

# Research Reports

TRANSPORTATION HISTORY

## A new book on motor homes follows the route of these recreational vehicles

By Brenda Kean Tabor  
Special to Research Reports

**D**uring correspondent Charles Kuralt's career broadcasting "On the Road" segments for CBS News, CBS leased or purchased for him two Travco motor homes, two Cortez motor homes, a Revcon motor home and a Farm Machinery Corp. Motor Coach with a big desk. Kuralt wrote television and radio scripts on "the Bus," as he called those vehicles, but slept in motels and ate in restaurants on the road.

John Steinbeck, who traveled across America in a truck camper in 1960 and wrote about it in *Travels With Charley: In Search of America*, wrote to his wife that "talking with people is easy because everyone loves the truck.... Everyone wants to see the inside of the truck."

These are two of many anecdotes to be found in *Home on the Road: The Motor Home in America*, a new Smithsonian Insti-



Roger White, with a copy of his book, leans from the door of a 1934 Trav-L-Coach house trailer in the National Museum of American History collection. (Photo by Jeff Tinsley)

tion Press book written by Roger White, transportation specialist at the National Museum of American History.

White's specialty is the history of motor vehicles, their design, manufacture and use, with a particular focus on leisure travel. In 1985, he curated an exhibition about vacation travel that included recre-

ation vehicles, autocamping, motels and sightseeing attractions.

"I amassed a lot of information about motor homes and trailers and considered writing an exhibition catalog," White says. "Instead, I decided to write a comprehensive history about motor homes that would bridge the gap between 1920s house-cars and 1960s Winnebago-style motor homes."

*Home on the Road* offers up an interstate's worth of information. Together with museum volunteer Peter Koltnow, who was once president of the Highway Users Federation, White amassed or examined 125 oral histories and closely traced 75 house-car owners—individuals who were located with the help of the *Reader's Guide to Periodical Literature* and diligent research.

Journals such as *Sunset*, *Popular Mechanics*, *MotorHome Life*, and *Motor Camper* and *Tourist* provided White with leads to census records and city directories. By putting together this jigsaw puzzle of data, White learned a great deal about motor campers and the people who owned them.

### The history of motor homes

Today the words "motor home" conjure up images of huge Winnebagos floating smoothly down four-lane highways. But motor homes have gone through many metamorphoses in the last century, from customized adaptations of the Ford Model T chassis to the comfortably furnished Blue Bird Wanderlodge featured at the close of White's book.

It all began with "the cycling craze of the 1880s and 1890s, when people discovered the novelty and thrill of controlling their transportation and seeing the countryside without depending on the fixed routes or staccato rhythms of passenger



Roland and Mary Conklin of Huntington, N.Y., made house-car travel a family experience. Their bus factory built the Gypsy Van, shown above, and in the summer of 1915, the Conklin family set out to see America. (Photo courtesy of the Huntington Historical Society)

trains and trolleys," White writes in *Home on the Road*.

"When automobiles became available in the early 20th century," he continues, "more couples and families began to explore rural and wilderness areas as a pleasure activity in their cars. They used the automobile as a buffer, transferring the sophisticated furnishings, technological systems and daily routines of home to the healthful attractions, scenic splendors and deprivations of the outdoors."

The motor home is very much a grass-roots invention, having been created in the late 1910s "by motorists, not by manufacturers," White points out. In the 1920s, motorists "readily adapted their own vehicles and made house-cars for the fun of it," expanding the enormous popularity of autocamping. "Many of these vacationers were enthusiastic tinkerers who were mechanics, worked in auto factories, or ran body shops or campgrounds," he adds.

The wealthy, on the other hand, had customized house-cars built for them. Some of these house-cars, like Roland and Mary Conklin's 1915 Gypsy Van, had a homelike interior that was "similar to their mansion, which was styled after English manor houses," White says. In the mid-1920s, Will Keith Kellogg, of Kellogg's

Corn Flakes fame, had a buslike house-car designed for him that resembled a private railroad car.

### Autocamping

In the first two decades of the 20th century, autocamping was often hazardous, and its enthusiasts were intrepid adventurers. In the early 1910s, most roads were primitive, especially in the West. Motorists often found themselves "fording streams much the way travelers did with horses and wagons," White writes.

Autocamping enthusiasm grew during the 1920s, when "federal and state governments sponsored numerous improvements in highway grading, alignment, surfacing, bridges and signage," according to White. During the Depression, roadside camping became associated with Hoovervilles—shelters erected by the homeless and itinerant—and autocamping diminished.

### A changing industry

A trailer industry emerged in the 1930s, and revived in the late 1940s through the 1950s, when recreation vehicles with the "tight handling and responsiveness of the family car" emerged, White says. While

*'Motor homes,' continued on Page 6*



**Distinguished Research Lecture** ■ *The first annual Secretary's Distinguished Research Lecture was held in April at the National Museum of American History. Margaret Geller, senior scientist at the Smithsonian Astrophysical Observatory in Cambridge, Mass., and professor of astronomy at Harvard University, delivered the first lecture. This column is excerpted from remarks made by Smithsonian Secretary Lawrence M. Small prior to Geller's lecture.*

I am delighted to welcome you to the first in a series of annual lectures that will honor the practice of research at the Smithsonian by honoring our best practicing researchers, individuals who have made exceptional contributions to a field of knowledge throughout careers of sustained excellence.

The lectures will be occasions to affirm publicly the Institution's commitment to fundamental inquiry in the sciences, the humanities and the arts. And as they grow in number over the years, they will stand as a substantial body of testimony to the breadth of Smithsonian research and the quality of Smithsonian researchers, of whom there are currently 650 in some 34 fields of the sciences, art, history, anthropology and material culture.

Since arriving at the Smithsonian not quite three months ago, I have been pondering the question: Why do we do research at the Smithsonian? It is obvious, of course, that research was part of the original mandate for the Institution. In fact, Joseph Henry [the Institution's first Secretary] wanted the Smithsonian to be primarily a center for research, a "college of discoverers." He equipped the Castle with five lecture halls, numerous laboratories and a library—rare scientific research facilities at the time.

He established processes for sharing scientific knowledge, within the United States and internationally, and he initiated publication of the series Smithsonian Contributions to Knowledge. But he was reluctant to accept the role Congress designated for the Institution: to be steward of the nation's collections of scientific and historical objects.

And yet, what were all those objects then, and what have they been over the intervening century and a half but a stimulus to more research? They are the first things we need to know about, though by no means the only things. And sometimes, we need to learn about them all over again, because each new generation approaches them with new questions.

