

Research Reports

ZOOLOGY

Pandas' first year provides a wealth of data on behavior and biology

By Vicki Moeser
Smithsonian Office of Public Affairs

Paper is a traditional gift for celebrating a one-year anniversary, but giant pandas Tian Tian and Mei Xiang happily accepted a sugar cane treat on their first anniversary at the Smithsonian's National Zoological Park.

The two giant pandas arrived in the United States on Dec. 6, 2000. After a brief quarantine period, they went on view in their renovated Panda House on Jan. 10, 2001. In all, 2.8 million visitors saw the celebrated couple during their first year.

The first anniversary was marked by a ceremony on Jan. 10 renaming the panda exhibit the Fujifilm Giant Panda Conservation Habitat. Fujifilm contributed \$7.8 million, the largest single sponsorship ever received by the National Zoo. The money was used for the acquisition of the pandas; for the planning and construction of a new, expanded panda habitat, scheduled to open in 2004; and for extensive education, conservation and research programs.

Other corporate donors included Animal Planet and Federal Express.

Lisa Stevens, the National Zoo's assistant curator for pandas and primates, has praise for these and other donors not only for bringing the pandas to the Zoo but also for enabling the Zoo to continue playing a key role in conservation efforts. That's the most spectacular aspect of our panda program, she says. Our exhibition is truly linked to a massive panda conservation effort in the wild.

Indeed, over the past year, the giant panda exhibit at the National Zoo has been transformed into an intensive research site devoted to learning about giant panda behavior, biology and preferences.

For a year, National Zoo scientists have been collecting behavioral and physiological data and recording the pandas' preferences for food, resting and sleeping locations, and even which trees, logs and rocks the pandas prefer to climb, National Zoo Director Lucy Spelman says. The infor-

mation is being used to help design the new giant panda facilities that stimulate panda behaviors.

The giant pandas are on a 10-year loan to the Zoo from China. In return, the Zoo is contributing \$1 million a year to the China Wildlife Conservation Association. The money, raised from private donations, goes to projects that preserve endangered species in the mountain forests of central China.

Despite the popularity of the giant

panda, our scientists are well aware that there remains much to be learned about this species, in part because pandas are very difficult to study in the wild, Spelman says. In future years, we will support numerous research projects designed to learn from captive giant pandas and extrapolate to the wild.

The Zoo's research, Spelman adds, will include continued behavior watch studies and behavioral competence studies that involve the development of husbandry, breeding management and sexual behavior surveys for giant pandas in Chinese facilities. Research also will focus on health assessments of giant pandas and sero-

logic screening for infectious diseases, lactation studies, predator recognition and avoidance, giant panda vocalizations, and foraging and cognitive abilities.

In addition, she says that, wherever possible, National Zoo scientists will collaborate with colleagues at Zoo Atlanta, the San Diego Zoo and facilities in China, supplemented by workshops and training courses to share information.

I went to China twice in 2000, Spelman adds. The purpose of those visits was to gain a better understanding of China's nature reserves for the giant panda in Sichuan; to visit the four reserves that the Zoo will be supporting in the coming years; and to help select the first projects to be funded by the annual loan money [to the China Wildlife Conservation Association] for these reserves.

Meet Mei Xiang and Tian Tian

Upon arrival at the National Zoo, the giant pandas settled easily into their new surroundings. Mei Xiang, the female, is nearly 4 years old, and Tian Tian is nearly 5. Little more than a year ago, Mei Xiang weighed in at 139 pounds; on Jan. 10, 2002, she tipped the scales at 200 pounds for the first time and now weighs about 204. Tian Tian weighed 217 pounds when he arrived. Today, he weighs about 265.

Between them, they eat more than 80 pounds of bamboo a day, in addition to carrots, apples and biscuits formulated for leaf-eating zoo animals. The pandas will continue to grow, Stevens says, possibly gaining up to another 20 to 30 pounds each.

Each panda has its own distinct personality, Stevens says. Tian Tian can be very demanding and active. He's usually awake and interested in what the keepers are doing. He needs attention and always needs something to do. He is very food-motivated. His name means more and more. We joke that it really means more and more food.

Mei Xiang, she says, takes life a little more in stride. She's more laid back about food. She's a more careful explorer, more contemplative and more low key.

Observing preferences

The new panda habitat will not only give Tian Tian and Mei Xiang more space, but it also will reflect what scientists have already learned about their preferences. The preference study is part of a series of



The Smithsonian's National Zoological Park has been home to giant pandas Tian Tian, shown here, and Mei Xiang for a little more than a year. (Photo by Jessie Cohen)

Pandas, continued on Page 6

African American history ■ Portia James loves to hear people tell stories. From ordinary, everyday men and women she has gained some of her richest knowledge about history and the people who made it happen. I am often fascinated by people who can appear so nondescript and unassuming, yet, when you talk to them, you realize that they have been involved in some incredible historical moments, says the historian and senior curator at the Smithsonian's Anacostia Museum and Center for African American History and Culture. I get emotional when I think about the people I've met as a result of this job. It's been the biggest payoff of this kind of work.

As a youngster growing up in Detroit, James was always curious and interested in many things. In fact, that curiosity almost gave my mother a heart attack, she says, laughing. I attended so many colleges and was interested in so many areas. I just couldn't settle down in one field. Looking back, I might have wasted a lot of time, but I gained invaluable insight as a result of all those exposures to different fields. It actually helped me, because, as a curator, you cross many disciplines.

She attributes her curiosity to the places she visited and the people she met through books. I was an only child until I was a senior in high school, when my sister came along, she says, so my mother used books as my babysitter and to keep me out of trouble. Thus, James became a voracious reader. When she learned new things, it was



Portia James

like being in love, she says. I was excited and giddy until I found a new love.

When she joined the museum in 1985 as a historian, James knew that she had found her niche. It's wonderful, she says, that someone would pay me to read about and research things that interest me. Her curiosity, scholarship and personal interests culminate in exhibitions on African American history and culture.

James is the curator of the museum's current exhibition *Precious Memories: The Collectors*

Passion, which is on view through Sept. 30. The show explores the work of Washington, D.C.-area collectors of African American art, memorabilia and archival material. While she doesn't take credit for conceptualizing the exhibition—that credit goes to museum Director Steven Newsome, she says—she did have the challenge of working with the collectors and crafting an exhibition theme. That theme, she explains, centers around the importance of collecting and preserving your history.

The real treasures that speak to African American history and culture, she says, are not in repositories, but in homes and private hands. And too much of it is being thrown away, she adds. It's not as much about the dollar value of these things as it is about the capacity the artifacts have to speak with authentic voices that are totally different from the second-hand text of scholars. If you don't begin to develop some appreciation for the origin and historical context of things, you will not be able to deal with and understand racial and cultural changes that are taking place throughout this country.

