Smithsonian Institution
# Research Reports
*No. 81 Summer 1995*

*MARINE BIOLOGY*

## New marine station benefits people and environment

*By William Schulz*
*Smithsonian Office of Public Affairs*

As soon as Hector Guzman steps from his boat onto Chachahuate, a small sand key in the Cayos Cochinos (Hog Islands) archipelago of Honduras, a young woman bursts from the door of her thatched hut and begins to follow the marine biologist. In rapid-fire Spanish, clearly upset, she demands to know why park rangers working with Guzman have confiscated her husband's cayuco—a type of dugout canoe.

Guzman, a staff scientist at the Smithsonian Tropical Research Institute headquartered in the Republic of Panama, listens calmly. He gently reminds the woman of well-known regulations that govern a new biological reserve here—regulations that will ultimately benefit the Garifuna people of Chachahuate and other nearby islands.

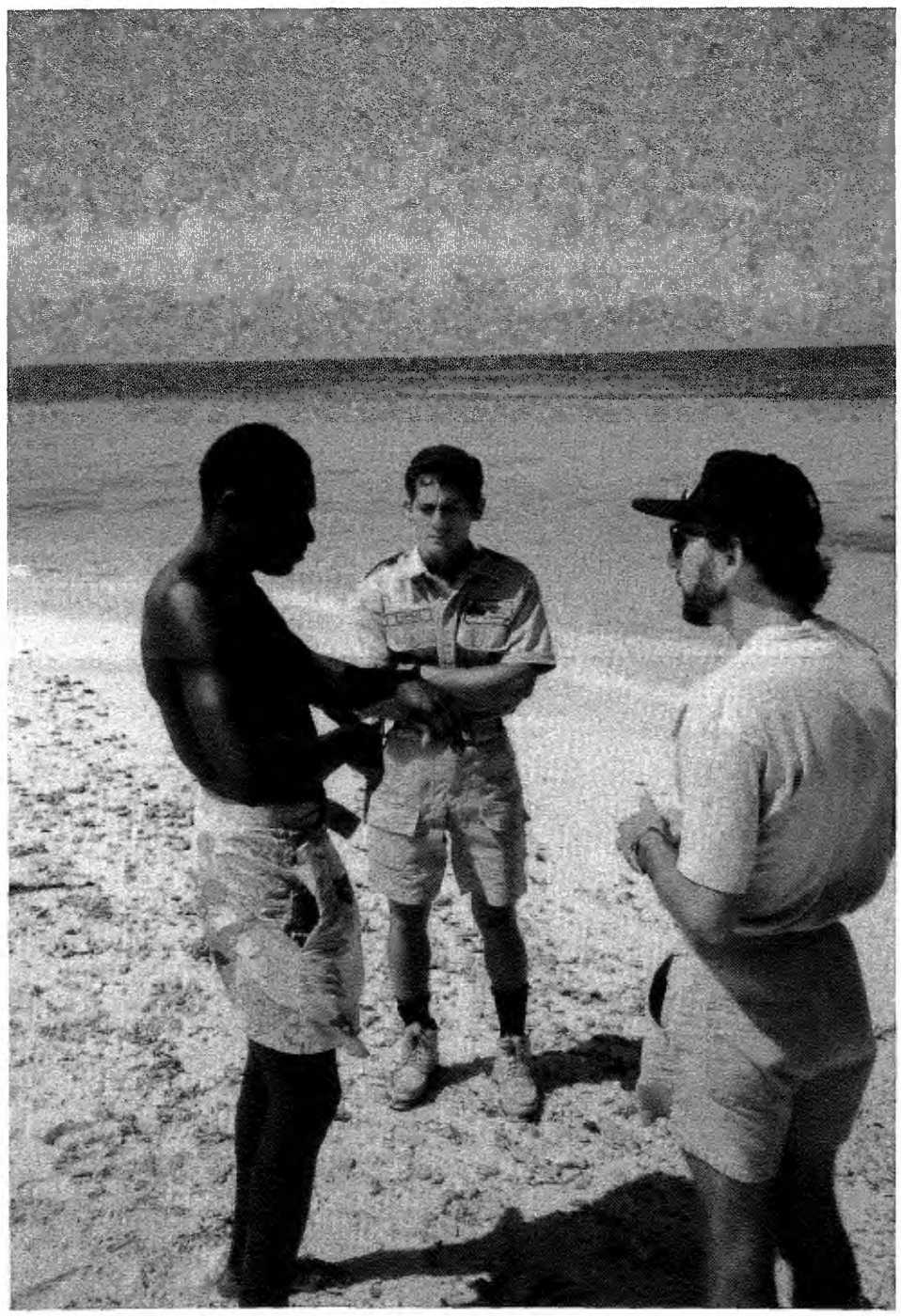
The man in question was fishing for queen conch and spiny lobster, both protected species because over-fishing has decimated their populations. This was a first offense, Guzman explains, and the woman's husband can retrieve his cayuco in a week. But he warns that second and third offenses mean escalating penalties, including permanent confiscation of fishing boats and gear.

For Guzman—assisted by Ranger Elias Aguilar and Honduran Navy Captain Adan Martinez—explaining and enforcing the rules of the new Cayos Cochinos Biological Reserve are part of the ongoing challenge of managing and protecting its resources. Later in the day, for example, Guzman will confront a woman from Europe demanding permission to toss garbage overboard from her sailboat. And once again, with seemingly infinite patience, he will sympathize with the inconvenience, but insist that the trash be towed to a mainland disposal site.

"In order to protect the wildlife of the marine reserve, we needed to establish regulations that affect local fishermen, a diving resort, tourists and boaters who sail to the archipelago," Guzman says. "We cooperate with all of these individuals to ensure that wildlife is protected and that people can maintain their livelihoods."

The Cayos Cochinos reserve—a 460-square-kilometer (184-square-mile) area that includes two forested islands and 12 sand keys in the archipelago, as well as surrounding coral reefs, seagrass beds and other underwater habitats—was created by decrees of the Honduran government in 1993 and 1994, with the assistance of the Tropical Research Institute. Recently, STRI assisted with the opening of a new biological research station on Cochino Pequeño (Small Hog), one of the forested islands. Combined, the station and the reserve constitute a bold, new initiative in sustainable development in Latin America.

The new field station—among the largest marine-research centers in the western Caribbean—includes solar-powered laboratory and living space for 15 scientists; housing for a station manager; a new pier with wet-lab facilities, including a seawater system of aquaria; and a dining facility that doubles as an auditorium and commons for researchers using the station. Hydrographic and meteorologic monitoring equipment on the island is maintained by the U.S. National Oceanic and Atmospheric Administration.



*Hector Guzman (right) and Ranger Elias Aguilar (center) talk to a local man about environmental regulations in the Cayos Cochinos Biological Reserve. (Photo by William Schulz)*

But the new station and the biological reserve have by no means been roped off solely for the purpose of scientific research. Mindful of the needs of the Garifuna people, and a small tourism industry in Cayos Cochinos, STRI, in partnership with the Avina Foundation of Switzerland, Honduran businesses and the Honduran government, gives equal we ight to creating a unique project in sustainable development.

Toward that goal, Guzman, scientist-in-charge of the new station, describes a day in the very near future when Cayos Cochinos will support mariculture or sea-farming ventures operated by and for the Garifuna people. Strongly regulated ecotourism will benefit the local sport-diving industry, and a wide variety of terrestrial and marine research opportunities will draw scientists from around the globe.