So it strikes me as one reason we do research at the Smithsonian is that without it we would be a mere storehouse—immense but lifeless. Our role is not just to store, or even to display. It is to identify and explain and make connections. It is to impose order on collections and to find order in the natural world. And in the course of doing all that, our role is to stir the curiosity that asks for better explanations, more persuasive connections and more cogent schemes of order. Research grounds the authority of the largest display and the integrity of the smallest label.

And the more I talk to researchers at the Smithsonian, the more obvious it becomes that we do research simply because human beings are fundamentally curious. They want explanations. They want to know about themselves, about others, about the world they can see and about worlds they cannot see, and they want to know all the particulars. So we do research because it is the human thing to do.

And the process of research becomes more fully human when the knowledge is shared and is made a contribution to the common store of knowledge. At the Smithsonian, we have a special obligation to explain what we are doing, to bring the public along with us, to communicate the importance and the consequences of our work.

And finally, I have come to realize it is important for us to do research at the Smithsonian because it keeps the enterprise vital, keeps us from showing our age. It perpetually re-creates the Institution. Research is the base that supports the building. There is no lasting structure without it.



This set of 65 bronze bells, found in the tomb of Marquis Yi of Zeng, is considered too precious to leave China. A smaller, similar set of 36 bells from an adjacent tomb is in the exhibition "Music in the Age of Confucius" at the Arthur M. Sackler Gallery. (Photo by John Tsantes)

MUSIC HISTORY

## A set of bells unearthed in China is the oldest existing musical assemblage

By Brenda Kean Tabor  
Special to Research Reports

In 1977, troops from the Chinese People's Liberation Army were sent to the remote Yangtze River Valley in central China to level a hill near the town of Leigudun for a new factory. After removing the initial layers of dirt, they uncovered stones that clearly had been deliberately laid down. Archaeologists were called in, and they methodically set about uncovering an extraordinary Bronze Age tomb dating to around 433 B.C. It belonged to a previously unknown local lord named Marquis Yi of Zeng.

Jenny So, a curator at the Smithsonian's Arthur M. Sackler Gallery, likens this find to the earlier 20th-century discovery of King Tutankhamen's tomb in Egypt. The uncovering of the Marquis Yi tomb at the dawn of a period of renewed interest in scholarly pursuits in China, as well as a reopening of China to the West, was fortuitous timing.

One happy result is the Sackler Gallery's exhibition "Music in the Age of Confucius," which was curated by So and includes bells, zithers, drums, flutes and panpipes from the tomb of Marquis Yi. In the exhibition, visitors can see and hear the sounds of 2,500-year-old Bronze Age instruments that "constitute the oldest musical assemblage surviving from any culture," So says.

Almost as remarkable as the instruments themselves is the story of their discovery, which is dramatically documented in the exhibition in video excerpts from a recent television program produced by the Discovery Channel.

### Discovery of the bells

The flooded, muddy, timber-lined burial pit the Chinese archaeologists exposed was roughly 69 feet by 52 feet and divided into four distinct chambers. There they found two complete sets of musical instruments, as well as armaments, the bones of a middle-aged man lying within two nested

coffins and the skeletons of 21 young women who appeared to have been sacrificed.

On one bell, which is among a set of 65 bells found in the largest chamber, is an inscription indicating that it had been presented on the occasion of the death of the man within the coffins—Marquis Yi of Zeng. Marquis Yi had lived during the Warring States, or Eastern Zhou, period, a time when smaller principalities were being absorbed by more powerful neighbors. "Here was a Mr. Nobody in the middle of nowhere with an incredible collection of instruments," So says.

*'Chinese bells,' continued on Page 6*

Smithsonian Institution  
**Research Reports**

No. 101 Summer 2000

Published quarterly by the Smithsonian Office of Public Affairs, Smithsonian Institution Building, Room 354, Washington, D.C. 20560-0033, for Smithsonian Contributing Members, scholars, educators, museum personnel, libraries, journalists and others. To request this publication in an accessible format, call (202) 357-2627, ext. 124 (voice) or (202) 357-1729 (TTY).

David Umansky, *Communications Director*  
Kathryn Lindeman, *Associate Director*  
Jo Ann Webb, *Editor*  
Colleen Hershberger, *Production Assistant*

Telephone: (202) 357-2627  
E-mail: [researchreports@publicaffairs.si.edu](mailto:researchreports@publicaffairs.si.edu)  
Internet: [www.si.edu/researchreports](http://www.si.edu/researchreports)

Contributing Members who seek information about the Smithsonian or about their memberships may write to The Contributing Membership, Smithsonian Institution, 900 Jefferson Drive S.W., Room 1479, Washington, D.C. 20560-0410, or call 1 (800) 931-32CM.



# Entomologists work to narrow the gap between known and unknown species

By Jo Ann Webb  
Smithsonian Office of Public Affairs

**B**efore you swat that annoying fly or crush a disgusting-looking bug, think twice. You could be destroying an unknown species that an entomologist would give a right arm to find. In fact, some researchers admit that, of the estimated 20 million to 80 million species of insects and plants that exist today, only 1.5 million to 1.8 million have been identified. Undeniably, researchers have only scratched the surface. There is still a lot of work to be done.

Some research entomologists at the National Museum of Natural History have devoted much of their careers to this work—identifying, classifying and naming new species of insects. The process can take a few days to several months to complete, but Smithsonian scientists are not alone in this scientific endeavor. They collaborate with other researchers from museums and universities around the world.

Biological collections, with their associated data, Smithsonian researchers believe, are the reference libraries for all life on Earth, past and present. The specimens are proof, or evidence, of a species' existence.

"The old literature isn't much good without physical evidence," says Don Davis, a research entomologist in the museum's Department of Entomology. "It is important to see these insects—their internal and external characteristics, immature stages and what they feed on. Thus, complete descriptions are very important in this business."

Researchers spend a great deal of time in the field collecting specimens. But a major reason for fieldwork is not just to acquire more species for the museum, Davis says. It is to learn what roles and interactions these organisms play in the ecosystem. For example, he adds, many insects are important because they pollinate plants. One needs the other for survival.

"Our species probably could not survive more than a year or two if all polli-



This leaf shows damage caused by leaf-mining moths. (Photo by Vic Krantz)

nators were to suddenly disappear," Davis says.

"You never know how our research can be applied," says Robert Robbins, a museum entomologist who specializes in butterflies. For example, he says, about

half a century ago, a medical doctor, who was also a butterfly researcher, realized that the different genetic forms of a butterfly he was studying were inherited in a manner analogous to the way that Rh blood factors are inherited in people. On the basis of this information, he developed the treatment for Rh incompatibility between mother and fetus, which has saved countless lives.

