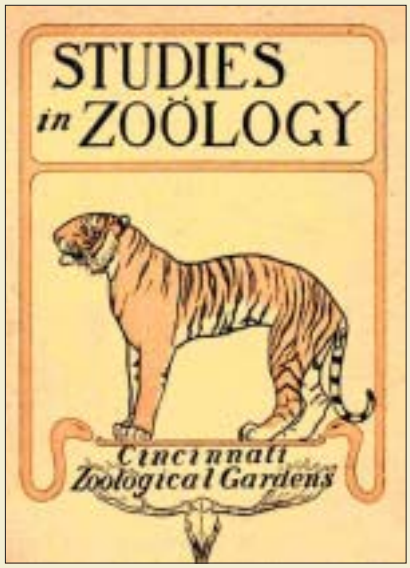
Inside
Smithsonian Research

Smithsonian Institution

SCIENCE, HISTORY AND THE ARTS

NUMBER 7 · WINTER 2005

Evolution of the zoo. Brass bands, boxing matches and outdoor dances were once regular entertainment at Belle Vue Zoological Gardens in Manchester, England. After seeing the animals, visitors also could enjoy Belle Vue's amusement park and motor speedway. In the past century, zoological parks offered many kinds of public entertainment considered unorthodox by today's standards. In 1905 at the New York Zoological Gardens, for example, children could ride an Indian elephant around the zoo grounds. A revealing look at the variety of roles zoos have played in the last 100 years is available in the large research collection of zoo pamphlets and guidebooks maintained by the Smithsonian's National Zoological Park Library. The Smithsonian Web site "Zoos: A Historical Perspective" offers a sampling of some of the hundreds of these pamphlets and guides—including maps, drawings and photographs of zoos from more than 30 states and 40 countries—available in the National Zoo Library. **—www.sil.si.edu/ondisplay/zoos/intro.htm**



This journal from the Cincinnati Zoological Gardens was printed in 1900.

'America on the Move.' Henry Bliss holds the dubious distinction of being the first person in America to die in a car accident. Stepping from a New York City streetcar in September 1899, he was hit by an electric taxi. In the early years of motoring, not all Americans were convinced that the new "devil wagons" were here to stay. But as people came to value the convenience of the automobile, cars became a significant part of everyday life. A slew of businesses—gas stations, tire shops, garages—sprang up to supply drivers' needs. Twenty-three million cars were on the road by 1930, and more than half of America's families owned one. The rise of the automobile is just one facet of "America on the Move," a new fact- and image-filled online exhibition from the Smithsonian's National Museum of American History. Using the museum's vast transportation collections, this Web site takes visitors on a journey through America's past, along its canals, railroads, highways, airways and waterfronts to learn how transportation satisfied a restless population and transformed a continent. This Web site is a preview of the real thing: the 26,000-square-foot exhibition "America on the Move," at the National Museum of American History in Washington, D.C.—**americanhistory.si.edu/onthemove/index.html**

Winton touring car, 1903

Inside
Smithsonian Research

NUMBER 7 • WINTER 2005

Published quarterly by the Smithsonian Office of Public Affairs, Smithsonian Institution Building, Room 354, MRC 033, P.O. Box 37012, Washington, D.C. 20013-7012, for Smithsonian Contributing Members, scholars, educators, museum personnel, libraries, journalists and others. To be added to the mailing list or to request this publication in an accessible format, call (202) 357-2627, ext. 119 (voice) or (202) 357-1729 (TTY).