James hopes to find the time to turn her research attention to African American material culture. The museum has begun reorganizing its collections, and a new Web site, which will highlight artifacts, give virtual tours and offer online workshops, is being developed. In addition, James wants to slip in a research project on foodways and how they tie and connect us to our social history, as well as to other cultures.

And her research wish list goes on and on. While she admits that most scholars are focused, her inquiring mind will always want to know about more subjects than she could ever get around to researching. There just aren't enough hours in a day, she says.



This brightly colored red-and-black hooded pitohui, found on the island of New Guinea, is one of the most toxic bird species known. (Photo by John Dumbacher)

ORNITHOLOGY

Mysteries continue to unfold as researcher studies poisonous birds

By Michael Lipske
Special to Research Reports

A bird can be regal like an eagle or scruffy like a pigeon. There are verbal birds like the parrot and long-limbed beauties like the flamingo. What a bird can't be is poisonous—at least it couldn't until John Dumbacher met the pitohui.

A Smithsonian research associate and an ecologist with the Smithsonian's National Museum of Natural History Molecular Genetics Lab, Dumbacher first encountered pitohuis, jay-sized birds common on New Guinea, an island of Papua New Guinea, more than a decade ago. He was a graduate student at the time, assisting on a study of birds of paradise in Papua New Guinea's Varirata National Park. Capturing birds of paradise in mist nets also meant that he spent a lot of time untangling and releasing unwanted birds, like pitohuis.

Pitohuis have sharp beaks and claws. Dumbacher noticed that when one of the birds nicked his finger or if, after handling them, he happened to rub his eyes or touch his mouth, he felt a burning sensation. He describes the feeling as not unlike that caused by hot chili peppers. When he mentioned the burning sensation to one of the project's New Guinean guides, the man replied, Oh, yeah, those birds are poisonous. The guide and other hunters called pitohuis rubbish birds.

Ultimately, Dumbacher would learn that the skin and feathers of pitohuis contain a dangerous nerve poison called batrachotoxin. The same compound is produced by tiny South American frogs whose toxic skin secretions are used to poison darts shot from blowguns.

Gram for gram, Dumbacher says, batrachotoxin is one of the most toxic natural substances, more toxic even than curare or strychnine. Just hold a poison-dart frog like *Phyllobates terribilis* in your palm, he says, and you're risking your life.

But the batrachotoxin in New Guinea's pitohuis is less concentrated than it is in the frogs—a good thing, considering all the birds that Dumbacher has handled.

A closer look

Upon returning to the United States after that first trip to New Guinea, Dumbacher shared his pitohui feathers and tissue samples with the team of chemists in the National Institutes of Health's Laboratory of Bioorganic Chemistry in Bethesda, Md.

Poisonous birds, continued on Page 6

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'United We Stand': A nation looks to the American flag during times of crisis

By Valeska Hilbig

National Museum of American History, Behring Center

In the darkest moments of our nation's history, Americans have always rallied together to endure the crisis at hand. From the Revolutionary War to the Sept. 11 terrorists attacks, the phrase "United We Stand" has symbolized the strength and courage of the American people. In fact, it has been this show of solidarity that has given comfort to the American people.

The "United We Stand" slogan became part of a little-known home-front effort during World War II, when the magazine publishing industry initiated a flag cover campaign called "United We Stand." Thus, in July 1942, seven months after the attack on Pearl Harbor, American flags waved proudly from the faces of some 500 magazine covers across the country.



Magazines such as *The American Home* found creative ways to display the flag. (Courtesy of Peter Gwillim Kreitler)

The campaign had a dual purpose: to demonstrate patriotism and national strength in a time of crisis and to illustrate the value of the magazines to a nation at war. To mark the 60th anniversary of this campaign, the Smithsonian's National Museum of American History, Behring Center showcases nearly 100 of these memorable magazine covers in the exhibition "July 1942: United We Stand." The show, which opened March 22, is on view through Oct. 27.

A collection shared

Most of the covers in the exhibition belong to California collector Peter Gwillim Kreitler. It all began when the Episcopalian minister and environmentalist, born in July 1942, received one of the magazines for his birthday. As he came across more and more of the flag-themed covers from July 1942, he began collecting them.

Now, 10 years later, Kreitler owns almost 300 covers. He approached the Smithsonian with the idea of sharing his

collection with others. In fact, he has written a book, *United We Stand: Flying the American Flag*, recently published by Chronicle Books. The book, available in Smithsonian museum stores, features many of the colorful covers from the flag campaign.

The National Museum of American History, home of the original Star-Spangled Banner, is just the place to explore the history of our national symbol and the ideals for which it stands, says Marilyn Zoidis, cultural historian and curator of the Star-Spangled Banner Preservation Project.

The meaning of the American flag has evolved over time, and it now embodies the entire history of the [United States], she adds. We have been planning this exhibition for a while, but since Sept. 11, the flag has renewed meaning. This exhibition allows us to connect this country's present to its past.

A lost moment found

Zoidis, along with Helena Wright, curator of graphic arts, and Kathleen Kendrick, assistant curator of the Star-Spangled Banner Preservation Project, make up the curatorial team. They immediately recognized that the magazine covers, along with their stories, would illustrate one of the lost moments in American history.

The "United We Stand" magazine campaign was an unprecedented cooperative effort that not only tied the country together but also presented dramatic visual images and creative designs that captured the imagination of the American public, Wright says.

The research team set out to uncover the history of the campaign. They sifted through original records of the U.S. Treasury Department, the Franklin D. Roosevelt Presidential Library and the Magazine Publishers of America.

Internet research helped to track down the son of Paul MacNamara, a publicist at the Hearst Corp. who initiated the campaign in early 1942. It is the nitty-gritty curatorial work—one finding leading to another and then to another until the full picture emerges—that allows us to tell the full story of this campaign for the first time, Zoidis says.

MacNamara thought of the idea to put the flag on the covers of America's magazines. He believed



This cover from *Vogue* magazine is featured in the exhibition "July 1942: United We Stand" at the National Museum of American History. (Courtesy of Peter Gwillim Kreitler)

that such a campaign would demonstrate the publishers' patriotism and reinforce the magazines' important role of keeping the nation informed.

He presented his plan to the National Publishers Association, now the Magazine Publishers of America. Eventually, some 500 magazines agreed to participate, including major publishing houses, as well as in-house and trade publications.

The flag was an obvious choice for the campaign. The flag is a kind of [symbol] that all Americans understand, and it represents shared identity, values and interests, Kendrick notes.

Many magazines paired the flag with the old slogan "United We Stand." Popular since the Revolutionary War, the phrase originated in a 1768 patriotic ballad by John Dickinson titled "The Liberty Song." A portion of the lyrics read: "Then join hand-in-hand, brave Americans all, by uniting we stand, by dividing we fall."