To ease the temporary burden some local people feel, Guzman has made helping the Garifuna people a principle component of the reserve's operations. A natural diplomat, Guzman is always willing to listen, and impromptu "town hall" meetings with the Garifuna are a near daily aspect of his work.

With grants from Avina, Guzman has initiated projects to improve a local school and to install water-storage tanks, solar-energy generators and sewage treatment facilities on the Garifuna's islands. He hires local people to staff the new research station and to work as naturalists and park rangers within the reserve. He offers education about various marine animals, including the conch and lobsters. And Guzman has shown the Garifuna how to make a sort of charcoal briquette from coconut debris, rather than cutting firewood from island forests.

Likewise, Guzman works with the owners of private residences and a diving resort; often these owners are foreigners in Honduras. Regulations for the reserve mean that

***'Cayos,' continued on Page 6***

*Inside...*

# RESEARCH VISTAS

In Africa, Tropical Research Institute staff scientist Olga Linares says, modern cities are experiencing unprecedented growth in population and size. Influxes of rural, migrant people are rapidly altering the landscape of cities—Nairobi, Lusaka and Dakar, to name a few—on a continent that suffers periodic shortages of food.

In her latest research, supported by a Smithsonian Scholarly Studies grant, Linares poses a question about this phenomenon: Do migrant peoples, who often live in precarious settlements lacking adequate services, contribute to processes of environmental degradation and resource depletion?

That question and possible answers stem from a broad range of research by Linares. Studying rural peoples migrating to African cities is simply the latest outgrowth of a steady line of research by the noted anthropologist. For more than 30 years, among many other projects, she has spent time living among, and documenting in meticulous detail, the rice-cultivating Jola people of Casamance, Senegal.

During the course of this research, Linares has developed many new insights about how the lives of the Jola and other rural peoples have changed along with Africa's shifting climates, both economic and environmental. Around the world, her work has influenced the study of other subsistence farmers who enter the cash economy.

Linares' most recent book, *Power, Prayer and Production: The Jola People of Casamance, Senegal*, explores the reasons why land, labor and the technology of rice production are so different among Jola farming communities. Her book shows the ingeniousness and foresight of the Jola in exploiting their natural resources. Through the eyes of the Jola, Linares looks at the social and political causes of the present-day African food production crisis.

Disastrous droughts that began in the 1970s are weighing heavily on the Jola and other indigenous groups in Africa. "Thirty years ago, the granaries of the Jola overflowed," Linares says. "Today, no household is self-sufficient in terms of producing rice."

Panamanian-born Linares began her scientific career at Harvard University in 1964. She then taught at the University of Pennsylvania, in Philadelphia, and has held a variety of other positions focusing on Central American human ecology and archaeology and African social anthropology. In 1992, Linares was elected to the prestigious National Academy of Sciences in Washington, D.C. She has been a staff scientist at STRI since 1973.

As hard as she works, Linares points out that the Jola—in towns and rural communities—work even harder. "Farming for the Jola is work—and serious work," she says. "The Jola challenge one another to complete cultivation of parcels of land.... You have to stay in shape to keep up."

Linares worries that attachment to the land may be lost as more and more Jola migrate to larger cities and towns. For now, she says, migrant Jola are still farming. Migrant Jola, she says, practice "opportunistic" farming within and beyond town limits. They cultivate rice, millet and sorghum in fields surrounding the town, and they keep intensive household gardens to grow vegetables for sale in the markets.

As for the pressing question about the impact of the migrant Jola and other peoples on cities, Linares argues that such urban cultivation maintains, and increases, aspects of cultural and biological complexity. Unemployed household members have work, for example, and the labor encourages interethnic cooperation.

Biologically, Linares says, urban farming contributes such benefits as increasing ground coverage to prevent erosion, limiting built-up areas and maintaining green spaces, and providing a haven for many kinds of useful and often threatened species of birds, mammals and other animals.

*—William Schulz*

*A 19th-century pair of ice skates collected by George Brown Goode, now part of the Sport History Collection of the Smithsonian's National Museum of American History.*

*CULTURAL HISTORY*

# Sports collection pioneered new directions for Smithsonian mission

*By Vicki Moeser*
*Smithsonian Office of Public Affairs*

Sitting in her book-filled office adorned with a Victorian wooden ticket window at the National Museum of American History, Ellen Roney Hughes discusses her belief that all artifacts have meaning, including—and perhaps especially—sports artifacts. "My research area is in material culture, which is the use of artifacts in the study of history," she explains.

Hughes, a cultural historian in the museum's Division of Community Life, oversees a collection of about 3,000 mostly 19th- and 20th-century sports objects, ranging from a backyard badminton set to Arthur Ashe's tennis racket.

Included in this collection is an assortment of sports equipment acquired in the late 1800s by George Brown Goode, who worked at the Smithsonian from the early 1870s, first as a volunteer and eventually becoming the director of the U.S. National Museum (now Arts and Industries).

"Goode propelled the Smithsonian away from a purely scientific bent into the realm of popular education," Hughes says. "He invented strategies for museums to become lively educational forums, repositories for collections with universal appeal and monuments to American progress."

Discussing his strategies in 1884, Goode said the museum collector must "enter into every detail of human life, not only of the present but of the past, and is to be the custodian of the future. It [the collection] will show our great-great-grandchildren how their forefathers dressed, how they lived, cooked, and ate their food, how they amused themselves, and in 1992 will speak of the toys the children in 1892 played with."

Indeed, according to Hughes, Goode collected millions of artifacts for the Smithsonian, including amateur sporting equipment—ice and roller skates, bows and arrows, footballs, polo mallets and tennis rackets. The survivors of that original group of sporting goods, acquired for the National Museum in 1882, now reside in the Sport History Collection of the Museum of American History.

"Those goods expressed ideas, as do all material goods, which have changed since their acquisition," Hughes says. She seeks to uncover the meaning of the sports objects to Goode and his contemporaries.

"What did sport mean to the people who

***'Goode,' continued on Page 6***

Smithsonian Institution
*Research Reports*
*No. 81 Summer 1995*

Published quarterly by the Smithsonian Office of Public Affairs for Smithsonian Contributing Members, scholars, educators, museum personnel, libraries, journalists and others. Printed on recycled paper with soy ink.

# Exuberant design marked wallpaper patterns of the 1950s

*By John Barrat*
*Smithsonian Office of Public Affairs*

Cross a pineapple and a sea lion with a lemon, two chickens, some martinis and an electric coffeepot and what have you got? Thanksgiving in the tropics? Not quite. Try vintage 1955 American wallpaper, perfect for the rumpus-room wet bar.

A sample of this festive paper, with its baffling melange of images, is featured in a new exhibition, "From Kitsch to Corbusier: Wallpapers From the 1950s," at the Smithsonian's Cooper-Hewitt, National Design Museum in New York City. It is one of thousands of wallpaper designs from the 1950s that captured the fancy of Americans after World War II and that can now be found in the collections of the Cooper-Hewitt.

During the decade when Truman and Eisenhower were president, Elvis Presley was cutting his first records and the Soviet satellite Sputnik became front-page news, wallpaper was undergoing a quiet renaissance, the exhibition reveals. People papered their walls with playful images of French poodles, space stations, organic forms, television antennas, jazz musicians, sound waves, vegetables, prom corsages, abstract art and sports gear. Innovative new colors, motifs and patterns also came into vogue. Stylecraft, an American company, even marketed a line of paint-it-yourself scenic wallpaper to take advantage of the paint-by-number craze.