John Barrat, *Editor*

Colleen Hershberger, *Assistant Editor*

Evelyn S. Lieberman, *Director of Communications and Public Affairs*

Kathryn Lindeman, *Publications Director*

Telephone: (202) 357-2627
E-mail: insideresearch@si.edu
Internet: www.si.edu/insideresearch

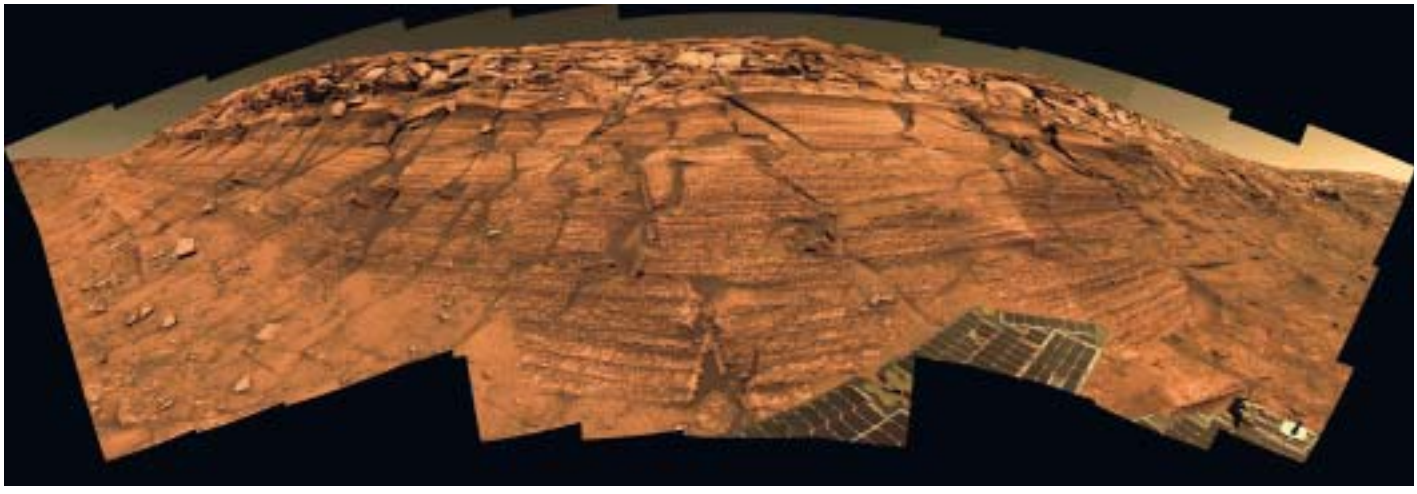
Contributing Members who seek information about the Smithsonian or about their memberships may write to The Contributing Membership, Smithsonian Institution, A&I 1130, MRC 410, P.O. Box 37012, Washington, D.C. 20013-7012, or call 1 (800) 931-32CM or (202) 357-1699.

On the cover: The tracks of the National Aeronautics and Space Administration's Mars rover Spirit can be seen in the dust of Gusev Crater. This image was taken by Spirit at a position three-fourths of the way between Bonneville Crater, inside Gusev Crater, and the base of the Columbia Hills. This approximate-true-color image is part of a photographic panorama made up of 384 separate photos. *(See story on Page 3.)*

Smithsonian Institution

Astounding images from Mars are telling a fascinating story of planetary geology

By Rita Zeidner
Special to Inside Smithsonian Research



Most geologists take for granted the ability to hold in their hands samples of the rocks and soils they study. For John Grant, however, such access is impossible. A geologist with the Center for Earth and Planetary Studies at the Smithsonian's National Air and Space Museum, Grant's interest lies in rocks he can never touch that are more than a hundred million miles away on the planet Mars.

But two golf-cart-size rovers that landed on the red planet in January 2004 are now allowing Grant and an interdisciplinary team of researchers from the National Aeronautics and Space Administration, Cornell University, the U.S. Geological Survey and other organizations to give the materials of the Martian landscape nearly the same scrutiny they can give to rocks here on Earth.

Grant, who co-chaired a rover landing-site selection committee that spent two years evaluating about 155 possible landing sites, says the rovers' findings have brought about dramatic changes in how scientists understand the development of Earth's closest neighboring planet.

"There is not a person on the project who is not amazed by the findings," he says from his office in Washington, D.C.

Looking for water

Equipped with suites of imaging and remote-sensing devices and various spectrometers capable of identifying minerals by reading infrared radiation, the two rover labs have been working much like human geologists. They are scouring the Martian surface for interesting rocks and soils and transmitting data and images to scientists back home.