In 1792, Kentucky designated the slogan as its state motto. During the Civil War, it became a rallying cry for Union soldiers, and in the 20th century, labor unions used the slogan during strikes.

A new campaign twist

Public support of war bond sales was waning, and sales had dropped dramatically. The war machine was costly, and the U.S. government was obliged to raise money lots of it. President Roosevelt considered instituting a system of forced savings in



In July 1942, magazine stands were filled with covers featuring American flags. (Courtesy of Peter Gwillim Kreitler)

Flag covers, continued on Page 6

The new MMT: Seeing more clearly into the heavens in the 21st century

By Daniel Brocius
Fred Lawrence Whipple Observatory

Months of preparation paid off in less than 60 seconds as Smithsonian and University of Arizona scientists successfully aluminized the mirror of the largest single-mirror telescope in North America.

In November, technicians at the MMT Observatory on Mount Hopkins in Arizona bolted a vacuum chamber directly over the 6.5-meter (21.5-foot) mirror's surface and, in a process lasting less than a minute, vaporized aluminum to create an incredibly thin reflective coating on the mirror.

The coating is much thinner than a human hair, MMT Director Craig Foltz says. In fact, the amount of aluminum now on the face of this 20-square-meter mirror would fit into the volume of an eraser on an ordinary pencil.

The nearly perfect, 91 percent reflective coating marks one of the last milestones in the process of converting the original six-telescope 4.5-meter MMT into a 6.5-meter, single-mirror instrument.

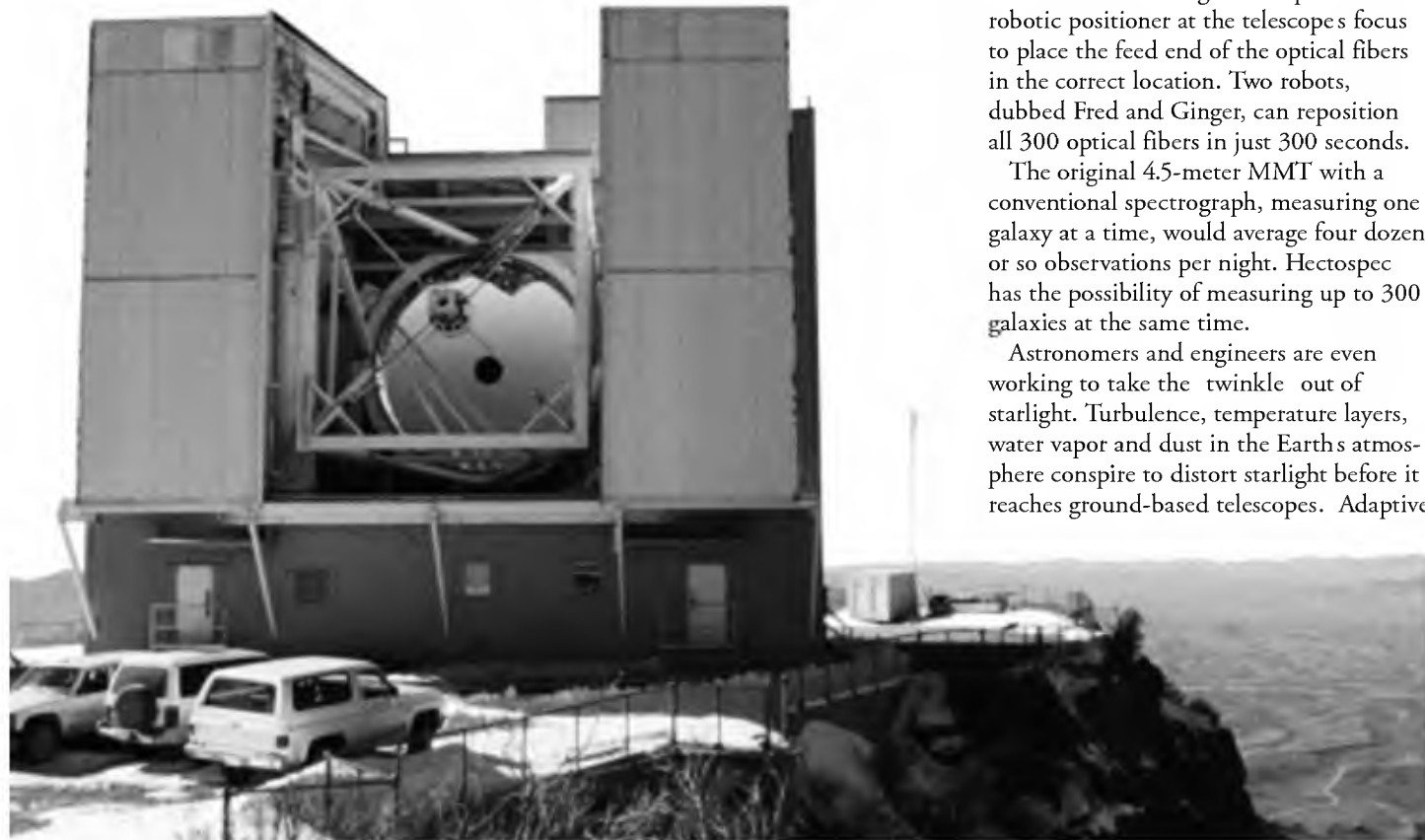
The original mirrors

The telescope at the MMT Observatory, a joint facility of the Smithsonian Institution and the University of Arizona, has been a pioneering instrument throughout its career. When first dedicated in May 1979, MMT stood for Multiple Mirror Telescope, because six individual, identical, 1.8-meter telescopes in a common mount were used as one. The combined light-collecting power was equal to that of a single 4.5-meter mirror, making the MMT, at the time, the third-largest optical telescope in the world.

To solve the problems of cost, weight and limits in mirror size that had stalled growth in telescope aperture, the original MMT featured three ground-breaking departures from conventional telescope construction. Those departures were: six telescopes with lightweight primary mirrors instead of one large, nearly solid, mirror; a computer-controlled altitude-azimuth telescope mount; and a co-rotating building instead of a dome.

To avoid the weight, handling and cost of a large single mirror, the MMT used six smaller telescopes arranged in a common mount. Adjustable secondary mirrors allowed each telescope's image to be controlled at the common focus. Initially, a laser alignment system was used to co-align the telescopes. Later, as computing power increased, a telescope co-alignment system analyzed the position of the telescopes' images and sent any necessary correction signals to the secondary mirrors.