"It was a wonderful outpouring of expression in a quiet product," Joanne Warner, curator of wallcoverings for the Cooper-Hewitt, says. "I was amazed, while researching this exhibition, at the wealth of wallpaper designs that were produced during the 1950s. This decade was really the last time Americans bought, used and enjoyed wallpaper."

Since 1900, Cooper-Hewitt has been collecting historical and contemporary wallpaper designs and maintains a collection of more than 10,000 examples, dating from the 17th century to the present. It is the largest and most complete wallpaper collection in the United States.

*Wallpaper with cocktail paraphernalia ©1955 (Gift of Suzanne Lipschutz)*

Unlike most items designed for use at home—chairs, tables, lamps, dressers, drapes, carpets, dinnerware—"wallpaper is pure ornament. It is there to give pleasure. It has no other purpose," Warner explains.

The earliest wallpapers originated as a less-expensive alternative to wall textiles. In the late 19th century, Americans fell in love with wallpaper and began using quantities of it in their homes. Wallpaper was cheap and purchased directly from paper hangers. Because it was nonwashable and colors faded rapidly, people repapered every two to three years.

"Yet, when prewar paper patterns were trotted out again after World War II, they were regarded as stodgy and old-fashioned," Warner says. "A lot had changed in America since these patterns first appeared." After World War II, hundreds of thousands of new homes were being built for GIs and their families under the New Housing Act. Colors and patterns that had decorated homes before the war seemed dreary to new home owners. Wallpaper sales dropped, and wallpaper manufacrurers allowed designers more leeway to create new and distinctive designs.

"Designers began by blending traditional conventions and modern innovations," Warner says. One example in the exhibition is an ochre paper printed by Griffin-Sefton Inc. in 1954. It uses the traditional motif of a repeating landscape scene, yet the structures in the landscape are ranch-style California villas. "The California lifestyle symbolized the informality and indoor-outdoor living that appealed to Americans in the 1950s," Warner says.

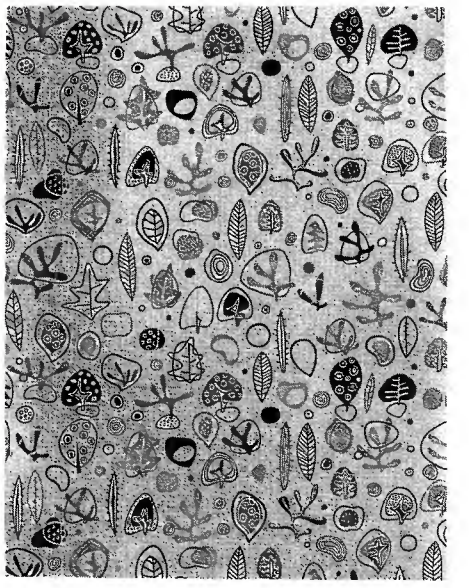
Technology also became a popular theme. By 1952, 19 million television sets were glowing in American homes. In 1951, Mildred Coughlin McNutt designed a red paper for Wall Trends Inc. that depicts broadcast antennas, spotlights, and scenes from televised sports and musical entertainment events. Intermingled with these images are gold swirling lines representing invisible broadcast beams reaching everywhere.

Wallpaper with patterns depicting sound waves, crystal structures, organic forms and animals revealed that designers were also being influenced by the growing importance of science in everyday life.

Manufacturers also redesigned papers to work with the floor plans of postwar homes and the new suburban lifestyle. Theme papers became popular for use in different rooms and even by different family members. Side by side in the Cooper-Hewitt exhibition are two "teen" papers—one for girls printed with prom corsages and engagement rings—and another for boys, showing activities such as football, skiing and studying.

A third paper for high-school students, "Teen Time," is patterned with images of teen-agers cruising the town in a hot rod, listening to records and swimming. For the kitchen, "Summer Stock" consists of line drawings of row upon row of vegetables on a yellow background. "Placing objects, utensils or food in well-ordered rows was a popular, decorative device used by wallpaper designers in the 1950s," Warner says.

In the den or workshop, "Hobby House" is a manly paper depicting a collection of guns and watches on a wood-panel background. "Doodle" consists of playful line-drawings of bathroom furniture—sink, tub, toilet, someone in a shower—that would have brightened up anyone's bathroom.



*Wallpaper with organic forms ©1955 (Gift of Kathleen Paton)*

Theme papers, also known as "conversationals," were often designed to spark up only one wall of a room to avoid the expense of papering all four walls, Warner says.

In researching the exhibition, Warner's work was cut out for her. There are very few resources available on the origin and design of wallpapers from this period. "Many of the papers donated to the museum by antique wallpaper dealers cannot be identified by manufacturer or the date they were printed," Warner says. "Most of the manufacturers from the 1950s are no longer with us, and their records and archives are lost. A great deal of information has fallen through the cracks."

Warner researched back issues of popular home magazines, such as Interiors, to find out about wallpaper styles and trends of the 1950s. These magazines occasionally ran articles featuring roundups of new wallpaper patterns. "I also conducted interviews with a number of people who worked in the wallpaper industry during the 1950s," she says.

In some cases, the influences are obvious. Wall murals featuring works of art by Joan Miró and other popular artists were available from one upscale wallpaper producer.

"Explorations by abstract artists—Dali, Picasso, Matisse, Miró and Calder—into new ways of ordering the world through fantasy, symbolism, abstraction, collage, dripping paint and the use of expressive brush strokes, also influenced 1950s wallpaper design, Warner says. "Boomerang and amoeba shapes, and the doodles and drips that decorated the furnishings of homes across America had their origins in the paintings and sculpture of avant-garde artists in this country and abroad."

After the 1950s, American homes experienced what designers call the "white-wall syndrome," which is still very strong today. "The way people used patterns in the 1950s is gone. When you mention patterns today, the average person no longer thinks of wallpaper." ■

# World's first photographs delivered dramatic impact

*By Peggy Langrall*
*Smithsonian Office of Public Affairs*

Imagine the world before photography. In America, prior to 1839, there were no photos of famous people and none of anyone's relatives. None. There were no scenic photos on postcards; no illustrations in newspapers or magazines, other than engravings; no pictures on the sides of public conveyances; and, of course, no moving pictures—as in film or video; such magic was undreamed of.

"You have to wipe your mind clean in order to fully realize the impact that daguerreotypes—the very first photographs in the world—had on people," says Merry Foresta, curator of "Secrets of the Dark Chamber: The Art of the American Daguerreotype," which opened June 30 at the Smithsonian's National Museum of American Art in Washington, D.C.

"What we are showing in the exhibition," Foresta says, "is no less than an original moment in time. Like ripples that form when a stone first drops into a pond, these first photographs unimaginably presaged the media glut we have today."

From the beginning, Americans enthusiastically accepted the "miraculous machine-like precision of the daguerreotype, with its wealth of information spread uniformly across the surface of the metal plate," Foresta writes in the catalog that accompanies the exhibition. To artist and inventor of the telegraph Samuel B.F. Morse, the daguerreotype possessed "an exquisite minuteness" that was more perfect than "the interiors of Rembrandt." Part art, part science and part craft, the invention was born of experiments in optics, chemistry and illusion originally performed by French inventor Louis-Jacques-Mandé Daguerre over many years. Daguerre's photographic process became public in France in August 1893, but with the arrival of his technical manuals on these shores in Seprember, thar year, Americans took to the daguerreotype like no one else.

"It was one of the great crazes of the 19th century," writes photography historian John Wood, in the exhibition catalog. "American photographers patented hundreds of devices and developed countless techniques, formulas and approaches to improve the process, and the American people put more money into it than any other nation did." Indeed, portrait daguerreotypes became so popular that one contemporary newspaper account declared that "ordinary greetings of the day" had been quickly replaced with the possibly portentous question, "Have you been taken yet?"