Davis, who studies primitive moths—the ones that appeared earliest in the history of the order—is currently working on the biology of about 1,000 new species that have been collected from around the world, as well as locally. He has lost track of the number of new species that he has described and named. More important than identifying new species, he is interested in the evolution and life cycles of these highly metamorphic insects.

## Collecting new specimens

How then does Davis go about finding and classifying these "unknown" species? "We look for unusual leaf damage," he answers. "It's like fingerprints. Once I see the damage, I can often tell you the genus."

But identifying the genus is only solving half of the problem. One genus can have hundreds or even thousands of species that look alike but are different, Davis says. For example, at a small site in La Selva, Costa Rica, he and a colleague have identified 250 species of a family of leaf-mining moths. Of this number, only two species had been previously discovered and named.

One of the known species at La Selva, the citrus leaf miner, has invaded other countries with detrimental effects. Its larvae mine in the leaves and peels of citrus fruit, eventually disfiguring the fruit and wiping out entire crops. Knowledge of such species is important to farmers, Davis says, because they lose millions of dollars each year from crop damage.

"Invasive species are becoming a national priority," Davis says. "Losses caused by invasive species cost the United States somewhere between \$1.1 billion and \$137 billion annually. Such loss, coupled with increasing loss of natural habitat and biodiversity around the world, means that much of the science pursued in this museum and elsewhere has a very real and urgent deadline."

Most of the specimens that Davis collects in the tropics are caught in ultraviolet light traps, which he sets at night. These traps attract thousands of nocturnal insects in addition to moths. Because the traps do much of his collecting, he is free to spend his days looking for live larvae that he will bring back to the museum and raise.

## Identifying and classifying

Back at the field lab, he removes the moths that have been caught in his traps. He keeps them "relaxed" by placing them in moist, high-humidity chambers. The moisture keeps the moths soft enough to spread their wings. It is



This fly species *Dagus rostratus*, found in the Caribbean and northern South America, was redescribed by Wayne Mathis in 1982. (Illustration by Young Sohn)

a delicate process that must be timed precisely, because, after about 12 to 24 hours, the moths become too wet to work with.

remainder, making numerous micro slides during the process.

When it comes to examining the tiny larvae, he uses a scanning electron microscope for high magnification and resolution. By rearing the larvae, he will learn more about the insect's biology and what it feeds on. He collects enough larvae to dissect some, yet rear most to maturity. During dissection, he examines such features as the type of larval mouth parts to help determine the genus and establish the precise method of feeding. He also can determine behavior modifications, as well as systematic relationships.

While the techniques for identifying and classifying insects can differ among species, the processes are similar. Wayne Mathis, also a research entomologist at the National Museum of Natural History, works with aquatic flies.

Of course, Mathis' collecting is done around waterways, using various techniques and equipment. "Sometimes, I don't know if I have found a new species until I dissect it," he says. "Flies can look almost identical but belong to different



Wayne Mathis collecting insects in Dominica in 1991

He has to discard the moths he is unable to pin and prepare in the field. He eventually studies under a microscope those that he was able to prepare, looking for telltale signs of the genera or the species.

When he returns to the museum, Davis continues his examination of the fragile moths, some of which are tiny enough to fit on the head of a pin. While many butterflies, beetles and other insects have external, easily identifiable characteristics, the morphological, or structural, diversity of micro-lepidoptera (small moths) is internal and usually concealed by scales.

To begin the identification and classification process, he has to first remove the moths' abdomens by placing them in a solution that macerates, or softens and breaks down, unwanted tissue. He then slowly and painstakingly dissects the

genera. There may also be considerable variation within some species."

Various species, he says, require specific environmental conditions. Mathis can almost name the genus, based on where he collects the flies. "Flies are fairly specialized in what they want," he explains. "Some are tolerant of pollutants, while others require pristine aquatic habitats. Therefore, I can tell you whether the water is clean or dirty, if it is saline or alkaline, based on specimens collected near or around waterways."

In examining specimens, Mathis looks for even spotting patterns on the wings and the structure of the abdomen. Some of his colleagues use DNA sequences as well. After making external observations, he

*'Insects,' continued on Page 6*



# 'Digilab' allows scholars, visitors to 'handle' artifacts in 3-D, on-screen

By Angela Cervetti  
Smithsonian Office of Public Affairs

Superman's blue tights and red cape tower impressively above visitors to the National Museum of American History's Graphic Arts Hall. Nearby, a 3-D image of the same costume foretells the coming of a digital supermuseum—faster than a speeding bullet, stronger than a display case and able to leap the confines of traditional exhibitry in a single click.

The exhibit is "Digilab," a showcase for the process of digitizing Smithsonian artifacts, documents and photographs. Digitization is essentially the taking of electronic photographs of objects. These electronic photos are then used on the Internet and on CD-ROMs. The exhibit, which opened in December, represents a trend that is transforming the nature of museums.

"Digitizing is happening everywhere in the world, in all kinds of institutions," says David Allison, curator and chairman of the museum's Division of Information Technology and Society. "The Smithsonian's goal is not only to digitize its own collections but also to make the public understand what it means to digitize."

## The imaging lab

The centerpiece of the exhibition is the imaging lab. Visitors peer through large windows to see Smithsonian staff digitizing documents and developing Web sites showing the images, some of which are 3-D.

Next to the lab, a glass case displays a Superman cookie jar, a pogo stick, a ray gun and the costume worn by actor Christopher Reeves in the movie "Superman IV." On the opposite side of the case, an interactive computer offers visitors more of the Superman collection, its history and, most impressive, a brilliant 3-D image of the action hero himself.

"People are surprised by the interactivity of the exhibit. And young visitors get really excited to see Superman in all his forms," says Karen Lee, the division's exhibition developer.

"We wanted to put the two types of displays side by side and let visitors compare the physical and virtual experiences of the same objects and think about how digitizing changes and enhances their museum experience," Allison says.

## Changes in printing, graphic arts

The "Digilab" exhibition is presented within the larger context of the history of printing and graphic arts. "It was appropriate and easy to place the lab within that context," Allison says. "Printing and graphic arts have been radically transformed by the process of digitizing. Secondly, it was an opportunity to take an older exhibition and give it a modern conclusion."



A display case in the "Digilab" exhibition showing Superman memorabilia is next to an interactive computer that allows visitors to manipulate a 3-D image of the action hero. (Photo by Terry McCrea)

As visitors approach the lab, they first encounter yesterday's iron printing presses. "We thought visitors would be interested in seeing the physical work and myriad of manual steps these big machines required and then trace the history of printing to our 'Digilab,' where it is all done by computer," Lee explains.