J.T. Williams, chief engineer at the MMT Observatory, says perhaps his greatest reward came in 1978, with first light for the old MMT. One might say it was a life-changing event, he says. The light



The MMT, a single-mirror telescope that sits on Mount Hopkins in Arizona, has 2½ times more light-gathering capacity than the old multiple-mirror telescope and allows astronomers to peer even deeper into a vast and complicated cosmos. (Photo by Lori Stiles)

from the first of the six telescopes achieved such perfection and the image it produced of Sirius, a nearby star, was so sharp that it took his breath away.

The six telescopes were supported on the first computer-controlled telescope mount. Computer control was needed because the simpler, compact, naval-gun-type altitude-azimuth mount required constant adjustment in two directions to follow the arcing motion of a star across the sky.

The compact mount allowed the MMT to fit into a building 4½ stories tall, which was much smaller than those housing conventional telescopes of similar size. The entire 900-ton building still turns with the enclosed telescope mount. Thus, as the telescope tracks the sky, the building stays out of the way.

Time for change

By the mid-1990s, however, as very large telescopes began to be planned and built, the 4.5-meter MMT was becoming a medium-sized telescope. The limits placed on mirror sizes during the 1970s had changed with the advent of spin-casting large mirrors in the innovative rotating oven at the University of Arizona—a technique led by Professor Roger Angel and his team at the university's Steward Observatory Mirror Lab.

The Smithsonian and the University of Arizona decided to convert the telescope by installing a 6.5-meter-diameter single mirror that would double the light collecting power of the telescope.

It's like keeping a car whose body and styling you like but dropping in a two-times-bigger engine, says Chris Impey, a University of Arizona astronomer who frequently uses the MMT.

On March 2, 1998, the 4.5-meter Multiple Mirror Telescope closed its chamber doors onto the night sky for the last time before it was converted. The disassembly of the telescope began later that day.

like spectrograph that will be able to take the spectra of up to 300 objects at once.

Astronomer Daniel Fabricant leads a team at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., developing this fiber-optic-fed instrument. Light from individual galaxies, for example, will travel through 25 meters of optical fiber from the telescope to a large, bench-mounted spectrograph located elsewhere in the building. Hectospec uses a robotic positioner at the telescope's focus to place the feed end of the optical fibers in the correct location. Two robots, dubbed Fred and Ginger, can reposition all 300 optical fibers in just 300 seconds.

The original 4.5-meter MMT with a conventional spectrograph, measuring one galaxy at a time, would average four dozen or so observations per night. Hectospec has the possibility of measuring up to 300 galaxies at the same time.

Astronomers and engineers are even working to take the "twinkle" out of starlight. Turbulence, temperature layers, water vapor and dust in the Earth's atmosphere conspire to distort starlight before it reaches ground-based telescopes. Adaptive

Installation of the new mirror

The 6.5-meter mirror cell that holds the mirror was put in place on Aug. 6, 1998. The primary mirror itself made the long journey up the single-lane mountain road and was successfully installed on March 25, 1999.

The mirror was hard to get into the telescope, Foltz says. The only way we could do it was to point the telescope straight up, lift the 10-ton mirror with suction cups on its front surface and hoist it about 60 feet into the air. Once you lower it into the telescope, there are so many connections to be made that, basically, you never want to take it out again.

The new telescope achieved first light on May 17, 2000. The image quality exceeded staff expectations by clearly resolving a double star separated by only .7 arc second. (One arc second is roughly the apparent diameter of a dime viewed from a mile away.) The 6.5-meter telescope of the MMT Observatory was dedicated on May 20, 2000.

The MMT conversion team has been working with a \$20 million budget. While this is a substantial sum, it is very modest when compared with other big telescopes whose cost approaches \$80 million to \$100 million.

What's to come?

The new telescope is being outfitted with a new suite of detector packages. One that will take advantage of the MMT's larger field of view is the Hectospec—a Medusa-

optics combine computers, optics, mechanical systems and even lasers to remove distortion from images.

The system being developed for the MMT will use a relatively bright star or a laser beam to characterize the atmosphere above the telescope. The sodium laser light will leave the telescope, travel upward until it is reflected by a layer of sodium atoms high in the atmosphere and return to the telescope. The returning image will be analyzed to determine atmospheric conditions and then will generate correction signals for a deformable mirror, that is, one in which the flexible mirror can be pushed and pulled by actuators to correct the image misshapen by the atmosphere.

In a bold step, the MMT team will make corrections with a 70-centimeter-diameter (27.5-inch-diameter) secondary mirror rather than with a small auxiliary mirror as done in other systems. More than 300 actuators will push and pull from behind the surface of the secondary mirror and thus adjust for atmospheric turbulence on the fly.

Foltz predicts the system, which can make adjustments down to about a millionth of an inch, several hundred times per second, will produce exquisite images in the near-infrared spectrum.

I don't know of anybody anywhere who is currently so close to commissioning an adaptive secondary, he says. The MMT Observatory is a great place to do it.

Potential profit from drug discoveries promotes rain-forest conservation

By Elizabeth Tait
Smithsonian Office of Public Affairs

Along the Gaillard Highway, which parallels the Panama Canal, there is an unexpected clearing in the lush foliage—a gently sloping hillside dotted with white crosses. The French Cemetery is the final resting place for some of the estimated 20,000 men who perished in the first failed attempt to cleave the isthmus and open a waterway linking the Atlantic and Pacific oceans. Their deaths were the result of insect-borne diseases of the tropics.

A wealth of information

The tropics have taught us much about the prevention and treatment of life-threatening illnesses. In modern health-care systems, the majority of the most widely prescribed drugs are derived, directly or indirectly, from biological sources such as plants.

A great advance in the treatment of breast and ovarian cancer in recent years, for example, was the discovery of taxol from the Pacific yew tree. The taxol molecule is extremely difficult and expensive to replicate in the laboratory—that degree of complexity and efficacy can only be found in natural products.

Tropical forests are the most diverse terrestrial ecosystems on the planet. The diversity of species in these forests also is reflected in the diversity of chemical compounds they contain, most of which still are unknown to science. The potential benefit to human health from those chemicals is incalculable.

Unfortunately, the vast majority of the world's rain forests grow in nations beset by poverty and political instability, where the economic incentive to harvest timber for export or clear the land for livestock grazing is greater than the drive to conserve biodiversity. Can the prospect of finding promising new medicines be used as an incentive to conserve tropical forests? Is there a connection between saving lives

and saving trees? The answers to these questions come from sources far from the tropics.

A curious biochemist

Early in the 1990s, Todd Capson, today a research associate and the coordinator of the International Cooperative Biodiversity Groups for Panama at the Smithsonian Tropical Research Institute in Panama, spent his workdays as a biochemist at the National Institutes of Health in Bethesda, Md. At night and on weekends, he was at the Library of Congress in Washington, D.C. He was interested in environmental issues and in broadening his focus beyond a single enzyme in an Eppendorf tube, he says.