Technical modifications of the camera lens and the surface of the photographic plates speeded exposure times from some 20 minutes down to less than a minute by the early 1840s, Foresta says. Even though sitters had to hold completely still during the process, daguerreotype galleries with reception rooms and viewing salons attracted visitors and patrons in every major city and nearly every small town up until about 1860, when the Civil War began. Some daguerreotypists went into rural areas, doubling as tin peddlers. Their wagons served as daguerreotype salons, and they were as likely to exercise a talent for sharpening knives or selling pots and pans as their skill with the camera.

The majority of daguerreotypes were portraits, most of which were about 3 by 5 inches, or one-sixth of a photographic plate. They were charmingly boxed in hinged, cut-velvet cases, and the complexity of making the images themselves was largely unfathomed by most proud sitters. The magical process involved "semiprecious metals, dangerous chemical vapors, and the shifting combinations of light and atmosphere," Foresta says.

Whether images of people or localities, daguerreotypes today usually have a somewhat ghostly aspect and are hard to see. They have not been popular subjects for exhibitions over the course of many years. In her research, Foresta came across daguerreotypes entombed in boxes that had not been opened in decades. "Daguerreotypes are probably better researched by private owners than by museums and other institutions," she says. "I think the greatest amount of them will eventually be discovered in county historical societies, and I hope some representatives of those will see the show and come forward with examples of their own."

In order to find daguerreotypes for "The Dark Chamber," Foresta turned to the American Daguerreotype Society, which gave her leads not only to daguerreotype collections but also to collectors of literature on the subject of daguerreotypes. She studied contemporary literature on the subject in libraries and archives and also found primary documents, many of which had not been published in photographic history books, including articles by daguerreotypists themselves.

Many of these articles had to do with questions surrounding the new art, such as whether it was indeed creative art or whether it was merely mechanical imitation. Debate raged over the ways art would be affected by this new technology and to what degree. "And that is a question we are still wrestling with today," Foresta notes.

Some of America's finest daguerreotypists wrote about the process. The list includes Smithsonian Castle architect James Renwick, who experimented with the process; J. H. Fitzgibbon, well-known for his portraits of Native Americans; and John Whipple of Boston, one of the most innovative American photographers. Whipple's photographing of the trachea of a silkworm "sounds almost as amazing now as it must have in 1853," historian W ood notes.

In 19th-century America, there were two great areas of exploration—science and the western frontier. According to Wood, the daguerreotype was at the forefront of both. The desire of people in the East to know what the West actually looked like made the role of the daguerreotypist essential. Photographer Robert Vance's 300 whole-plate views of California—now all lost—created a sensation when they were exhibited back east in 1856. "These included panoramas of San Francisco and other towns, missions and their surroundings, views of Native Americans and their way of life, gold miners and also the places one saw while sailing to California—Valparaiso, Cuzco, Panama and Acapulco."

Another photographer, J. Wesley Jones, set out with his "artist troupe," as the newspapers had it, on an overland trip covering 8,000 miles. During his travels, Jones fought off Indians, the story goes, and was seriously wounded. Even though he had to be carried on a litter, he still continued to make daguerreotypes. When he finally returned East with his 1,500 plates, he engaged the finest artists he could find to make large paintings from the daguerreotypes, which he titled "The Pantoscope of California." The whereabouts of these works and the 1,500 daguerreotypes is now unknown.

What came to be considered a serious limitation of daguerreotypes was the fact that they could not be successfully produced in color. Photographer Levi Hill claimed in 1851 that he had invented natural-color daguerreotypes, but by 1856, when his process was finally published, he was generally considered to be a fraud. Respected daguerreotypist Marcus Root stated in his book *The Camera and the Pencil* that Hill's daguerreotypes were probably hand-colored and varnished. After examining one "under a strong magnifier," he concluded that it "proved to be only an ordinary [hand-]colored daguerreotype—the dry colored powder being undeniably and distinctly visible on the face and hair."

There was certainly no greater controversy in the daguerreotype community of the mid-19th century than this flap over Hill's color claim. "It even had serious economic ramifications," Wood notes. "Hill's 1851 announcement led to a major nationwide slump in the daguerreotype business because the public was eagerly awaiting the soon-to-be-available color process." In addition, for all the charms of daguerreotypy, "it remains the most complicated way of making pictures, so its eclipse was inevitable." ■

*"Hat on Chair, Portrait of Man in a Hat," by an unidentified artist, is part of "Secrets of the Dark Chamber: The Art of the American Daguerreotype," an exhibition at the Smithsonian's National Museum of American Art.*

# Listening allows Zoo scientist to understand animal behavior

*By Ana Acosta*
*Smithsonian Office of Public Affairs*

*National Zoo researcher Carlos Ruiz-Miranda (center) examines a snake that has swallowed a golden-lion tamarin in a Brazilian reserve. He is assisted by Dr. Andrew Baker from the Philadelphia Zoo and Brazilian graduate student Cecilia Kieruff. (Photo by Devra Kleiman)*

While the fictional Dr. Doolittle sought to "talk to the animals," National Zoo developmental ethologist and education specialist Carlos Ruiz-Miranda spends much of his time listening.

Working mostly with golden-lion tamarin infants, Ruiz-Miranda is studying how the environments in which animals are raised in affects their communications.

Golden-lion tamarins, a type of primate, are an endangered species. The National Zoo has been at the forefront of efforts to save golden-lion tamarins from extinction. To reach that goal, the Zoo orchestrates propagation of the monkeys within the global zoo community, then reintroduces family groups back into the wild in Brazil.

Golden-lion tamarins provide "a unique situation for research," Ruiz-Miranda says, because they are one of the few species for which scientists "have the opportunity not only to study wild animals but also to observe animals that are born and raised in zoos and then released in groups back into their natural environment."

Looking at infants is especially helpful as well, according to Ruiz-Miranda, because "golden-lion tamarin infants are loud and they vocalize often. Their vocalization rate is five to six times higher than that of the adults." Because their calls do not always get a response, they repeat them often. This is called tonic communication. The effects of a call carry over time and with repetition.

As the first study ever to compare vocalizations of captive and wild monkeys, Ruiz-Miranda hopes his research project will help researchers determine whether communication differences affect reintroduced monkeys' adaptation to life in the wild. The findings will help other Zoo scientists make adjustments to and gauge the success of the reintroduction program.

Ruiz-Miranda puts it a little more starkly: "We need to know if zoo-born, reintroduced monkeys have the skills to survive in the wild." The reintroduction program has been incredibly successful, he notes. Many of the reintroduced tamarins and their offspring have successfully reproduced. So far, the Zoo has returned 141 monkeys to the Poço das Antas Biological Reserve near Rio de Janeiro in Brazil.

Ruiz-Miranda's research addresses several specific questions: Do zoo-born animals lose vocalizations typical to the species? Do zoo-born, reintroduced and wild animals use the same calls? Do the monkeys use calls in the same contexts and with similar results?

The first step toward finding the answers is field research. Ruiz-Miranda spends between four and five months each year conducting research in Brazil, recording the vocalizations of both wild and zoo-born reintroduced golden-lion tamarins. He notes a monkey's behavior when it makes a particular sound, along with the animal's "microhabitat"—the physical surroundings in which the sound was made.