The juxtaposition is particularly striking as presented by two objects: a page from the 15th-century Gutenberg Bible and the Rocket eBook,



David Allison shows how one of the large format printers in "Digilab" is used to produce poster-size printouts. (Photo by Angela Cervetti)

a 22-ounce electronic device that can download text and hold 4,000 pages of words and images.

"Digilab" hardware includes a large-format ink-jet printer, a digital-photograph printer, a large-format image scanner and computers for Web page design, as well as a two-sided scanner, a digital video camera and several servers for managing the production process. Collaboration with technology firms helped make "Digilab" possible, with Hewlett-Packard and Intel, among others, donating money and equipment.

## Digitization and 3-D images

But key to the digitization of SI's collections have been those who take the electronic photographs. "The increased use of digital photography is happening throughout the photographic profession. It's the latest step in the continuing advances photography has made since its invention," says Jim Wallace, director of the Smithsonian's Office of Imaging, Printing and Photographic Services. Wallace oversees a team of photographers involved in the digitizing process.

"To create 3-D images, we set the object on a rotating table and photograph it with a digital camera. We rotate it 10 degrees and take another picture. We take 36 pictures per object," Wallace says. "Once the images are electronically stitched together, you see a single image on the screen that can be manipulated by computer users in a variety of ways."

For example, the compass used by early American explorers Lewis and Clark has been digitized in such a way that it is seen not just from multiple angles but also opening and closing. It took 108 photographs to offer this effect, 36 for each of the three positions in which it is shown.

Another advantage of digitization is to prevent the deterioration of items. Handling of items by researchers and staff can irreversibly weaken and distort them. Digitizing items that are heavily used for display, research or publication increases their general access and reduces the risk of improper handling.

With more than 141 million items in the Smithsonian's collections, the complete digitization of all collections is not the ultimate goal. Priorities are set by a collection's popularity, condition and internal demand. By making the Smithsonian's collections available on the Internet, millions of people worldwide can enjoy them.

For example, the Vidal collection of popular

culture and religious objects, given to the Smithsonian by Puerto Rican collector Teodoro Vidal in 1997, was digitized soon after it arrived. Now, people in Puerto Rico who previously had no access to these objects—because the items were not on public display in Puerto Rico—can see them on the Internet.

In addition to increasing access, digitizing can give virtual visitors a deeper, more focused learning experience. "A museum is a great environment to see objects, but if you are keenly interested in one particular object, the 60 words on the display label aren't enough," Allison says. "On the Internet, you can have a wealth of information in addition to images."

More significant, the blending of traditional and electronic approaches may solve one of the most challenging aspects of museum work. Exhibits provide a context for objects, a sense of what they meant in their original time. Museums can often only afford to exhibit one interpretation.

Instead of having to choose one view over another, digitization allows curators to juxtapose interpretations of the same objects. "Imagine an exhibit in which a variety of elements, such as choices for subjects and objects, is programmed at the discretion of the visitor. They could make up their own multimedia program, customize their museum experience through technology," Allison says. There are so many ways of using electronic technology creatively to enhance the visitor's experience, Allison believes, that it will necessarily change the very nature of museums.

"I don't really know what the museum of the future will look like," Allison admits. "But I am fairly certain it will be a marriage of physical and electronic exhibitry." And as the trend toward digitization in museums steams ahead, the Smithsonian is well established on the cutting edge with "Digilab."



# Smithsonian scientists discover rich, varied life in the mangrove swamps

By Elizabeth Tait  
Smithsonian Office of Public Affairs

The air, thick with the distinctive, rotten-egg smell of sulfides, is abuzz with insects. The sun is so palpably close it seems to be adding as much to the noise and damp as it is to the heat and brightness. Welcome to Isla Christobel, an island in the Bocas del Toro archipelago of northeastern Panama. This is no day at the beach. This is the mangrove swamp.

"That looks like a good foothold there," says Catherine Lovelock, leaning over the prow of the Smithsonian Tropical Research Institute's runabout boat. The object in question looks more like a small tree branch, the breadth of a woman's finger, arcing delicately out of the sodden, coffee-colored ground and back in again. Overhead is a web of more such branches, decorated with bright green leaves.

## Surveying the mangroves

The first step off the boat is that fabled long way down. Someone safely aboard the boat cautions against falling into the water, where "sometimes we see crocodiles." The second step brings this brief traverse to a dead halt, sunken ankle-deep in muck that feels the way one imagines quicksand would—wet, warm and gooey. The downward pull seems to exceed gravity.

Lovelock, nearly seven months pregnant, has forged ahead gracefully and effortlessly. She turns back to lend a hand—literally extricating the neophyte by the arm from the quagmire.

This is the wonderful world of *Rhizophora*, *Avicennia* and *Laguncularia*, where what appear to be branches actually are roots—the trees growing as much downward as up—some of the trees 100 years old, yet barely knee high. Here, the meeting between land and sea is more of a courtship than a confrontation, the one giving way to the other gradually.

As the water shallows, the mud underfoot becomes more perilous for its slickness than its suction and seems to vibrate with the perpetual, scuttling motion of crabs the size of quarters.

On this research trip, Lovelock, a plant ecophysiologicalist, is accompanied by Ilka Feller, an insect ecologist. Both are senior scientists at the Smithsonian Environmental Research Center in Edgewater, Md. Today, they are checking the progress of an experiment that measures the effect of added nitrogen and phosphorus fertilizers on the growth of dwarf red mangroves, *Rhizophora mangle*.

Mangroves are prevalent along the world's tropical and subtropical coastlines. In the Atlantic, they range from Miami to Rio de Janeiro and, in the Pacific, from Hong Kong to Sydney. Strictly speaking, "mangrove" is not a taxonomic term; that is, it does not define a single type of tree.

Rather, it is used to describe a group of trees and shrubs that share characteristics that allow them to live in the warm, salty waters of the intertidal zone.

"There are very few mangrove species," Feller notes. "Even the relatively rich Indo-Pacific coasts boast only about 40 mangrove species along their entire length. In the Western Hemisphere, only eight or so mangrove species can be found. And of this small set, just three kinds of mangrove tree are truly common."

## Mangrove adaptability

The fringes around the islands that comprise Bocas del Toro consist largely of red mangroves. The roots these trees sprout above ground, called prop roots, and send earthward in long, midair shoots, or stilt roots, are the mangroves' means of exchanging gases for survival in soil that is oxygen-starved. Another adaptive feature of the plants is the ability of some to exclude, and others to excrete, salt from their tissues.