Capson enrolled in a postdoctoral program at the University of Utah to study anti-cancer agents derived from marine natural products. There, he met the husband-and-wife team of biologists Phyllis Coley and Tom Kursar, now STRI research associates. They have spent 20 years studying how plants defend themselves against insect predators in the tropics of Southeast Asia, Africa and South America, but mostly on Barro Colorado Island in Panama.

An idea turns into discovery

The whole thing started with a conversation, Capson says, referring to the plan he hatched with Coley and Kursar in 1994 to bring the drug discovery process to Panama. Funding was difficult, but seed money came in two grants of \$70,000 each—one from the University of Utah's Huntsman Cancer Center and the other from the Environmental Trust Fund administered by Fundación Natura, a conservation group in Panama.

In 1996, the three-member team began recruiting scientists and seeking support from the Panamanian government. Two years later, they won a five-year, \$2.5 million grant from the International Cooperative Biodiversity Groups, a program funded jointly by three U.S. organizations—the National Institutes of Health, the National Science Foundation and the Department of Agriculture.

Collaboration begins

Panama's National Authority for the Environment, the University of Panama and Gorgas Memorial Laboratories subsequently signed agreements to ensure appropriate sharing of the profits from any useful products discovered by the program among the collaborating institutions.

Novartis Pharmaceuticals Corp. also signed an agreement with STRI last year to test plant materials identified by ICBG scientists for activity against cancer. Novartis will play a key role in the commercial development of any promising drug candidates discovered in Panama. The company also has agreed to provide training and laboratory equipment for Panamanian scientists.

The involvement of local scientists, academic institutions and government agencies in Panama is vital to the ICBG program in that country, Capson says. Traditionally, he adds, the host countries have provided the raw materials to universities and pharmaceutical companies, but they have not been active in the drug discovery process.

By moving much of this process to Panama, he continues, the ICBG creates opportunities to train students, transfer and develop technology, and improve the scientific infrastructure for a permanent drug-discovery program based in the host country. If host-country scientists take part in these steps, they will be in a position to receive a far greater share of the revenues associated with the discovery of a new medicine. In that manner, drug discovery can provide substantial economic incentives for forest conservation.

To put this in perspective, taxol generates more than \$3 million per day in sales, Capson says.

Young leaves provide best clues

In all the splendid diversity of species in tropical forests, how do scientists choose which is most likely to lead to novel medicines? That is where STRI's more than 90 years of experience in Panama comes in.

On Barro Colorado Island, Coley and Kursar found that young leaves—tender and rich in nitrogen—are the most susceptible to insect attack. Lacking physical defenses, young leaves deter predators with toxins. Infusing the leaves with chemicals slows their growth, so scientists focus on slow-growing, young leaves as most likely to yield compounds of medical interest.

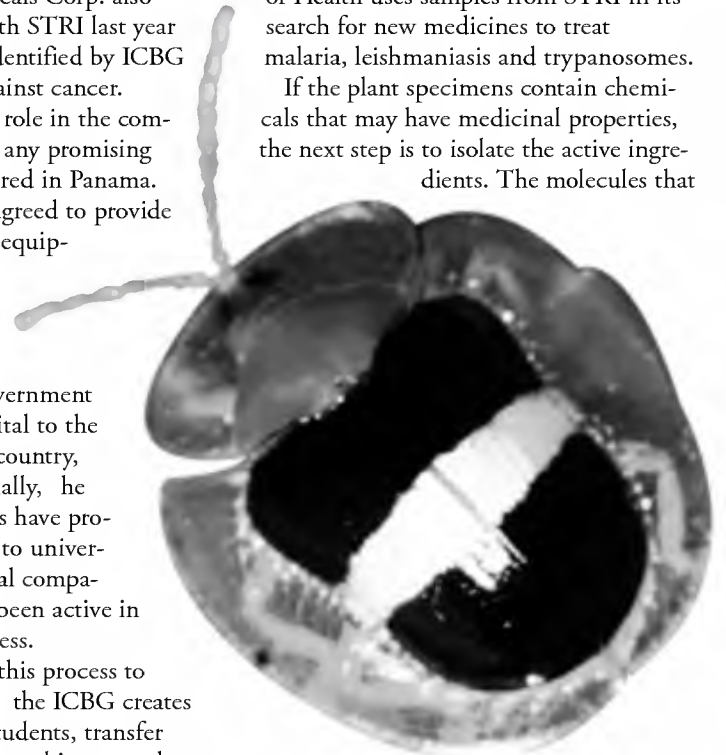
The insects themselves give clues, too. The bright colors of caterpillars and butterflies serve to warn predators that the insects are highly toxic. The toxins they harbor typically come from the plants they eat. Beetles also obtain toxins from plants and advertise this with warning coloration. Orchid bees protect their larvae by building nests from plant resins that have potent antibacterial properties.

Marla Ramos, a scientist at the University of Panama's Department of Microbiology, examines the effect of plant extracts on replication of the virus that causes HIV. (Photo by Todd Capson)

Testing samples

ICBG collaborators in the United States and Panama analyze the samples that STRI collects. At the University of Panama, plant extracts are tested for activity against the human immunodeficiency virus, or HIV, cancer and diseases of the central nervous system. Panama's Ministry of Health uses samples from STRI in its search for new medicines to treat malaria, leishmaniasis and trypanosomes.

If the plant specimens contain chemicals that may have medicinal properties, the next step is to isolate the active ingredients. The molecules that



This red, white and black beetle (*Charidotis aurofasciata*) shows "aposematic" coloring, which means that it employs bright colors in order to display toxicity and to dissuade potential predators. (Donald Windsor photo)

show promise undergo still more tests, and a select few proceed to clinical trials. Of those, only a small fraction become new medicines.

For Capson and his colleagues, the process is at least as important as the potential outcome. Some 40 scientists in Panama now have careers tied explicitly to the conservation of biodiversity in the tropics. Their training is complemented by investments—nearly \$1 million over the last three years—in Panamanian scientific infrastructure, equipment and training.

The involvement of Panamanian scientists in the work that leads to identification of the active ingredient provides the potential to create intellectual property that can be licensed and patented. This is a new model.

It is a long road from a plant to a U.S. Food and Drug Administration-approved medicine, Capson says. If we are fortunate and find a novel medicine that generates revenue from royalties, half of those revenues will contribute to the support of the Panamanian national park system and projects that promote conservation.

Ecological research like that done at STRI has demonstrated how this buzzing landscape helps maintain the health of the planet. Capson and his colleagues and collaborators begin the 21st century hopeful that they can reveal what the forest has to offer to help maintain the health of the people and that the people, in turn, will protect the forest as though their lives depended on it. And perhaps they do.



behavioral studies designed to learn more about giant panda preferences, including if or how they change as they age.