Ruiz-Miranda also notes such details as the presence of other tamarins, the disposition of the group (at rest or in transit) and the nature of group activity at the time (eating, foraging or defending their territory). His equipment includes a sturdy audio recorder and a microphone so sensitive that it sometimes picks up the sound of mosquitoes landing on its windscreen.

*Two tamarins pause as they exit an outdoor cage upon their reintroduction to the wild in the Poco das Antas Biological Reserve in Brazil. (Photo by James Dietz)*

Ruiz-Miranda also spends hundreds of hours recording the vocalizations of golden-lion tamarins while they are still at Zoo facilities. After all this gathering of sounds on audiotape, he then spends about half of his remaining work time transcribing the content of the tapes in notebooks, classifying the sounds as long calls, short calls, trills, clucks or rasps.

Graphs of the sounds are also derived using a real-time analyzer, a machine that "draws" sounds, noting the duration, energy and frequency of each. This and other customized computer equipment, "is the same technology the FBI employs for voice identification," Ruiz-Miranda says.

Calls of particular interest are saved to a computer disk. The information stored on disk can then be manipulated to compare vocalizations of golden-lion tamarins according to three major groupings: zoo-born/nonreintroduced, zoo-born/reintroduced and wild golden-lion tamarins. Ruiz-Miranda tries to correlate variations in sound with variations in behavior both between individual monkeys and between the groups.

Another part of the study involves playing the vocalizations back to tamarins, manipulating the structure and context of the call, to observe the animals' reactions. Although his research is not yet complete, Ruiz-Miranda has already arrived at some interesting and perhaps surprising results.

First, he soon realized in his fieldwork that zoo-born golden-lion tamarins are just as noisy as those born and raised in the wild. The zoo-born monkeys do not seem to "lose" vocalizations typical of the species. However, it also appears that zoo-born and wild tamarins communicate differently, or use specific calls in different contexts to accomplish distinct goals.

Some specific findings were counter-intuitive, Ruiz-Miranda says. For instance, zoo-born tamarin monkeys have little opportunity to travel long distances in groups because of the more confined spaces in which they live . Zoo-born tamarins would have little need for the vocalizations typically used in the wild to coordinate long- distance group movements. Surprisingly, Ruiz-Miranda found that monkeys in zoos used these calls just as often as wild monkeys. Now he is trying to determine the factors that elicit the use of these calls.

Other conclusions have been more expected. For instance, although vocalizations of zoo-born, reintroduced and wild golden-lion tamarins looked similar overall, the frequencies (pitches) were different between groups. Monkeys in zoos tended to have higher pitch calls while the wild-born tamarins tend to use lower-frequency vocalizations.

"High-pitch calls travel shorter distances than low-pitch calls," Ruiz-Miranda explains, "and captive golden-lion tamarins have less of a need to communicate over long distances because of their limited habitat."

As for the reintroduced golden-lion tamarins, preliminary analysis seems to indicate that they use calls more like their captive relatives, although it remains unclear whether they are able to adapt their communications to the wild. Moreover, Ruiz-Miranda wants to determine whether the infants of reintroduced monkeys communicate more like their parents or like other wild-born tamarins.

While Ruiz-Miranda's research is important for increasing our knowledge about animal communication in general, he says it also has "signific ant repercussions for wildlife management." His research may help many other scientists better understand whether reintroduction is a viable long-term option in the struggle to save endangered species. ■

*'Cayos,' continued from Page 1*

improvements or additions to their facilities must meet strict criteria and may only be carried out with proper permits from the Honduran government.

"We lead by example," Guzman says. "All of the regulations that govern resort or vacation-home owners govern the research facilities, too. We were the first group in Cayos Cochinos to write an environmental impact statement for a new building, which is required by law."

From cursory studies, Guzman, a coral-reef expert, has established that the reef system of Cayos Cochinos is n ot yet experiencing any extreme stress. In the recent past, he says, it has been devastated by powerful hurricanes, such as Hurricane Fifi in 1974, and it was also affected by the mysterious "coral-bleaching" phenomenon in the Caribbean in 1987 when, suddenly, massive areas of coral reef began to lose natural coloration and die.

But the health of the Cayos Cochinos reef system is something of an exception. Worldwide, Guzman says, "there is a crisis with coral reefs." Poisoned by pollution, suffocated by sedimentation from mainland deforestation and recklessly mined for minerals or for trinkets in curio shops, coral reefs are being destroyed just as biologists are beginning to appreciate their complexity and overall contributions to the environmental health of the planet. "New or extra stresses on many reef systems can mean disaster," he says.

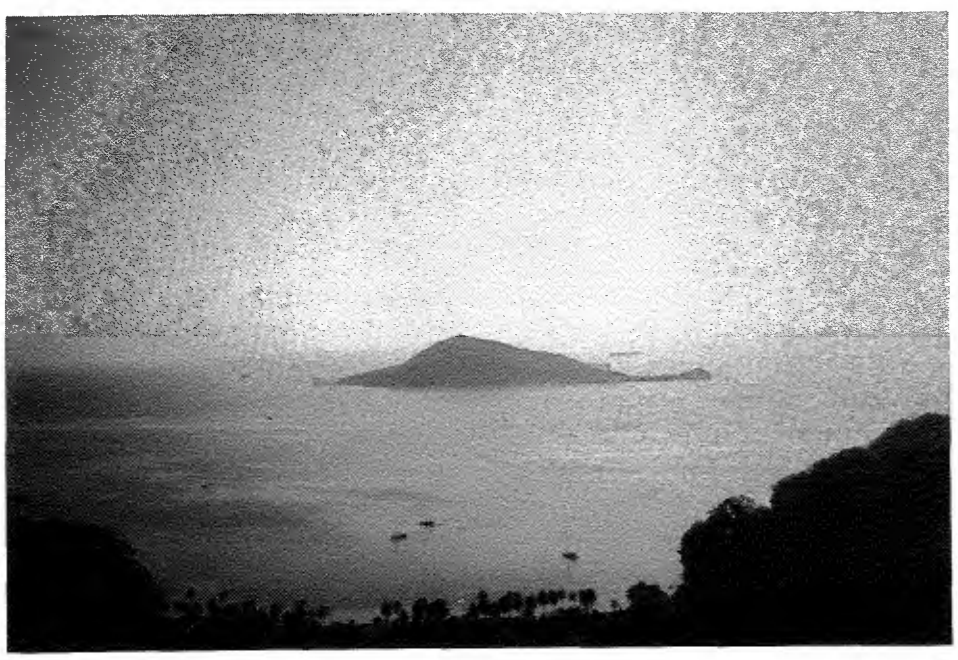
That the marine environment of Cayos Cochinos is relatively untouched, Guzman says, provides powerful reasons to insure its survival. Properly managed, the reserve in Cayos Cochinos can serve the needs of local people while also contributing to biological knowledge. "The biodiversity of Cayos Cochinos is representative of the entire Caribbean," he says. "It is unique, however, because people haven't screwed it up—with the exception of overfishing, there has not been a heavy and direct human impact in this area."

Among the studies scientists will pursue, Guzman says, are important investigations of coral larvae—for instance, how larvae move about in oc ean currents and how they come to be "recruited" on established reef systems. The dispersal of marine life poses other questions, he adds. "Do marine species stay in the reserve? Can we keep genetic stocks of marine species within this reef system or is the reef part of a wider system in this region of the Caribbean?"

One immediate priority, Guzman says, is to survey all of the marine life in Cayos Cochinos and find out what species fisherman are taking and from where. In the future, he adds, the ban on fishing some species might be lifted. Other areas where people fish might be restricted, perhaps on a rotating basis. Whatever the decisions, Guzman says, reliable scientific data will be the guide; maintaining fishing as a source of income and food will be a priority goal.