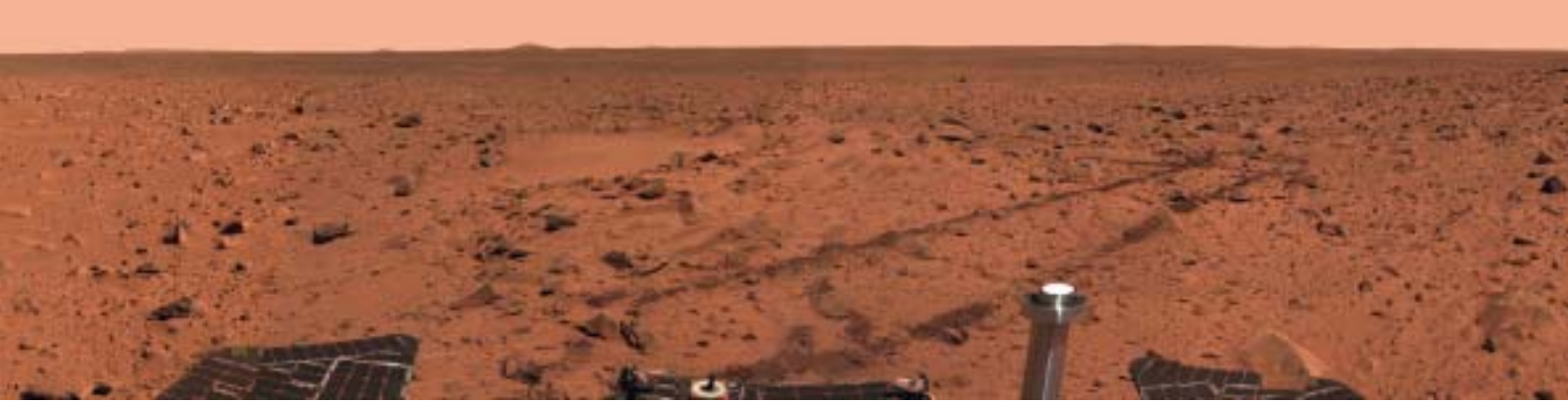
"The rovers' cameras allow us to see the juxtaposition of different land forms, which helps us pick out rock targets that we can approach," Grant explains. "We then command the rover to place other instruments right on the rocks using the rover arm. This method of characterizing the surface and analyzing targeted rocks in detail allows us to piece together the planet's geologic history. More specifically, we are looking for evidence of past and present water. If there was water, then maybe there were once conditions favorable to life."

The mobile laboratories were launched separately from Florida's Cape Canaveral Air Force Station on June 10, 2003. Named Spirit and Opportunity, each rover made the trip tucked inside a lander encased in a protective aeroshell and attached to a disc-shaped cruise stage.

In planning for the $820 million rover mission, Grant says, "the mantra was,

(continued)

Above: National Aeronautics and Space Administration Mars rover Opportunity captured this view of Burns Cliff, a southeastern portion of the inner wall of Endurance Crater, in November 2004. In this wide-angle composite of 46 different images, the cliff appears to bulge outward. In reality, the walls form a gently curving, continuous surface. (Photo courtesy of NASA/JPL/Cornell)



'You won't get any science if you don't land safely.'" Landing sites that seemed too rugged, too rocky or too high in elevation—meaning a descending spacecraft would pass through less Martian atmosphere and thus not reduce its speed sufficiently before landing—were rejected by the selection committee.

The rover Spirit

Spirit, which landed first in Gusev Crater, a Connecticut-size basin on Mars' Southern Hemisphere, has been adding fresh evidence about the history of the layered bedrock there. Before, scientists believed that a wide, dry channel that runs downhill for hundreds of miles to the crater was carved by water flowing into the crater.