These studies will generate information that will help scientists provide zoo pandas with the best possible environments and also will help them to better understand the needs of wild giant pandas.

The preference study began as soon as Mei Xiang and Tian Tian arrived at the Zoo. In the first year, volunteers collected data on bamboo preferences; environmental (including temperature and humidity) preferences; competency in orientation, navigation and locomotion; and social and reproductive behavior. Ten hours of observations are conducted on each animal each week.

Observers use a remote camera surveillance system with input from microphones and cameras equipped with low light and infrared-vision capabilities, as well as

motion-sensing capabilities. Live video feeds are captured using cameras placed throughout the indoor and outdoor enclosures. A computerized behavioral data collection program allows scientists to rapidly tabulate, summarize and present data.

The giant panda, like the Asian elephant or the Sumatran tiger, is often called an umbrella species, Spelman says, because many other plants and animals share its habitat.

The new giant panda yard will be the anchor of a major renovation at the Zoo called Asia Trail. If we can protect giant pandas, she continues, then we can protect all the other species that live in China's bamboo forests. This concept is the guiding principle behind the Asia Trail, which will provide modern homes for many of the Zoo's other umbrella species. The first phase of the Asia Trail will include new homes for sloth bears, fishing cats, red pandas and giant pandas and is expected to open in 2004.



National Zoological Park Keeper Laurie Perry conducts a one-on-one training session with giant panda Tian Tian. (Photo by Jessie Cohen)

Back in the 1970s, the lab had identified the lethal neurotoxins produced by poison-dart frogs. In the October 1992 issue of *Science*, Dumbacher and his colleagues published the startling news about batrachotoxin in birds.

Tests at NIH showed varying levels of batrachotoxin among the five species of pitohuis. Recently, Dumbacher and the NIH scientists were able to add another New Guinean bird, the blue-capped ifrita, to the world's roster of batrachotoxigenic birds.

Why would a bird be toxic? The



poison that causes numbness, burning and sneezing in people who handle hooded pitohuis—a species with some of the highest levels of batrachotoxin—most likely causes equally unpleasant reactions in snakes and other animals that encounter pitohuis.

Despite the deadliness of poison-dart frogs, a natural chemical defense like a neurotoxin doesn't have to be lethal. It doesn't have to be poisonous enough to kill you, Dumbacher says. It just has to be toxic enough that you don't want to eat them.

Pitohuis tend to be strikingly patterned—the hooded pitohui has brick-red feathers on its belly and back and a jet-black head and wings. Pitohuis also emit a strong sour smell. Both the coloration and the odor might warn other animals that a dinner of pitohui is not recommended.

People in New Guinea tend not to eat pitohuis or ifrita. When they do roast one, they first remove the feathers and skin.

Dumbacher speculates that toxin in the pitohui's skin dander or in feather bits probably sloughs off on the bird's eggs or nestlings, perhaps protecting offspring from predators or even acting as an insect repellent.

Pitohuis aren't born poisonous. In that way also they resemble poison-dart frogs. If fully toxic dart frogs are taken from the wild and then reproduce in captivity, their offspring are born batrachotoxin free.

Both the frogs and the birds probably acquire batrachotoxin from some-

The hooded pitohui's conspicuous coloring may serve as a warning for potential predators. (Photo by John Dumbacher)

thing they eat. We go back and forth all the time trying to figure it out, Dumbacher says. Is it from plants, insects? We don't know.

Searching for more clues

In March, Dumbacher returned to Papua New Guinea to look for answers to that and other pitohui mysteries. For several months, he will follow pitohuis in Varirata National Park, where he hopes to radio-track six to eight birds.

Foods known to be eaten by pitohuis—everything from berries to insects to lizards—will be analyzed as possible sources of batrachotoxin. Dumbacher also will hunt for pitohui nests and try to learn at what age young birds turn toxic.

Dumbacher says there's another reason to study pitohui natural history: The more he learns about its ecology, the more likely that keepers can meet the birds' requirements in captivity.

He hopes to come home with about 20 of the birds, some for long-term study at the Smithsonian National Zoological Park's Conservation and Research Center in Front Royal, Va., and others for display at the National Zoo.

Everything that has been discovered about pitohuis serves to underline nature's continuing ability to astonish. After all, New Guinea's pitohuis were known to science for a century before they sprang their neurotoxic news on a graduate student with cuts on his hands. I think a lot of people were surprised by the finding, Dumbacher says.

The list gets longer

On the other hand, it seems that pitohuis and ifritas are not the world's only poisonous birds; there are at least a couple of others. The spur-winged goose of sub-Saharan Africa may acquire a toxic tang from eating blister beetles. Some European quail also make for dangerous dining, although only during their migration.

So are pitohuis just the tip of the iceberg? Maybe, Dumbacher answers, very few people have gone around tasting or surveying random birds for toxins.

the form of taxes to fund the war. Treasury Secretary Henry Morgenthau Jr. was convinced that higher taxes would only further depress morale. Thus, he persuaded the president to give war bonds one more chance and promised sales of \$1 billion a month by July.

When Morgenthau heard of the magazine cover campaign, Zoidis explains, he thought it was the perfect opportunity to also promote war bonds, hoping that his idea would inspire Americans to support the war with their dollars, as well as their hearts. So in July 1942, many magazines carried not only the flag but also a message to buy war bonds.

The United We Stand campaign was endorsed by the U.S. Flag Association, which awarded its Patriotic Service Cross to eight of the magazine covers. The Cross of Honor, the grand prize for best cover, was presented to House and Garden magazine. It featured Allen Saalburg's elegant watercolor, titled *The American Flag Over Mount Vernon*.

A fading effort

Despite its success, the magazine flag cover campaign of 1942 was not repeated. The Treasury Department requested another campaign for 1943, but only a few magazines featured a flag. Such a campaign was just too difficult to coordinate, and slowly, this major effort was forgotten.

This time around, there was not much media coverage about the flag covers. We found only small features in *Newsweek*, the *Evening Star* and the *Washington Post*, Wright says. And since not all of the magazines were sold at newsstands, the public did not see the full breadth of this campaign. In the end, people had other, more important things on their minds and nothing like it happened again. But that makes it a one-of-a-kind story.

July 1942: *United We Stand* was made possible with generous funding from Linda and Pete Claussen and Nina and Ivan Selin, with additional support from the Magazine Publishers of America.

Research Highlights

Asian art museums director. Julian Raby, distinguished member of the Faculty of Oriental Studies at the University of Oxford, England, has been named director of the Smithsonian's Freer Gallery of Art and Arthur M. Sackler Gallery. He will begin work in mid-May. Raby's broad and varied background includes a career rich in the research, study and teaching of Asian art and culture. A well-known teacher and scholar of Islamic art, Raby, 52, has a wide range of scholarly interests, from Byzantium to China, late antiquity to the Renaissance. He received his bachelor's degree with honors from Magdalen College at the University of Oxford in 1971 and his doctorate in Oriental studies from the University of Oxford in 1981.