The opening of the new research station earlier this year coincided with the first Smithsonian-sponsored research expedition to Cayos Cochinos. A team of scientists aboard the STRI research vessel Urraca journeyed to the archipelago from Panama.

In Cayos Cochinos, the scientific team, including researchers from the Universidad Nacional Autonoma de Honduras, carried out a variety of studies aimed at better understanding the area's natural resources. The expedition, Guzman says, should result in a more complete picture of the kinds of research opportunities that exist for scientists in several disciplines. For the people of Cayos Cochinos, especially the Garifuna, the expedition is the beginning of a new prosperity, one based on protecting the rich and renewable resources of the sea. ■



*The Smithsonian Tropical Research Institute helped open a new marine station on this island in Honduras' Cayos Cochinos (Hog Islands) archipelago. (Photo by William Schulz)*

---

*'Goode,' continued from Page 2*

shaped American institutions and how did they communicate their vision?" Hughes asks.

Few have had Goode's sweeping influence in the museum world. A descendant of an old Virginia family, Brown Goode (as his friends called him) was born in New Albany, Ind., in 1851. A colleague described him as "a young man of scholarly appearance, winning manners, and a very enthusiastic student of fishes."

Goode attended Wesleyan University in Middletown, Conn., graduating in 1870 at age 19. Returning after a year of graduate work at Harvard, he taught at Wesleyan and curated its museum until 1877. An introduction to the Smithsonian's Professor

*George Brown Goode, who, in the 19th century, propelled the Smithsonian Institution into the realm of popular education*

Spencer Baird in 1872 began a close friendship and mentor relationship.

This was a turning point in Goode's life. He joined the Smithsonian as assistant curator in ichthyology and went to live with Secretary Joseph Henry, his family and other curators in the Castle. In 1887, he became assistant sectetary of the Smithsonian in charge of the National Museum. He died in 1896—at the age of 45—at his home in Washington, D.C. In an obituary, Science magazine hailed Goode as "one of the ablest and best men in America."

"The American trend toward sport and physical culture began around the time Goode was born in the 1850s," Hughes says. "They had become a full-blown national passion by the time he died."

Gymnastics, rowing, skating, body-building and cycling had all enjoyed waves of popularity, Hughes adds. New outdoor leisure activities were supported by concerns of health, masculinity and morality.

It was during the late 19th century, Hughes points out, that the production of goods shifted away from the home. "The national culture idealized the purchase of mass-produced commodities. Sporting goods became a significant industry. "

World expositions were intricately connected to the emerging consumer society in the second half of the 19th century, Hughes says. "The Smithsonian Institution enthusiastically participated in the new ceremony of American life—museums, consumerism and sport intersected at the monumental world fairs."

In 1875, Baird asked Goode to organize the Smithsonian's display at the Centennial Exposition in Philadelphia. Although other agencies shared the Government Building, the Smithsonian's display took up more than 40 per cent of the space.

"Goode's success at the Centennial exhibition had a dramatic effect on the history of the Smithsonian," Hughes says. "When it was over, 42 freight cars brought from Philadelphia to Washington varied objects from the exhibition donated by exhibitors. These formed the core collections of the National Museum."

Goode traveled the world pursuing objects to fill his halls. Through a series of letters to his agent in New York , Goode acquired objects of everyday life, including sporting goods.

On May 26, 1882, the Peck & Snyder Co. of New York sent a package to Goode with more than 35 pieces of new sports and entertainment equipment. "These artifacts related to sports and recreations popular with a wide range of American men and women in the 1880s: archery, roller skating, football, polo, lacrosse, lawn tennis, ice skating and gymnastics."

Hughes adds that fencing, baseball, cricket, boxing and cockfighting objects also arrived but have since disappeared.

"Peck & Snyder sold its goods directly and through the new department stores where Americans were just beginning to shop," she says. "In 1886, the company published its first catalog. By material cultural analysis of these artifacts, along with the catalog descriptions and historical context, we can uncover the meaning of these objects to Goode and his contemporaries."

The Peck & Snyder nickel-plated American Club ice skates attached to shoes by adjustable heel and toe clamps. They sold for $7 and included a handsome leather case lined in red satin. "The club skate was a commercial manifestation of the skating craze of the 1860s, in which women, for the first time, took up an active outdoor sport on a mass scale," Hughes says.

"While the club skate traded on its upper-class name, it was bought and used to such an extent that ice skating has been called by some the first modern socially equal sport in America."

Two pairs of roller skates were also sent to the museum. The wood, brass and leather skates cost $1.25 a pair. "Roller skating never enjoyed the social cachet that other sport enjoyed," Hughes found, "partly because the opportunities for competition never developed, and partly because it was eclipsed by the more graceful ice skating."

The historic artifacts Hughes has researched have additional significance because they survived in the collections of the Museum of American History. She discovered that about a third of the original sports-equipment collection was given away in the 1940s; another third just "disappeared" over time.

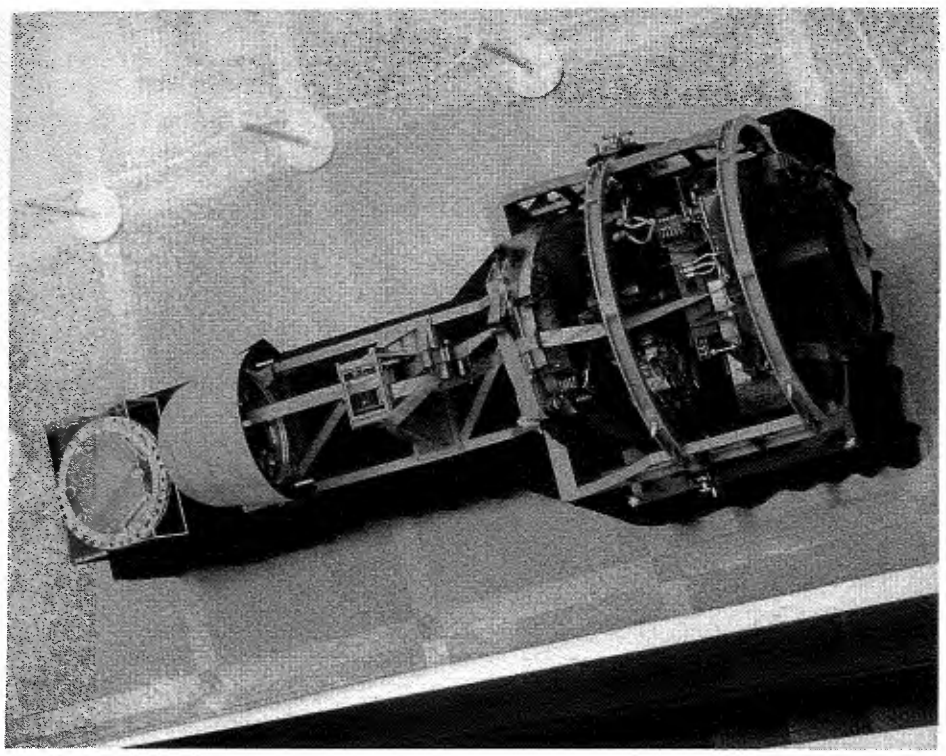
This equipment, Hughes says, represents a very particular aspect of sport history—modern, commercial amateur athletics. Left out were homemade and other alternative sport forms.