Mangroves that grow on continental shores are buffeted by the salty ocean on one side and the freshwater from mainland streams on the other. They tolerate extreme fluctuations in salinity across their breadth. Conversely, mangrove communities on oceanic islands experience shifts in salinity from evaporation or tropical storms.

In the study of tropical biology, mangrove swamps have played the poor step-sister to the popular rainforest and coral



Catherine Lovelock admires the dramatic growth of a mangrove tree fertilized as part of a study of increased nutrient input on Isla Christobel. (Photo by Harry Barnes)

reef, especially in terms of their perceived species richness and ecosystem complexity.

## Smithsonian research

The majority of Smithsonian research into mangrove ecosystems has been carried out



Ecologist Karen McKee of the U.S. Geological Survey National Wetlands Research Center in Lafayette, La., ventures into the mangrove swamp on Twin Cays to check on an experiment. (Photo by Elizabeth Tait)

on a pair of islands, about 12 miles off the coast of Belize, known as Twin Cays.

Nearby is Carrie Bow Cay, a one-acre island atop the southern Belize barrier reef that, for 28 years, has served as a laboratory and living quarters for an international team of scientists researching the biological richness of coral reefs and mangrove swamps. It is the field base for Caribbean Coral Reef Ecosystems, a collaborative program of the National Museum of Natural History and the Belize Fisheries Department. The Smithsonian opened a new, 2,400-square-foot building here in August 1999, to replace the island's original structures, destroyed two years earlier by an electrical fire.

Ian MacIntyre, a carbonate sedimentologist in the National Museum of Natural History's Department of Paleobiology, mapped Twin Cays and took core samples from the ground beneath the mangroves in the 1970s.

"It's peat clear to the Pleistocene," MacIntyre says, referring to the bedrock level of limestone, altered over geologic time to calcite. The 30-foot-deep layer of peat is made up of the decomposing roots of the mangroves. The finding, he adds, demonstrates that the mangrove community was established some 7,000 years ago in what was then very shallow water and has since kept pace with the rise of sea level.

The research of Klaus Ruetzler, director of Caribbean Coral Reef Ecosystems, testifies to the diversity of underwater life in the mangrove swamp. He and collaborators study aquatic invertebrates, algae and microbes that colonize the subtidal stilt roots and abound in most other habitats, from seagrass blades to the underground of the muddy bottom.

"Even for relatively well-studied groups, such as crustaceans," Ruetzler says, "some 10 percent of the species found at Twin Cays were previously undiscovered."

Feller first visited Twin Cays and Carrie Bow Cay in 1979, when she was a scientific illustrator. Her interest in science led to a doctorate in ecology in 1993. For her dissertation, she measured the effects of

adding different fertilizers on the growth and herbivory, or damage from insect feeding, of dwarf red mangroves on Twin Cays. She discovered that the tree's stunted growth is due to a lack of phosphorus.

## Mangrove ecosystems

Her work on animal-plant interactions in mangroves has changed beliefs about the extent and diversity of insect fauna in these ecosystems. The key, Feller says, is looking beyond leaf surfaces, as entomologists typically do.

"Most insect species in the mangroves deal with the harsh sun and lack of freshwater by feeding only at night or living entirely inside plants," Feller explains. So she dissects plant parts and collects and rears the insect larvae she finds within. The approach has uncovered a world-record number of new species of leaf and stem-mining insects, among others, and an extraordinary degree of specialization in plant-insect relationships.

Lovelock's work in the mangroves began in her native Queensland, Australia, with doctoral research into how mangrove tree species absorb carbon through photosynthesis despite living in an environment where the potential for damage from high levels of solar radiation is great. At the Smithsonian Marine Station at Fort Pierce, in Florida, and in Panama, she has experiments under way to assess what factors contribute to mangrove seedling growth and death, and how they vary across the intertidal zone.

Collectively, the work of Smithsonian scientists gradually is revealing the mangrove swamp to be a diverse world of intricate and interdependent relationships among plants, insects, animals, soil, water, air and climate—all susceptible to the effects of human activity.

Entwining her fingers to illustrate the point that the tangled roots of mangroves are the threads that stitch shorelines together—buffering the effects of storms and controlling erosion—Feller explains that mangroves also provide nurseries and feeding grounds for fishes. But these delicate ecosystems, she points out, are endangered by development and destruction.

Feller recently received a \$4.5 million grant from the National Science Foundation to examine how increased nutrient input from natural, agricultural and urban sources can disturb the delicate balance of life in the mangroves.

She has assembled an interdisciplinary team, including Lovelock and researchers from eight other institutions, to study various aspects of the problem over the next five years, with an eye toward better management and conservation of mangrove ecosystems. The proposal also calls for a mangrove ecology field course for students, teachers and natural resource managers similar to one that Feller taught before in Belize.

So off they go in nylon pants and neoprene diving booties, knee-deep in mud or 10 feet up a tree, fearless of snakes and fond of bugs. You may never catch up with them on this journey, but you'll see what Feller and Lovelock see: all the wonders of the mangrove world.



car conversion continued in the 1950s and 1960s, many people turned work vehicles into leisure vehicles. Pickup truck campers were popular, and delivery vans and buses were modified for recreational purposes.

In 1961, nationwide sales of house-cars began when a small manufacturer of house-car bodies in Michigan linked up with the Dodge Division of Chrysler Corp. to manufacture Frank Motor Homes, later known as the Dodge Motor Home. The much smaller Volkswagen van camper arrived on the American scene in 1956 and was followed by Chevrolet and Ford van campers in 1961.

In 1966, Winnebago Industries of Iowa introduced a moderately priced model that was to usher in the era of mass-produced motor homes. These are the latest vehicles used by Americans in their quest, so diligently chronicled in White's book, to feel at home on the road.

See "Books & Recordings," Page 7, for details on ordering books published by Smithsonian Institution Press.



In the late 1930s, mechanical engineer Alexius Pribil and race-car driver Ray Harroun built this house-car, called the Pribil Aircar, in an effort to popularize self-propelled campers. Pribil planned to manufacture the aircar, but died in 1938. (Photo courtesy of G.K. Mulholland)

The quantity of artifacts inside the tomb alone would have made this an extraordinary trove. Almost 3 tons of bronze—more than has been found in any Chinese Bronze Age tomb, including those of kings—were found there. Also discovered were clues to the musical culture of fifth-century B.C. China. Until then, little had been known about the music of that period, as no system of notation had survived. Extensive inscriptions and illustrations on the instruments and other artifacts within the tomb "have provided the most complete written record of early Chinese musical systems yet found," So adds.

