the opening, apparently as a shield. Or it may move into the inner, coiled area of the shell.

Using an empty clamshell, an octopus applies the hundreds of suckers (literally little suction cups) on its eight arms to hold the two halves of the shell together — a feat they accomplish nearly as effectively as do clams, whose muscles attach to the shell.

Despite the advantages of shells as refuges, they sometimes are too scarce to house all the octopuses in a population. Given that an octopus without a shelter is in mortal danger when confronted by a predator, the availability of shelters may effectively determine how many octopuses live in an area, and therefore may limit the number of octopuses in the population.

Aware that such a limitation would most strongly affect sand-flat octopuses, I chose to study *Octopus digueti*, the Pacific pygmy octopus. My idea (in essence borrowed from the basic tenet of capitalism) was that if I were to provide more of the limiting resource (shelters), the octopuses would beat a path to my door. If I placed empty shelters in the sand flats, I reasoned, homeless octopuses in the population would move into them, and all I would have to do would be to collect the shelters with their resident octopuses. If my shelters were acceptable to all members of the octopus population, these resident octopuses would represent a random sample of the population. But if I wanted to trace growth rates in the population, I would have to be certain that small octopuses as well as large ones would move into the shelters.

Given that the size range in question extended from 10mm-long hatchlings (less than half an inch) to adults over 120mm long (4.5 to 5 inches, including the arms), this presented a problem. I knew that earlier studies had shown that octopuses avoided clear glass and that they seemed to prefer to be in contact with, but not cramped by, solid walls. I also knew that the virtual absence of hard parts allows octopus bodies to be compressed enough to squeeze through very small spaces. The ideal shelter

could have a narrow entrance, but inside it had to have enough, but not too much, room to make both small and large octopuses comfortable.

Animal House

I wanted these criteria to be met by a single shelter type to keep my study simple, but finding one shelter that would meet all these criteria

Despite the advantages of shells as refuges, they sometimes are too scarce to house all the octopuses in a population.

seemed hopeless. Late one evening, however, the solution presented itself. With the help of another researcher at the Center for Desert and Ocean Studies at Puerto Peñasco, I discovered a classically elegant, dark brown glass bottle with a two-inch-long tapered neck and a football-shaped body that met all my specifications. Fortunately, such bottles were available in quantity locally in Sonora, filled with Corona Cerveza. Draining the required number of bottles presented minimal problems in the marine station, poised between the desert and the beach. After accumulating 150 bottles, I tethered them in groups of ten to lines in the lower intertidal zone of a sand flat habitat. I left the shelters in the intertidal zone for the duration of the study, clearing octopuses that had taken up residence in them every day during each spring tide series (bimonthly periods of maximal tidal variation coincident with new and full moon) for one year.

In total, this sampling technique allowed me to collect 805 octopuses, which ranged in size from 0.6 gram to 75 grams (2.5 ounces). I

(Continued on page 11)

OCTOPUS . . .

(Continued from page 10)

took each octopus to the laboratory, narcotized, weighed, and measured it, and determined its sex.

My data reflected population-level data rather than traced individuals; I estimate that I recaptured less than one percent of the animals handled. Despite this limitation, I collected enough octopuses to make some inferences about octopus biology. By monitoring changes in sizes of the octopuses sampled at every collection period, I could estimate growth rates. By determining the proportion of males to females, I could infer how many females were brooding eggs and therefore had not moved into the shelters. I tested this by surveying shells for females with eggs, and my predictions held up.

I concluded that octopus lives are short, but are also highly variable, probably due to genetic variation. In companion laboratory experiments, researchers at the University of Texas Marine Biomedical Institute found that on average the animals lived seven months, and

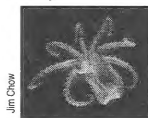
in that time they grew from 0.04 gram to 40 grams, a 1,000-fold increase. However, even in carefully controlled conditions, two siblings could differ in life span by up to two months and in maximum body size by up to two fold. This unsuspected variation, it appeared, had been a major factor complicating studies of octopus biology — but the variation is critical to species survival. It allows the population to respond to natural selection, and therefore to evolve.