"Just like the sporting equipment in the Peck & Snyder collection enabled and constrained sporting practices of the 1880s," Hughes says, "it now enables and constrains our material culture research and our interpretive exhibitions of the present. It is essential that we become conscious of our biases and those inherent in our collections." ■

## RESEARCH HIGHLIGHTS

**150th Anniversary**. In 1996, the Smithsonian Institution will celebrate its 150th anniversary with a traveling exhibition of more than 150 treasures from Smithsonian museums. "America's Smithsonian" will be booked at convention and civic centers around the nation for an average of six weeks each. A series of lectures, seminars, workshops, discussions and debates on research at the institution will accompany

*'Highlights,' continued on Page 7*



*Discoverer, launched in 1960 as the world's first spy satellite, is shown here on display at the Centeral Intelligence Agency in Langley, Va.*

***'Highlights,' continued from Page 6***

the exhibition, which will be seen by an estimated 8 million to 10 million people.

**Invention and innovation.** In May, the National Museum of American History received a gift of $10.4 million from American inventor Jerome Lemelson and his wife, Dorothy, to establish The Jerome and Dorothy Lemelson Center for the Study of Invention and Innovation. The new center will document, interpret and distribute information on the heritage of American invention and strive to create an active program that inspires young Americans to pursue careers in invention and innovation.

**World Wide Web.** The Smithsonian entered cyberspace in May with the opening of its own home page on the World Wide Web. This presentation of the Institution's sites, people and resources offers more than 1,500 electronic pages, hundreds of photogtaphs, and overviews in Spanish, French and German at the click of a button. The Smithsonian's home page address is: **http://www.si.edu.**

**Government and art.** This fall, the Smithsonian's Archives of American Art will publish a guide for researchers to nearly 800 collections and interviews in its holdings, which document the close relationship between government and art in the United States. Especially well-documented are various government projects begun during the Depression and lasting into World War II. A copy of the guide will be available for $10 from Archives of American Art, Room 331 MRC 216, Washington, D.C. 20560.

**Sioux repatriation.** In March, the National Museum of Natural History returned the human remains of 14 Yankton and Yanktonai Sioux Indians to representatives of the Devils Lake Sioux and Yankton Sioux Tribes of the Dakotas. Evidence assembled by the museum's Repatriation Office supported identification of the remains, which were housed in the museum's anthropology collections.

**Guidelines response.** Response has been overwhelming to the Winter 1995 Smithsonian Research Reports article "Scientists Revise Guidelines for Museum Climate Control," which outlined the work of Conservation Analytical Laboratory researchers Marion Mecklenburg, Charles Tumosa, David Erhardt and Mark McCormick-Goodhart. Since publication, the Conservation Analytical Laboratory has received requests for the new climate control guidelines from more than 50 cultural organizations in the United States and from as far away as Nigeria, Australia and Hungary. Mecklenburg, Tumosa, Erhardt and McCormick-Goodhart have also been asked to give papers at a number of conferences focusing on materials conservation.

**Classroom science.** "Soils," a new hands-on, science-education kit developed for elementary-school students by the National Science Resources Center, has been successfully tested and is now available for classroom use. "Soils" is part of the NSRC's Life and Earth Sciences curriculum for students in second grade and involves experiments in composting, discovering different components of soils, root development of plants grown in different soils, and insects and larvae that live in soils. The kit is available from Carolina Biological Supply Co., 2700 York Road, Burlington, N.C. 27215.

**Household inventions.** A study of U.S. patent applications for household inventions in the 19th century may lead to a better understanding of domestic life and customs in Victorian America. Rodris Roth, curator of domestic life in the Smithsonian's National Museum of American History, is working on a series of illustrated checklists of U.S. patent models for household objects—chairs, stools, washboards—in the museum's collections, as well as an interpretive essay focusing on concerns and problems of 19th-century homemakers.

**Mathew Brady.** Research is under way by National Portrait Gallery Curator Mary Panzer for a 1997 exhibition devoted to Mathew Brady, the most famous American photographer of the 19th century. The exhibition will draw upon Brady images in the collections of the Portrait Gallery, the Library of Congress, the National Archives and Harvard University, as well as information from Brady's publications, illustrations, client records and lawsuits generated during his career.

**Ancient rubber.** Variations in the crystal structure of ancient rubber artifacts is helping materials scientists predict how modern rubber products—particularly the rubber parts of space suits—may deteriorate over time. Because the slow crystallization that occurs in rubber over time cannot be simulated, polymer chemist Mary Baker of the Conservation Analytical Laboratory is examining several-hundred-year-old samples of Mexican and Southwest American rubber used in Native American artifacts. Initial results indicate the crystal structure of ancient rubber may hold clues to the temperatures the rubber has been exposed to over the centuries.

**Maya ceramics.** A research project on Mayan pottery, headed by Conservation Analytical Laboratory scientist Ronald Bishop, seeks to pinpoint the location of workshops where these ornate vessels were created. Incorporating the fields of art history, epigraphy, and archaeology with nuclear chemistry and statistical analysis, researchers are combining data on the technical and aesthetic achievements of the Maya with information on societal changes prior to the collapse of Maya civilization. They hope to determine the geographic origins of the various styles of Mayan polychrome pottery.

**Spy satellite.** In April, the National Air and Space Museum added to its collections a model of Discoverer, the world's first spy satellite, given to the museum by the U.S. Central Intelligence Agency. First launched in 1960 under the CIA codename Project Corona, this satellite and its successors shot 855,000 photographs of Earth between 1960 and 1972. Discoverer insured early warning of a Soviet nuclear attack for a significant portion of the Cold War.

**Cryopreservation of fish.** National Zoo researchers Mary Hagedorn, David Wildt and William Rall are using magnetic resonance micro-imaging to examine ways that the eggs of fish can be preserved through cryopreservation. Fish spermatozoa can be frozen successfully, but cryopreservation of fish eggs has rarely been successful. This research may help scientists develop cryopreservation techniques for preserving the eggs of birds, reptiles and amphibians.

## SERIES PUBLICATIONS

The following publications on research in various fields were issued during the period Feb. 1 through April 30, 1995, by the Smithsonian Institution Press in the regular Smithsonian series. Diane Tyler is supervisory editor. Requests for series publications should be addressed to SI Press, Series Section, 470 L'Enfant Plaza, Suite 7100 MRC 950, Washington, D.C. 20560.

**Smithsonian Contributions to Zoology**

- 555 *The Functional Morphology of Male Cerci and Associated Characters in 13 Species of Tropical Earwigs (Dermaptera: Forficulidae, Labiidae, Carcinophoridae, Phygidicranidae),* by R. Daniel Briceno and William Eberhard, 63 pages, 98 figures, 1 table.

- 559 *The Intermuscular Bones and Ligaments of Teleostean Fishes,* by Colin Patterson and G. David Johnson, 85 pages, 16 figures, 2 plates, 8 tables.

- 562 *Ostracoda (Myodocopina) of the SE Australian Continental Slope, Part 2,* by Louis S. Kornicker, 97 pages, 54 figures.

- 568 *Ostracoda (Halocypridina, Cladocopina) from the Anchialine Lava Tube in Lanzarote, Canary Islands,* by Louis S. Kornicker and Thomas M. Iliffe, 32 pages 16 figures, 1 table.

- 569 Pycnogonida of the Western Pacific Islands, XI: Collections from the Aleutians and Other Bering Sea Islands, Alaska, by C. Allan Child, 30 pages, 10 figures.

- 570 *A Review of the Hermit Crabs of the Genus* Xylopagurus *A. Milne Edwards, 1880 (Crustacea: Decapoda: Paguridae), Including Descriptions of Two New Species,* by Rafael Lemaitre, 27 pages, 17 figures.