The discovery of two distinct musical ensembles—a larger "court orchestra" and a smaller, more intimate "chamber ensemble"—within the tomb seem to have con-

firmed writings of the followers of the Chinese philosopher Confucius. These indicated the existence of two parallel but distinct styles of music in the Chinese society of the time: somber ceremonial music and more intimate music for pleasure.

#### Bells displayed

The Chinese government considered the 65 bells from the marquis' court ensemble too precious to travel to the United States, and they are not in the exhibition. However, a smaller, similar set of 36 bells from an adjacent tomb is on view, and this set contains representatives of all the other instruments found within the tomb.

Clapperless, the bells are struck with long poles and mallets. Each bell's almond-shaped cross-section and concave mouth allows it to produce two tones or

notes, usually a major or minor third apart, when struck at the highest point of the mouth and to one side. Together, the 65 bells can play tones over a range of five octaves.

Characters cast on the surface of each bell naming the tones show that the notes were predetermined before casting. Exactly how ancient bronze-casters and musicians achieved this remains a hotly debated issue. As acoustical and technological marvels, even in our advanced technological world, these bells have an unrivaled reputation, So says.

"Music in the Age of Confucius" has strong audio and educational components. Visitors to the exhibition can hear a free audio tour narrated by the distinguished cellist Yo-Yo Ma. Ma also will perform with the ensemble Music From China in a free concert on Sunday, Sept. 17—the day the exhibition is scheduled to close.

uses the microscope to look at their skeletal parts, observing the slightest variations in the structures, which he hopes will be a solid lead in making a classification.

The dissections are challenging within themselves because some of Mathis' specimens are less than 1 millimeter long. "You need good vision and a steady hand," he says.

#### The naming process

Once the researchers collect, identify and classify new species, naming them is next. A number of factors are taken into consideration when naming new species, says Oliver Flint Jr., curator emeritus in the museum's Department of Entomology, who specializes in caddisflies and has described more than 1,000 since arriving at the museum in 1961. A species name, he adds, may be based on color, structure, the scientist who collected it or location from

which the specimen was collected. In some instances, insects are named in honor of a deceased researcher or for a research donor. For example, Flint has one genus and several dozen species named after him or his wife, who usually works with him in the field.

Mathis also has about a dozen species named after him. In most cases, colleagues named new species after him based on his primary work on the genus and his verification of new species found in the field or in other institutions.

#### Publication requirements

But before a new species is officially recognized, certain guidelines have to be met, Mathis says. Researchers have to be able to show how species differ from each other. For morphological evidence, they look at such things as the antennae, the wings and the male genitalia. In addition, they have to be able to document the geographical and seasonal distribution of the species,

show overall body variation, since no two species are exactly the same, and correctly publish the material, preferably with illustrations.

The information has to be published in a manner that makes it available to other scientists, he adds. In some cases, many of these findings are published in lengthy monographs, which explain not just relationships of new and little known taxa but also their biogeography, behavior and ecology based on observations of living specimens in the field.

While Davis boasts about the National Museum of Natural History's unparalleled insect collection, he emphasizes that "major portions of our biological collections are grossly under-sampled. We have no idea of how many species we're losing with the destruction of natural habitats. It's important that we get out and collect as much as we can. The heavens will be around forever for astronomers to study, but biodiversity will not wait."

## Research Highlights

**Senior management.** Smithsonian Secretary Lawrence M. Small's reorganization plan sets up five departments. As a result, he has added some new members to his senior management team. Dennis O'Connor, formerly Smithsonian Provost, is now Under Secretary for Science. Sheila Burke, Under Secretary for American Museums and National Programs, came to the Smithsonian from Harvard University's John F. Kennedy School of Government. Robert Bailey, Under Secretary for Finance and Administration, was previously a senior officer of the Madrid-based Santander Group, the largest bank in Spain and Latin America. Thomas Lentz, Director, International Art Museums Division, was deputy director of the Smithsonian's Freer Gallery of Art and Arthur M. Sackler Gallery. Gary Beer continues as Chief Executive Officer of Smithsonian Business Ventures.

**Directors appointed.** Marc Pachter, formerly counselor to the Secretary, has been named director of the National Portrait Gallery. He succeeds Alan Fern, who retired July 1. Lucy Spelman, previously chief veterinarian in the National Zoological Park's Department of Animal Health, has been named director of the National Zoo. She replaces Michael Robinson, who retired May 1.

**New bird species.** In the last two years, National Museum of Natural History Ornithologist Pamela Rasmussen has described four new species of birds—the most recent being a bush-warbler, *Bradypterus, Sylviidae*. First collected in the mountains of Taiwan in 1917, the *Bradypterus* had never been formally named as a distinct taxonomic group. The songs of these birds are much clearer, "sweeter" and more piercing than their Asian counter-



Pamela Rasmussen has recently named a new species of bush-warbler, *Bradypterus, Sylviidae*. (Illustration by Ian Lewington)

parts, Rasmussen notes. In addition, she says, several subtle but consistent morphological, or structural, differences exist between specimens from Taiwan and all named taxa, principally in bill size and shape, plumage color and reduced variabil-

'Highlights,' continued on Page 7



ity, pattern of undertail coverts and wing formula. Her other findings include rediscovery of the *Athene blewitti*, a forest owl that, until recently, had not been seen in



The Multiple Mirror Telescope now has just one mirror instead of six.

113 years; two new species of scops-owl, *Otus alius* and *Otus collari*; a hawk-owl, *Ninox ios*; and the recognition that a second species of scops-owl, *Otus madagascariensis*, exists in Madagascar.

**Mirror rededication.** The Multiple Mirror Telescope, previously composed of six 72-inch mirrors with a total diameter of 14.7 feet, was converted over two years into a 21.5-foot, single-mirror telescope—the largest of its kind in North America. The conversion enables the telescope to collect 2½ times more light and view an area of the sky 200 times larger than before. The new instrument proved its ability to conduct large-scale surveys of faint objects in deep space when it received its “first light” on the evening of May 17.

**Panda agreement.** The National Zoological Park has signed a letter of intent with the China Wildlife Conservation Association for the long-term loan of two giant pandas. Under the agreement, the association will loan the National Zoo a pair of pandas for study, breeding and exhibition for 10 years. China will retain ownership of the male and female pandas and any offspring they produce. According to the letter of intent, the National Zoo will contribute \$1 million to the China Wildlife Conservation Association each year for 10 years. The money will be used to support China's National Project for the Conservation of the Giant Panda and its Habitat.