New Postal Museum director. Allen Kane, a former senior manager at the U.S. Postal Service, has been appointed director of the Smithsonian's National Postal Museum. He worked at the Postal Service for 30 years before retiring in September. A Brooklyn, N.Y., native, 56-year-old Kane holds a bachelor's degree from Brooklyn College and a master's degree in business



Allen Kane

administration from Baruch Business School in New York. He succeeds James Bruns, the Postal Museum's founding director, who stepped down in November 2000 to become director of operations for American museums and national programs in the Smithsonian's central administration.

Science Commission meets. The Smithsonian Science Commission met for the fourth time Feb. 28 and March 1. The provost and dean of science at the American Museum of Natural History in New York joined the discussion on the best practices and organization of science at other institutions. Subcommittees of the commission reported on site visits and town hall meetings held in January and February at the Smithsonian's research centers in Panama; Edgewater, Md.; Cambridge, Mass.; Front Royal, Va.; and Suitland, Md. Additional meetings were held at the Smithsonian's National Zoological Park and National Museum of Natural History. The next meeting of the Smithsonian Science Commission will take place April 16 and 17.



Julian Raby

Joseph Cornell centennial. In honor of the December 2003 centennial of the birth of Joseph Cornell (1903-1972), the Smithsonian American Art Museum is collaborating with the Voyager Foundation in Washington, D.C., on a DVD and book project about the artist's life and works. Cornell is internationally known for his poetic box constructions, collages and films. The DVD, produced by Cognitive Applications in England and scheduled to be released this summer, will provide an interactive exploration of the artist's subjects, themes and sources. The lavishly illustrated book, to be published by Thames and Hudson in 2003, will feature essays and commentary by Lynda Roscoe Hartigan, chief curator at the Smithsonian American Art Museum; Walter Hopps, curator of the Menil Collection in Houston; Robert Lehrman, chairman of the Voyager Foundation; and Richard Vine, managing editor of Art in America.

Coral reef history. A major, three-year grant from the National Science Foundation will enable John Pandolfi, curator in the Department of Paleobiology at the Smithsonian's National Museum of Natural History, to track the history of coral reef community development from the raised reef terraces of Papua New Guinea. The exposed fossil reef from the 3,000-year-old Holocene interval preserves fossil assemblages before and after a clearly identifiable, narrowly dated and widespread earthquake. The coral reef community structure will be compared with local and global changes in the environment.

Northwest Coast artifacts. A 14-month research project is under way at the Smithsonian's National Museum of the American Indian to develop an exhibition on the museum's Northwest Coast collections. The museum is currently identifying Northwest Coast Native individuals and communities to be involved in collaborative research that will greatly enhance the documentation and interpretation of Northwest Coast objects. The planned exhibition will incorporate the research and present the voices and perspectives of Northwest Coast peoples.

Silver tells a story. Silver services such as a punch bowl with ladle and cups, vegetable and other serving dishes, tureens and coffee urns, and servers, which have

been designed for U.S. Navy ships since the late 1880s, are in themselves beautiful. They also tell an amazing story about U.S. history, U.S. Navy history and American decorative arts history, according to Kenneth Trapp, curator-in-charge at the Smithsonian American Art Museum's Renwick Gallery. His research, *Silver on the High Seas*, has revealed that there is a strong parallel between the development of the United States as a naval power and the tradition of designing special silver services for namesake ships.

Series Publications

The following publications on research in various fields were issued during the period Dec. 1, 2001, through Feb. 28, 2002, 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, Victor Building, Suite 4300, MRC 953, P.O. Box 37012, Washington, D.C. 20013-7012.

Smithsonian Contributions to Paleobiology

88 *Phylogenetic Relationships of the Earliest Anisotrophically Coiled Gastropods*, by Peter J. Wagner. 152 pages, 37 figures, 3 tables, 3 appendices.

94 *Middle Proterozoic (1.5 Ga) Horodyskia moniliformis Yochelson and Fedonkin, the Oldest Known Tissue-Grade Colonial Eucaryote*, by Mikhail A. Fedonkin and Ellis L. Yochelson. 29 pages, frontispiece, 19 figures.

Smithsonian Contributions to Zoology

614 *Biology and Systematics of the North American Phyllonorycter Leafminers on Salicaceae, with a Synoptic Catalog of the Palearctic Species (Lepidoptera: Gracillariidae)*, by Donald R. Davis and Gerfried Deschka. 89 pages, 451 figures, 6 maps, 4 tables, 1 graph.

615 *A Generic Revision and Phylogenetic Analysis of the Dendrophylliidae (Cnidaria: Scleractinia)*, by Stephen D. Cairns. 75 pages, 3 figures, 14 plates, 3 tables.

616 *Ostracoda (Myodocopa) from Bahamian Blue Holes*, by Louis S. Kornicker, Thomas M. Iliffe and Elizabeth Harrison-Nelson. 99 pages, 69 figures, 2 maps, 8 tables.

Books & Recordings

Official Guide to the Smithsonian (Smithsonian Institution Press, 2002, \$12.95). A colorful guide to the Smithsonian's 16 museums and National Zoological Park.

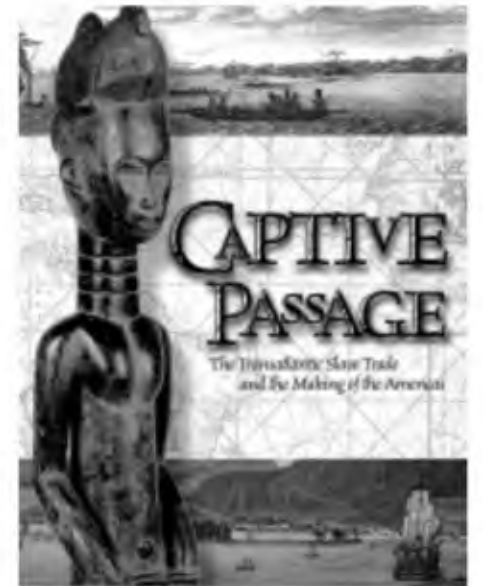
Official Guide to the Smithsonian: National Air and Space Museum (Smithsonian Institution Press, 2002, \$14.95). A comprehensive, full-color

tour of the world's greatest and most-visited aviation and space museum.

Tales of a Helicopter Pilot, by Richard C. Kirkland (Smithsonian Institution Press, 2002, \$21.95). Sixteen harrowing, true narratives of helicopter rescue missions, spanning the time from pre-World War II to today's civilian rescues.