But data collected by the rover so far have shown no evidence of a past body of water in the crater. Rather, Spirit's findings suggest the exposed surface of Gusev was shaped mainly by wind and lava flows. "All of the surficial deposits are basaltic and their uniform composition argues for a local volcanic origin," says Grant. He was principal investigator for the paper "Surficial Deposits at Gusev Crater Along Spirit Rover Traverses," published in a special supplement to the Aug. 6, 2004, issue of Science. Grant also served as co-author for a number of other peer-reviewed papers on the geology of Mars in that same issue.

Still, the surface materials in Gusev Crater may be masking or burying evidence of a former lake, Grant adds.

As Spirit closed in on the Bonneville Crater inside Gusev, a 690-foot-wide impact crater, the rocks it encountered increased in size about fivefold. The meteor impact that excavated the crater heaved volcanic rocks to the surface from as deep as 33 feet.

"The shape, size and clearly defined distribution of ejected blocks larger than 8 inches around Bonneville is generally consistent with observations made around pristine craters here on Earth," Grant says. His interest in how landscapes evolve has taken him to craters in the western United States and in Argentina and Namibia. Studying how craters erode and change over time on Earth enables Grant to form conclusions about the process of geologic change on other planets.

Other clues suggest the presence of at least some water in Gusev. Rocks that were bored into by Spirit's rock abrasion tool have coatings and bright veins—apparently from mineral alteration after the rocks formed. "Bromine and other properties of the rocks suggest the veins reflect alteration resulting from exposure to water," Grant says. Coatings on the rocks suggest the exposure occurred while the rocks were buried.

Spirit's investigations of the Columbia Hills—about two miles from the initial landing site—suggest that the hills are made up of different materials than the surrounding plains. But they, too, may have been shaped by volcanic activity, rather than water, Grant says. The hills—

Above: This false-color panoramic view of Bonneville Crater inside Gusev Crater was taken by the rover Spirit. It shows the crater's rim, interior and Spirit's tracks. Part of the rover is visible in the foreground at left. (Image courtesy of NASA/JPL/Cornell)

Left: Circles ground into a rock in Endurance Crater by an abrasion tool carried on the rover Opportunity lets scientists study the interior of Mars rock. Tiny spherules of hematite, which can be seen dotting the surface of the rock in this image, are believed to be the source of the red powder shown here. Colors are exaggerated to help researchers spot differences in rock texture and composition. (Image courtesy of NASA/JPL/Cornell)

Opposite: John Grant, a planetary geologist in the Center for Earth and Planetary Studies at the Smithsonian's National Air and Space Museum, studies digital photographs taken by the NASA rovers to study the geology of the surface of Mars. Both rovers, which landed on Mars in January 2004, have been exploring the planet's surface guided by scientists on Earth. (Photo by Eric Long)

about 300 feet high and four miles long—appear to be an older geological outcrop rising out of the younger plain where Spirit landed.

"Ongoing investigations of the hills in the coming months will provide more clues as to their origins," Grant says.

The rover Opportunity

Halfway around the planet, Opportunity hit the jackpot early. Landing on the Meridium Planum, a smooth landscape near the planet's equator, the rover's versatile scientific instruments detected hematite and sulfate salts—minerals found on Earth that usually are associated with a wet environment. The presence of chlorine and bromine in the rocks provide additional clues that a body of deep salty water once flowed gently over the area. However, this is not enough to determine the size, depth and longevity of the water.