**Hot bubbles.** Sophisticated computer analysis of 20 years of data from a giant array of radio telescopes has revealed evidence of hot “bubbles” in the dense, rapidly spinning disk of material being sucked into a massive black hole at the heart of our own Milky Way Galaxy, says Jun Hui Zhao of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. Zhao and his colleagues, using the Very Large Array, or VLA, at the National Radio Astronomy Observatory in Socorro, N.M., discovered that an object at the Milky Way's center shows pulses in its

radio emission every 106 days. Known as Sagittarius A\*, this object was discovered in 1974 and is believed to harbor at its core a black hole 2.6 million times more massive than the sun.

**Peabody Award.** “Mississippi River of Song,” a Smithsonian Productions radio program that tells the story of America through music born along the Mississippi River, from Minnesota to Louisiana, has won a Peabody Award from the University of Georgia's Henry W. Grady College of Journalism and Mass Communications. The Peabody Award is considered by many to be the most prestigious recognition of excellence in broadcasting and cable. The production's seven-hour documentaries, presented on Public Radio International, feature interviews and performances and are narrated by folk-rock singer Ani DiFranco.

**Biodiversity conservation.** A \$3 million, five-year grant from the Shell Foundation, a new charitable organization created by the Royal Dutch/Shell Group of companies in London, will enable scientists in the Smithsonian's Monitoring and Assessment of Biodiversity program to work side by side with the companies' oil and gas prospectors, local communities and governments, the private sector, and national and international organizations to integrate natural resource conservation with energy development. The Smithsonian designed, developed and tested this approach to working with private companies, local communities and governments on the assessment of biodiversity and development in conjunction with Shell in Peru, between 1996 and 1998.

## Series Publications

The following publications on research in various fields were issued during the period Feb. 1 through April 30, 2000, by Smithsonian Institution Press in the regular Smithsonian series. Diane Tyler is managing editor. Requests for series publications should be addressed to Smithsonian Institution Press, Series Division, 470 L'Enfant Plaza, Suite 7100, Washington, D.C. 20560-0950.

### Smithsonian Contributions to Anthropology

- 43 Human Remains from La Florida, Quito, Ecuador, by Douglas H. Ubelaker, 28 pages, 14 figures, 10 tables.

### Smithsonian Contributions to Zoology

- 605 *Jimmorinia*, a New Genus of Myodocopid Ostracoda (Cypridinidae) from the Bahamas, Jamaica, Honduras and Panama, by Anne C. Cohen, Louis S. Kornicker and Thomas M. Iliffe, 46 pages, 23 figures, 4 plates, 1 map, 2 tables.
- 608 *Arboreal Beetles of Neotropical Forests: Agra Fabricius, the Novaurora Complex (Coleoptera: Carabidae: Lebiini: Agrina)*, by Terry L. Erwin, 33 pages, frontispiece, 102 figures, 1 table.

## Books & Recordings

**Hap Arnold and the Evolution of American Airpower**, by Dik Alan Daso (Smithsonian Institution Press, 2000, \$29.95). The first biographer to draw from all of Arnold's personal papers, as well as recently declassified military documents, the author traces a career centered around the airplane—the technological achievement that revolutionized 20th-century warfare.

**American Noir: Underground Writers and Filmmakers of the Postwar Era**, by David Cochran (Smithsonian Institution Press, 2000, \$27.95). The author details how 10 writers and filmmakers probed the Cold War's cultural contradictions and indirectly challenged its social pieties: the superiority of American democracy, the benevolence of free enterprise and the sanctity of the suburban family.



In this compilation of studio and live recordings, Malvina Reynolds performs some of her most famous songs.

**Air Commando One: Heinie Aderholt and America's Secret Air Wars**, by Warren A. Trest (Smithsonian Institution Press, 2000, \$27.95). Using official records, personal papers and interviews with Brig. Gen. Aderholt, U.S. Air Force historian Trest details the life and career of a charismatic, unconventional military leader who has become a legend of the Cold War Air Force.

**The Published Writings of Wilbur and Orville Wright**, edited by Peter L. Jakab and Rick Young (Smithsonian Institution Press, 2000, \$49.95). Jakab and Young bring together, for the first time, 70 of the Wrights' published writings into a single, annotated reference.

**Trogons and Quetzals of the World**, by Paul A. Johnsgard (Smithsonian Institution Press, 2000, \$49.95). Beautifully illustrated with color plates and line drawings, this comprehensive review of these tropical birds—the first to be published in more than 150 years—covers all 39 extant species.

**Translating Native Latin American Verbal Art**, edited by Kay Sammons and Joel Sherzer (Smithsonian Institution Press, 2000, \$55). Maintaining that outsiders can best appreciate native Latin American cultures through their verbal art, 18 contributors translate myths, speeches, stories, conversations and magical chants to show how

indigenous discourse, from Mexico to Argentina, shapes social knowledge and experience.

**Phylogenetic Analysis of Morphological Data**, edited by John J. Wiens (Smithsonian Institution Press, 2000, \$49.95 cloth; \$26.95 paper). In this volume, 11 leading systematists provide an overview of recent advances and controversies, summarizing new methodological developments and evaluating how morphological phylogenetics has actually been practiced.

### Khevrisa: European Klezmer Music

(Smithsonian Folkways Recordings, 2000, \$15 CD). This is the first modern studio recording of the klezmer music of Europe, performed with the original European instrumentation—first violin, cimbal (hammer dulcimer), sekund (contra-fiddle) and bass.

### Safari: Music of African Immigrants

(Smithsonian Folkways Recordings, 2000, \$15 CD). Well-known master musicians from Ghana, Kenya, the Democratic Republic of Congo and Zimbabwe, now living in the United States, perform.

**Tuva, Among the Spirits** (Smithsonian Folkways Recordings, 2000, \$15 CD). The compact disc is a “sonic journey” to the steppes of southern Siberia, the wellspring of Tuvan and Sakhan music, where the spiritual power of nature is manifested through its sounds.

### Larry Long: Well May the World Go

(Smithsonian Folkways Recordings, 2000, \$15 CD). Singing the stories of hardworking people in ways that highlight the courage, deep personal experiences and heroism found in their lives, Long delivers lyrics that are as complex and rich as the lives he describes.

**Discover Indonesia** (Smithsonian Folkways Recordings, 2000, \$6.99 CD). Part of the “Music of Indonesia” compact disc series, these 15 tracks provide an exciting and varied introduction to musical styles from different parts of Indonesia.

### Malvina Reynolds: Ear to the Ground

(Smithsonian Folkways Recordings, 2000, \$15 CD). In this compilation of studio and live recordings, this well-known songwriter and activist for social justice and the environment performs some of her most famous songs.