Sharks, by Michael Bright (Smithsonian Institution Press and the Natural History Museum, London, 2002, \$16.95). An illuminating and engaging look at sharks and their diverse characteristics.

Captive Passage: The Transatlantic Slave Trade and the Making of the Americas (Smithsonian Institution Press and the Mariners Museum, 2002, \$39.95 cloth; \$21.95 paper). Eight essays and 160 color illustrations examine the complex causes,



Captive Passage examines the largest forced migration in history, the slave trade.

outcomes and legacies of the 400-year slave trade.

Bats, by Phil Richardson (Smithsonian Institution Press and the Natural History Museum, London, 2002, \$16.95). Many misconceptions are laid to rest in this informative and lively overview.

Whales and Dolphins in Question: The Smithsonian Answer Book, by James G. Mead and Joy P. Gold (Smithsonian Institution Press, 2002, \$55 cloth; \$24.95 paper). A collective response to thousands of letters and phone calls received annually by the Smithsonian's National Museum of Natural History about all species of whales and dolphins.

Cool Comfort: America's Romance With Air-Conditioning, by Marsha E. Ackermann (Smithsonian Institution Press, 2002, \$27.95). On the 100th anniversary of the first installation of air-conditioning, a look at how air-conditioning grew from a utopian dream to an American expectation.

The Storage Box of Tradition: Kwakiutl Art, Anthropologists and Museums, 1881-1981, by Ira Jacknis (Smithsonian Institution Press, 2002, \$55). An investigation of the effects of the long-term interaction

Books, continued on Page 8

Smithsonian Book of Giant Pandas

by Susan Lumpkin and John Seidensticker
(Published by Smithsonian Institution Press, 2002, \$39.95)

The arrival of giant pandas Tian Tian and Mei Xiang at the Smithsonian's National Zoological Park a little more than a year ago has created an enormous outpouring of public support for the conservation of this endangered species. The first step in attempting to ensure a future for giant pandas, the authors note in the *Smithsonian Book of Giant Pandas*, is understanding both their history and their current relationship with people.

In the book, the authors, Susan Lumpkin, communications director for Friends of the National Zoo, and John Seidensticker, senior curator at the National Zoo, examine the intertwined relationship between giant pandas and people. They explore how these striking animals became icons of goodwill between nations.

Lumpkin and Seidensticker also share with readers their personal experiences of working with these animals in the United States and China. In addition, they address the Smithsonian's monumental commitment to conserving these creatures and the challenges that go along with those efforts.

Giant pandas are among the most endangered of animals; they also are among the best known, the authors write.

Today, wild giant pandas live isolated in just a few mountain ranges in China.

Lumpkin first saw giant pandas in Chinese zoos in late 1980, and Seidensticker initially explored giant panda reserves in China in early 1981.

Knowledge gained from those trips was vital to the book. Writing the *Smithsonian Book of Giant Pandas* took about four months, but we've really been writing this book for 20 years, since we first went

to China and began thinking about giant pandas and their conservation, as well as more broadly about carnivores and about zoos, Lumpkin says. More intensively, this project began in late 1999, when we toured panda country in Sichuan and wrote articles about the changes in prospects for the future of giant pandas in the wild. At about the same time, the National Zoo began its concerted effort to bring another pair of giant pandas here [after the death of Ling-Ling in 1992, followed by Hsing-Hsing in 1999.]

Participating in this process, as well as observing how profound the giant pandas appeal is, Lumpkin continues, shaped our thinking about the panda as a cultural icon. So, it was only the putting words on paper that took four months. And this was a truly exhilarating experience for us—the ability to focus so completely and intensely on giant pandas. This total immersion sharpened our thinking and enhanced creativity.

Seidensticker says that while he and Lumpkin are interested in the biology of the large mammals, we have increasingly shifted the scale of our attention from seeking to understand the ecological and behavioral needs of giant pandas to understanding and encouraging landscape pat-



The new book from Smithsonian Institution Press explores the natural history and conservation of giant pandas.

terns in which large mammals, as different as elephants, giant pandas and tigers, can persist.

As biologists, he adds, we are interested in determining the factors that explain the life history adaptations of giant pandas and exploring the population-level consequences of these adaptations. We need to know what is necessary for giant panda survival in the wild if we are to develop strategies to secure their future.

One of the goals of both Lumpkin and Seidensticker is to raise awareness about these animals—from their evolution to efforts to save them in the wild. We have

been thinking about these issues for more than two decades, they say, and in writing the book, we had an opportunity to bring our thoughts together, and giant pandas are as good a focal species as there is. Through this book, we want to create an awareness of the larger context of panda conservation and what it will take for there to be wild giant pandas in our future.

Jo Ann Webb

In May, some Contributing Members will receive Smithsonian Book of Giant Pandas as a benefit of membership.

Books, continued from Page 7

between anthropologists and the Kwakiutl peoples of coastal British Columbia and the cross-cultural exchanges that resulted.

Creating Colonial Williamsburg, by Anders Greenspan (Smithsonian Institution Press, 2002, \$45 cloth; \$17.95 paper). How Colonial Williamsburg's evolving presentation of history offers an excellent means of understanding many social and political changes in 20th-century America.

The Kremlin's Nuclear Sword: The Rise and Fall of Russia's Strategic Nuclear Forces, 1945-2000, by Steven J. Zaloga (Smithsonian Institution Press, 2002, \$45). Drawing on Russian documents and interviews with designers and engineers of Russian nuclear missiles, a definitive account of this country's strategic forces, who built them and why.

Making Museums Matter, Stephen E. Weil (Smithsonian Institution Press, 2002, \$40 cloth; \$18.95 paper). Twenty-nine recent essays by the author addresses his beliefs that museums should be able to make themselves matter in an environment of potentially shrinking resources.

The Heart of Cape Breton: Fiddle Music Recorded Live Along the Ceilidh Trail (Smithsonian Folkways Recordings, 2002, \$15 CD). The sounds of Cape Breton,

located on Nova Scotia, are alive in these recordings from live concerts and dances.

Heroes and Horses: Corridos From the Arizona-Sonora Borderlands (Smithsonian Folkways Recordings, 2002, \$15 CD). A slice of life along the Arizona-Sonora border as it has been lived and memorialized in corridos, or ballads.

Fast Folk: A Community of Singers and Songwriters (Smithsonian Folkways Recordings, 2002, \$21 CD). This double compact-disc set features the music of such greats as Shawn Colvin, Steve Forbert, John Gorka, Lucy Kaplansky, Christine Lavin and others.

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 from Smithsonian Folkways Mail Order, Victor Building, Suite 4100, MRC 953, P.O. Box 37012, Washington, D.C. 20013-7012. To order by phone or for more information, call (202) 275-1143 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.

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