Such variability entails both costs and benefits. Female body size determines the number of eggs that can be produced: a larger female makes more eggs. But a large octopus risks outgrowing the available shelters (if you have collected shells at the beach you know that there are more small shells than large ones) and runs a greater risk of being eaten because to grow larger, she lives longer and must hunt more. For *Octopus digueti*, this means that a small octopus, despite producing fewer eggs, may have an advantage because she is more

likely to survive to lay those eggs than is a large octopus.

How much variation exists in the population? Females brooding eggs weighed as little as 11 grams and as much as 75 grams, with every possible size in between. The average was about 40 grams. The range shows that this population could adapt to and survive changes in the environment, whether those changes pushed the balance to favor large or small octopuses.

The ability of octopus populations to survive changing circumstances no doubt accounts for much of the evolutionary success of these creatures. More than 100 species of the genus *Octopus*, along with octopuses that belong to other genera, proliferate between the intertidal zone and depths of nearly four kilometers (about 2.5 miles), all over the world. And despite the culinary proclivities of the Greeks, Japanese, and Peruvians, among others, they do not seem headed for extinction anytime soon.



Jim Chow

POTTERY . . .

(Continued from page 1)

density, land use, and social and political organization," Roosevelt explains. "Our purpose in looking at this sequence is to try to understand the relationship between the physical environment and human societies, their mutual adaptations and co-evolution over time. We also want to understand the impact people have had on the environment over the 12,000 or so years this area has been occupied."

In the course of the project, Roosevelt and her colleagues have found evidence of much more intensive land use than had been postulated for the region.

"The accepted theory for many years was that this habitat was simply too poor, too low in resources, to support large, dense populations of plants, animals, or humans," she says. "But one of the first things we found was that the Amazon basin is filled with the same kinds of soil as the flood plains of the Nile, the Ganges, and other great river basins of the world, where we know there were large populations and complex societies that developed over long periods of time."

Amazonia, Roosevelt contends, is far from being the archetype of pristine nature we once took it to be. Indeed, much of the biodiversity we see there today is actually the product of thousands of years of human occupation. For example, she says, many of the most diverse areas, including those with clusters of economically important species like the Brazil nut tree, turn out to be ancient archaeological sites. It is the fact that people lived and planted there — or simply discarded their seeds — that fostered the flourishing of these forests.

The Most Endangered Species — Humans?

What is the significance of discovering that regions once considered virgin, untouched by human habitation, were in fact occupied by a succession of different cultures, large settlements, and complex societies for thousands of years?

According to Roosevelt, it tells us that the non-human communities in these habitats — the plants and animals of the area — survived under these conditions much better that we would have expected. The most fragile elements in the ecosystems were the indigenous human communities — large numbers of ethnically and biologically diverse individuals from indigenous populations. The native peoples are virtually gone from many of these regions today; they have been geographically marginalized by the conquest by Europeans, reduced to

living on poorer and more fragile land.

"There's a lesson to be learned from this," Roosevelt points out. "In looking at biodiversity, we ought not to forget that humans have been a part of nature for thousands of years. The Indians of South America are not the enemy. They cultivated this area intensively for long periods, they fished, they hunted — and yet, we didn't even realize that they had altered the habitat, it was in such good condition.

"All of us are committed to preserving fragile habitats. The Indians' land use, though more intensive than we expected, definitely is capable of supporting the conservation of the land. They are the ones that most need to be protected from extinction."

Societies in Harmony with Nature

Roosevelt's findings to date are extremely important. They offer hope that complex human societies — perhaps even our own — can exist in harmony with nature . . . if we will take our lessons from the textbook of the past.

Cracking that textbook, Roosevelt suggests, is the task that lies ahead. "We've come to realize that much of what we once thought about Amazonia is wrong," she says. "Now it's time to get to work and find out more about what really happened. We have to look at the empirical evidence, the actuality of the relationship between people and their habitats through the millennia."

Only then, she cautions, can we answer the urgent questions of conservation, sustained land use, and the future of indigenous peoples — issues many nations are struggling with today.