Books published by Smithsonian Institution Press can be ordered from P.O. Box 960, Herndon, Va. 20172-0960. To order by phone or for more information, call 1 (800) 782-4612. There is a \$3.50 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 Mail Order, 955 L'Enfant Plaza, Suite 7300, Washington, D.C. 20560-0953. To order by phone or for more information, call (202) 287-7297 or 1 (800) 410-9815. There is a \$5.50 fee for shipping and handling of the first 15 recordings ordered; call for other shipping prices.



## The Stone Carvers: Master Craftsmen of Washington National Cathedral

By Marjorie Hunt (Published by Smithsonian Institution Press, 1999, \$27.95)

When Marjorie Hunt set out for Washington National Cathedral one day in 1978 to begin documenting the work of its stone carvers, she never expected to be memorialized herself. But master carver Vincent Palumbo has seen to it that she will be long remembered at the English Gothic style church in the nation's capital.

Several years after meeting Hunt, Palumbo carved a limestone angel, with a likeness of her face, for a spot high on the cathedral's northwest tower. The angel should endure for centuries. In the meantime, Hunt, a folklorist in the Smithsonian's Center for Folklife and Cultural Heritage, has been doing her part to keep alive the story of artisans like Palumbo.

Hunt is the author of *The Stone Carvers: Master Craftsmen of Washington National Cathedral*, a book recently published by Smithsonian Institution Press. Her goal, she writes, was "to understand the craft of stone carving from the perspective of the carvers." To that end, she focuses on both the technical skills and aesthetic attitudes shared by Palumbo and other carvers who have spent decades creating the cathedral's gargoyles, grotesques, capitals, pinnacles, saints and angels.

In her years of research, Hunt haunted the stone carvers' workshop at the cathedral, climbed construction scaffolding and visited craftsmen's families at their homes. *The Stone Carvers*, illustrated with photographs of the carvers at work, describes the origins and the demanding apprenticeships that shaped these men for careers in

what Palumbo—noting that even the Ten Commandments were carved on stone tablets—calls "the oldest trade in the world."

To begin to understand that trade, Hunt used one of the most important tools of her own profession—her ears. "I was interested in their ideas about how they viewed themselves as craftspeople," she says. "I listened to them. I really didn't know anything about stone carving when I began."

In 1978, Hunt was a graduate student under contract to do fieldwork for the Festival of American Folklife. The Festival program that year was the folklore of Washington, D.C. The carvers at the cathedral, which had been under construction since 1907, were a natural choice, Hunt recalls. "So I went up and knocked on their workshop door and met Vincent Palumbo, who was the master carver at that time, and he introduced me to Roger Morigi [Palumbo's predecessor as master carver] and other stone carvers."

She followed the artisans around and took notes and photographs. "I was inspired by their work and by their love for their work," says Hunt, who ended up writing her doctoral dissertation on the culture of the stone carvers.

That was only the beginning of her fascination with the trade. Hoping to bring the carvers' story to a broader public, she teamed up with a filmmaker friend, Paul Wagner. By 1984, the two had completed a documentary film about the men who transform blocks of stone into art at the cathedral.

The film won an Academy Award for best documentary short in 1985 (the Hunt angel on the cathedral tower clutches an Oscar). Broadcast on public television, the documentary also was awarded an Emmy. Nonetheless, Hunt says that the film only hints at the depth of knowledge and skill possessed by the carvers and at the roots connecting them to their craft.

Hunt calls her Smithsonian Institution Press book—with its in-depth exploration of the carvers' work—"an ethnography of craftsmanship." In it, she investigates the carvers' earliest years, the learning they received in carving workshops in Italy and



Gargoyle of a wild cat, carved by Frederick Hart (Stewart Bros. Photographers)

the traditional values they absorbed on the job and at home.

"I was born into the stone," Palumbo told the folklorist. A fifth-generation carver who learned the craft from his father and grandfather at the family shop in Italy, he says, "I never had any concept to do anything else."

Palumbo has been the cathedral's master carver since 1978. As a youngster in Italy, he was brought to his father's studio after school. He cleaned the shop, watched the carvers and learned. At night around the dinner table, Vincent listened to his father and grandfather discuss work and tell stories.

Hunt writes in *The Stone Carvers*: "Like a child learning language, he began to acquire a grammar of stone carving; he began to piece together knowledge of the various elements of the craft and the underlying principles that governed them." Learning the names of tools and of types of stone, along with ideas of what constituted good work, Palumbo recalls that his mind became "drunk with all those things."

Morigi, who died in 1995, also had followed in the family stone-carving tradition. His father, Napoleone Morigi, carved decorative works for the U.S. Library of Congress and other buildings in this country. The younger Morigi followed his father to the United States in 1927 and was the Washington National Cathedral's master carver for 23 years.

Hunt taped many hours of interviews with Morigi, Palumbo and their families, gathering tales of strict teachers and com-

petition among apprentices, of past masters and their beautiful carvings. She devotes much of *The Stone Carvers* to these stories and the light they shine on the carvers' culture of work.

Hunt remembers being surprised at the degree to which the cathedral's carvers view themselves as performing artists rather than creators: "One might think that the work that they prize the most would be the whimsical gargoyles and grotesques that they themselves had the freedom to create," she says. "But what they valued most, what they considered the most difficult and challenging, was translating a sculptor's work in clay perfectly into stone—giving life to that through their skill. They taught me that satisfaction doesn't only lie in creating. This sense of performing in stone is their great satisfaction."

Hunt's current work builds on her years studying the stone carvers. "I'm curating a program for the Folklife Festival, for the summer of 2001, called 'Masters of the Building Arts.'" The program will present stone carvers, along with brick masons, ornamental metalworkers, woodworkers, mosaic tile artists and many other building artisans. "I want to bring to a large national audience a sense of appreciation and understanding of the skill and knowledge and, again, the deep feeling these people bring to their craft."

Her enthusiastic efforts to understand and explain the work of the National Cathedral stone carvers has already brought fresh blood to that ancient trade. Hunt recalls how, on a visit to Italy, she was peering into the window of a stone shop in Carrara when she heard a carver speaking English. "It was this young American guy," she says. "I started talking with him, and I said, 'Well, how did you get interested in carving?' And he said, 'I saw this great film called 'The Stone Carvers,' and I decided that's what I wanted to be.'" Laughing at that memory, Hunt says, "That was pretty amazing!"

—Michael Lipske

See "Books & Recordings," Page 7, for details on ordering books published by Smithsonian Institution Press.

SMITHSONIAN INSTITUTION  
Washington DC 20560-0033

Official Business  
Penalty for Private Use \$300

Bulk Rate  
Postage & Fees Paid  
Smithsonian Institution  
G-94