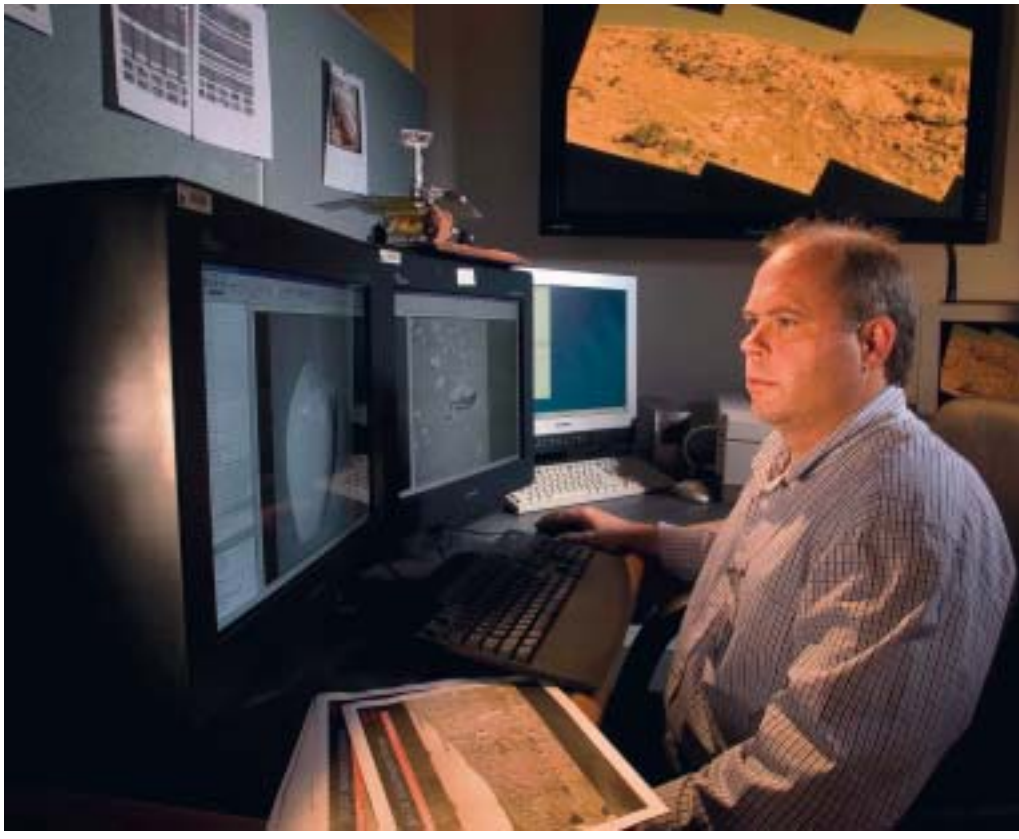
Moving slowly and deliberately on its six wheels, Opportunity has spent the last 11 months scoping out the surrounding two miles. On some days, the vehicle—operated mostly from NASA's Jet Propulsion Lab in Pasadena, Calif.—moves only a few inches or not at all and spends time analyzing soils and rocks.

By mid-November 2004, Opportunity reached the furthest point east in its travels inside Endurance Crater in the Meridium Planum. After the rover's drivers on Earth determined that there was no safe path beyond its current position, the lab was directed to initiate an intensive remote-sensing campaign, capturing a panorama of Burns Cliff, along with super-resolution images and miniature thermal emission spectrometer observations of other select targets.

Both solar-powered rovers have had to work quickly to capitalize on sunlight. As on Earth, the amount of sunlight varies with the season. Both rovers, however, have worked beyond their intended lives. Expected to have enough power to last only 90 days, the expedition has been extended twice and, as of press time, was closing in on a year.

As of December 2004, "the rovers are still doing fine and going strong with no end in sight," Grant says. "With any luck, Spirit and Opportunity will continue for a very long time." ❖

Surface materials in Gusev Crater may be masking or burying evidence of a former lake, Grant says.