- 571 *Monophyly and Phylogenetic Diagnosis of the Family Cetopsidae, with Synonymization of the Helogenidae (Teleostei, Siluriformes),* by Mario C.C. de Pinna and Richard Vari, 26 pages, 20 figures.

- 572 *Catalog of the Type Specimens of Seastars (Echinodermata: Asteroidea) in the National Museum of Natural History, Smithsonian Institution,* by Cynthia Gust Ahearn, 59 pages.

## BOOKS & RECORDINGS

**Public Culture in the Early Republic: Peale's Museum and Its Audience,** by David R. Brigham (Smithsonian Institution Press, 1995, $39). Study of the influence of the museum in early American cultural life based on the Philadelphia museum of Charles Willson Peale.

**Roscoe Turner: Aviation's Master Showman** by Carroll V. Glines (Smithsonian Institution Press, 1995, $29.95). Biography of an aerial showman, risk-taker and tireless self-promoter, who focused America's attention on aviation in the early 1900s. From the Smithsonian History of Aviation Series.

**Remembering the Maine,** by Peggy and Harold Samuels (Smithsonian Institution Press, 1995, $29.95). Controversial evidence, political impediments and faulty studies surrounding investigations of the 1898 explosion of the U.S. battleship Maine in Cuba.

***'Books,' continued on Page 8***

*'Books,' continued from Page 7*

**The Wealth of Oceans: Environment and Development on Our Ocean Planet**, by Michael Weber and Judith Gradwohl (W.W. Norton and Co., 1995, $25) Oceanography and marine ecology in the context of global economy and human population growth. Available from W.W. Norton, c/o National Book Co., 800 Keystone Industrial Park, Scranton, Pa. 18512. To order by phone, call 1(800) 233-4830. Shipping and handling fees vary by state.

**The Civil War in Popular Culture**, by Jim Cullen (Smithsonian Institution Press, 1995, $29.95) Popular renderings of the Civil War—from books and films to songs and drama—and how they represent various truths about the war.

**Fighter Pilot's Heaven: Flight Testing the Early Jets**, by Donald S. Lopez (Smithsonian Institution Press, 1995, $24.95). Dramatic inside story of the American military's transition into the Jet Age.

**Dream Songs and Healing Sounds in the Rainforests of Malaysia**, recorded, compiled and annoatated by Marina Roseman (Smithsonian/Folkways Recordings, 1995, $14 CD; $8.50 cassette). Songs and chants by the Temair people of the Malaysian rainforest.

**Musical Traditions of Portugal** (Smithsonian/Folkways Recordings, 1995, $14 CD; $8.50 cassette). Dances, songs and instrumental music from this small country with a rich heritage of musical styles. A 76-page booklet, written in both English and Portuguese, is included. From the Traditional Music of the World series.

Books published by Smithsonian Institution Press can be ordered from Department 900, Blue Ridge Summit, Pa. 17214-0900. To order by phone or for more information, call 1 (800) 782-4612. There is a $2.25 postage and handling fee for the first book ordered and $1 for each additional book.

Smithsonian/Folkways Recordings can be ordered by writing to Smithsonian/Folkways Recordings, 414 Hungerford Drive, Suite 444, Rockville, Md. 20850. To order by phone or for more information, call (301) 443-2314. There is a $2 fee for shipping and handling for the first recording ordered and 50 cents for each additional recording.

# *Off the Shelf*

## Ocean Planet: Writings and Images of the Sea

*Original text by Peter Benchley, edited by Judith Gradwohl (Harry N. Abrams Inc., Publishers, and Times Mirror Magazines Inc., in association with the Smithsonian Institution, 1995, $39.95 cloth, $19.95 paper)*

The first page of *Ocean Planet: Writings and Images of the Sea*, a new book published in conjunction with the National Museum of Natural History "Ocean Planet" exhibition, features a photograph of a U.S. Coast Guard life ring. It suggests some of the many facets of human relationships with the world's oceans, as well as the need to save oceans from humankind's often destructive and taxing burden.

In this full-color, 192-page book, these themes are realized with a mix of writings and photographs. As author Peter Benchley and editor Judith Gradwohl state in the introduction to *Ocean Planet*, "No matter who we are, no matter where we live or how we make a living, the oceans touch all of our lives. They sustain us, nourish us, inspire us." *Ocean Planet* evokes "the experiences of people whose lives have been deeply engaged by the sea."

The four major sections of *Ocean Planet*—"Visions of the Sea," "Seafarers," "Discovery" and "Oceans in Peril"—contain reflections on the sea by such renowned authors as Joseph Conrad and Kenneth Grahame, as well as scientific and historical writings by Benjamin Franklin and naturalist William Beebe.


*The U.S. Coast Guard inspects a fishing net.*

"Visions of the Sea" sets the tone for the rest of the book by showing how, through history, writers, scientists and others have revered—and even feared—the sea.

"Healthy oceans have intrinsic values that cannot be measured with economic and scientific yardsticks," says Gradwohl, who is curator of the "Ocean Planet" exhibition. "In 'Visions,' we show the oceans as a source of artistic and spiritual inspiration," she adds.

The book progresses with sections that reflect how modern, everyday lives are affected by our world's oceans. The overall message, Gradwohl says, is that we all depend on the health of the oceans, and our actions on land affect this health.

Photographs in "Seafarers" reflect a hard day's work, as fishermen struggle to catch enough to make a living. Issues such as fishing regulation and over-fishing, as well as the dangers of the profession—commercial fishing is the singlemost dangerous profession in the country—are addressed. A portion of the journal of Ann Davison, who crossed the Atlantic from England to Antigua to become the first woman to cross an ocean alone, is also included and details her life during her journey.

"Discovery" focuses on issues of scientific discovery and relates the fact that scientists have barely scratched the surface in unlocking the mysteries of our world's oceans. The section features an essay by William Beebe, who traveled a half-mile under the ocean's surface in 1934 in the Bathysphere, the world's first submersible, as well as writings by Jacques-Yves Cousteau and Frédéric Dumas on Cousteau's first trip underwater using the Aqualung—a precursor to scuba.

In "Oceans in Peril," the results of overfishing, pollution and deforestation are discussed. In addition to historical accounts of the once-plentiful fish in U.S. waters, essays are presented on pollution in different areas and what some people have done to help.

While "Oceans in Peril" shows how years of neglect are taking their toll, the book also suggests ways in which people can make a difference—such as using fewer pesticides and recycling motor oil and antifreeze.

As Benchley writes in his final essay, some measures have been taken to preserve our waters and the creatures in them. "To be successful, however, more and more of us will have to change our attitude toward the sea, away from our sense of species superiority and our conviction that every living thing on the planet exists solely to satisfy our caprices, wants and needs, and toward an appreciation of the commonweal and of the unity and mutual dependence inherent in nature's design."

The "Ocean Planet" exhibition will be on view at the National Museum of Natural History through Jan. 2, 1996, and will travel to 11 cities under the auspices of the Smithsonian Institution Traveling Exhibition Service.—*Holly Hammett*

*Note: This summer, James Smithson Society members and Patron-level members will receive* Ocean Planet *as a benefit.*

Smithsonian Institution
Office of Public Affairs
A&I 2410 MRC 421
Washington, D.C. 20560

Official Business

Penalty for Private Use $300

BULK RATE
POSTAGE & FEES PAID
SMITHSONIAN INSTITUTION
G-94

Smithsonian Institution
*Research Reports*

*No. 81 Summer 1995*