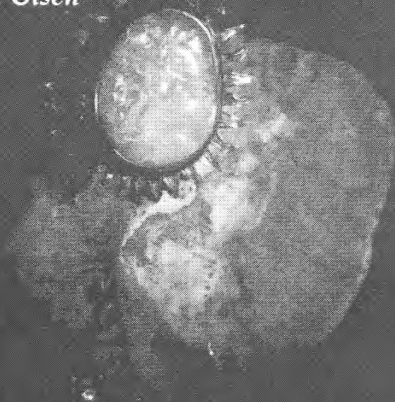
Anna C. Roosevelt

Now in the Field Museum Stores

Gems

A Companion to
The Grainger Hall of Gems

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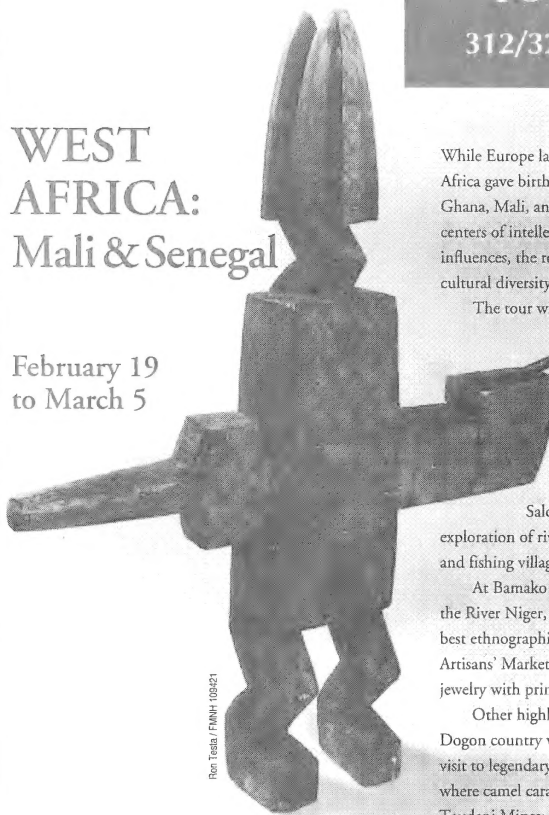
More than a display of beautiful stones — The Grainger Hall of Gems explores both the natural history and the social meaning of gems. Now, in easily accessible text and pictures, Edward J. Olsen, curator emeritus of geology, brings the fascinating story of gems to the printed page.

THE FIELD MUSEUM CENTENNIAL COLLECTION



WEST AFRICA: Mali & Senegal

February 19
to March 5



Don Teaba / FNMH 108421

While Europe lay mired in the Dark Ages, the Niger River Valley in West Africa gave birth to a series of great civilizations — those of ancient Ghana, Mali, and Songhai. For a thousand years, these empires were centers of intellectual, artistic, and cultural activity; today, despite colonial influences, the region has retained its ancestral traditions, its artistic and cultural diversity, and its overpowering natural beauty.

The tour will be guided by Deborah Mack, Ph.D., an anthropologist

who is the senior exhibit developer of the comprehensive exhibit on Africa now in preparation at the Museum. We begin in Dakar, Senegal, from which we'll explore Goree Island with its fort, slave house, and old colonial quarters, and visit with prominent artists and collectors. Then comes a three-day expedition to the bush country, including

Saloum National Park, highlighted by a scenic canoe exploration of river and mangrove swamps, a bird sanctuary, delta islands, and fishing villages of the many diverse ethnic groups of the area.

At Bamako in Mali, a predominantly modern town stretching along the River Niger, we'll visit the National Museum, which houses one of the best ethnographical displays in West Africa, and the Grand Marché and Artisans' Market, where skilled workers make beautiful leather goods and jewelry with primitive tools.

Other highlights include a two-day road excursion to the remote Dogon country where mud-hut villages stretch along a 125-mile cliff; a visit to legendary Tombouctou (Timbuktu) on the edge of the desert, where camel caravans still bring huge slabs of salt from northern Mali's Taudeni Mines; the major trade center, Mopti, packed with people in brightly painted pirogues selling their goods along the waterfront; and the ancient, picturesque town of Djenne in the Niger River Delta, whose elegant mosque is considered the best example of Sudanese mud architecture.

The tour is priced at \$6,850 per person (double occupancy).

Colorado River Rafting through the Grand Canyon

Read about the 1991 trip, Page 9
May 23–30, 1992

Borneo & the Philippines

April 17–30, 1992

Egypt & the Nile

Jan. 26 – Feb. 7, 1992

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