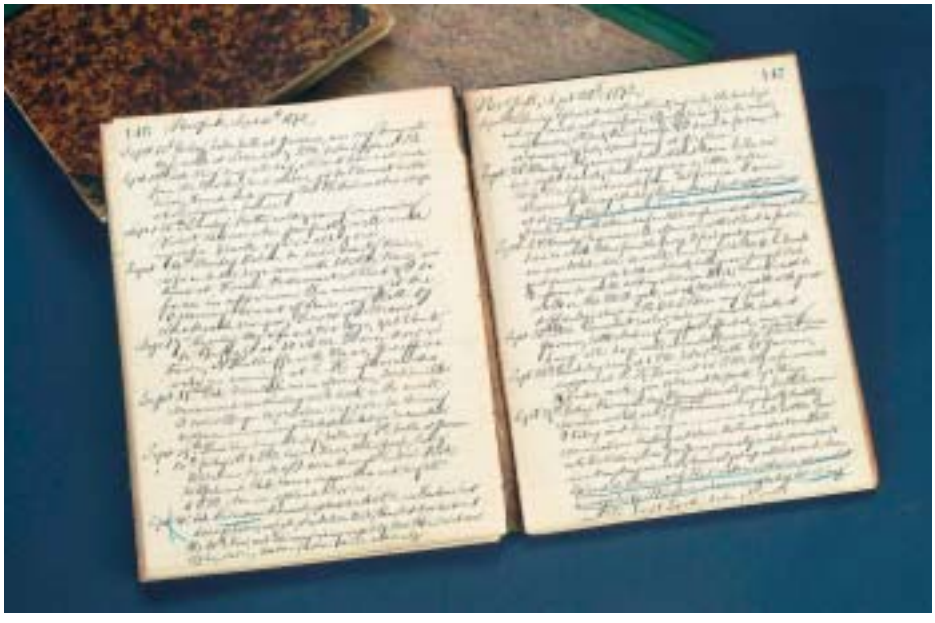
Steinway diary project is bringing to light many rich 'nuggets' of piano history

By Barbara Wells
Special to Inside Smithsonian Research

A dry, faintly sour smell of aging paper floats up from the pages of a ledger sitting open on a reading table in the Archives Center of the Smithsonian's National Museum of American History.

Deeply yellowed at the edges, its ruled pages lie loose inside the cover, the sewn binding having pulled apart long ago. Dated entries in this antique notebook divulge that it was used as a diary in the mid-1800s.

Writing in distinctive longhand, piano manufacturer William A. Steinway (1835-1896) poured his innermost thoughts and the intimate details of his daily life into nine of these notebooks between 1861 and 1896. In 1994, Steinway's grandson, Henry Z. Steinway, gave this remarkable diary to the Smithsonian as a gift.



Steinway recorded everything, from President Lincoln's assassination to the health of his children, the weather, meetings he had with President Grover Cleveland, his ailments and even the frequency of his sexual activities with his wife. But most important to piano afficionados are his insider's observations about the manufacture and design of the Steinway piano and his role in the rise of his family's piano business, Steinway & Sons.

Entrepreneurial genius

"A treasure" is how Smithsonian Curator Cynthia Adams Hoover—an avid scholar of music in American life—describes Steinway's notebooks, which she has studied for more than four decades.

"William A. Steinway was a major figure in 19th-century American life," Hoover says of this German-born American immigrant. He was the entrepreneurial genius behind the meteoric rise of Steinway & Sons and president of Liederkranz, a German singing society in New York City that was a leading social organization of the German American community.

Steinway left his mark on New York City. He chaired the Rapid Transit Commission that designed the city's subway and developed the neighborhood known as Steinway Village near the Steinway factory in Astoria. He also supported Bowery Bay Beach, now the site of LaGuardia Airport, in Astoria—a serious competitor to Coney Island that included a grand pier and a ferry.

A very complex man

Since the late 1980s, long before the diary was given to the Smithsonian, Hoover has supervised a research team of dozens of Smithsonian volunteers who have been annotating and editing the thousands of entries in Steinway's notebooks. Combing century-old newspapers, books, letters and other historical materials, the project team is gradually filling in the details of Steinway's diary, which piano historian and project co-editor Edwin M. Good has been transcribing.

"Steinway often alludes to things and to people, but rarely ever spells out what happened," Good observes. "Our job is to flesh out the implied narrative with annotations, explaining what he doesn't explain, identifying events, people and places he alludes to but doesn't identify."

Steinway was "a very complex man indeed," Good adds, "absolutely sure of himself and his opinions, often overbearing, passionate about music and a worka-

holic who couldn't imagine not spending all day, every day at the office and often working at home until 11 p.m. or later."

Steinway's first marriage did not last. "I am deeply excited and for hours cannot master my tears," he wrote on Oct. 16, 1875, after a hired detective confirmed that his wife was having an affair. "The rain falls in torrents all day. Can hardly eat any supper and shortly after fall into the wildest paroxysm of grief." He was later happily remarried.

Piano innovation

Steinway immigrated to the United States in 1850 at age 15 and soon became the driving force behind Steinway & Sons, a company started in America by his father, Heinrich Engelhard Steinway. While his brothers Henry Jr. and C.F. Theodore were the company's innovators, receiving several patents that altered the design and sound of the grand piano, William oversaw the business operations. He managed the finances, built factories, opened piano salesrooms across the country and promoted Steinway pianos to the public.

During the 1800s, many innovations to produce a stronger, more powerful piano were ushered in, including the revolutionary two-tiered arrangement of strings on a cast-iron frame that Steinway & Sons patented in 1859, Hoover says. The "overstringing," along with the increased strength of the iron frame, allowed for longer and more resonant strings.

Everywhere in the diary, new piano designs and the fierce competition that accompanied them loom large, culminating in the triumph of American technology showcased at the 1867 Paris Exhibition, with Steinway & Sons among those winning top honors.

Critical details of the history of the piano are "spread hither and yon in little nuggets throughout the 2,500 handwritten pages of his diary," Good says. Pulling them together in a manner that historians and others will find useful is a principal goal of the Steinway project, Hoover says.

"Musical instruments are a real strength of the Smithsonian's National Museum of American History. Our collection has many important historical pianos [including five Steinways] and other musical instruments," Hoover says. "William Steinway's diary adds an important human dimension to the manufacture and promotion of these wonderful instruments."

Through collaboration with the Smithsonian Institution Libraries, the diary will eventually be published as a digital Web resource on the Libraries' Web site. ❖

Opposite: Writing in his distinctive longhand, William Steinway kept his diary from 1861 until a few days before his death in 1896. He filled nine ruled notebooks. A few of his entries from September 1872 are shown in this photo. Blue underlines were made at a later date by a family member. (Photo by Harold Dorwin)

Above: This portrait of William Steinway was taken in 1882 by Carl Borntraeger while Steinway was traveling in Germany.

Below: William Steinway and his first wife stand on the steps nearest the camera in this photo taken about 1863 along East 52nd Street in New York City. William and his wife lived alongside his parents, the Heinrich Engelhard Steinways, and one brother, Henry Jr., and his wife, just down the street from the Steinway factory. The rear of the factory can be seen at far left. The factory stood on what is now Park Avenue. (Photos courtesy of the Archives Center, National Museum of American History)

Saltwater inclusions and brilliant, hidden colors reveal marine origins of jade

By Michael Lipske
Special to Inside Smithsonian Research

Considered more precious than diamonds or rubies, China's imperial green jade has been revered by Asian cultures for more than 2,000 years. The Chinese call jade the "stone of heaven."

Now, new research by a Smithsonian geochemist has revealed that this translucent mineral has an origin that is almost as fascinating as if it actually was forged in the heavens. Remarkably, Sorena Sorensen says, most of Earth's jade crystallized 100 million to 200 million years ago in high-pressure, low-temperature subduction zones where the plates that make up Earth's crust converge. Composed of the dissolved mineral constituents carried in seawater, jade also contains seawater itself, Sorensen says, "present as tiny inclusions of fluid within its mineral grains."

In her laboratory in the National Museum of Natural History, Sorensen is examining an ultra-thin slice of polished jade mounted on a glass slide. The sliver is from a 100 million-year-old rock Sorensen collected in Guatemala in January 2004.

Through the eyepiece of her microscope, the jade is nearly colorless. However, the specimen's black-and-white crystal pattern is interrupted by a tiny elongated inclusion, 10 microns across—about one-tenth the thickness of a human hair.

Inside the inclusion is a pocket of water and a spherical bubble. Based on analysis of similar fluid inclusions found in other jade samples, Sorensen's collaborators determined that the water is briny. "Jade has the fluid from which it grew trapped inside it," Sorensen says. "And it turns out to be seawater!"

The bubble is gas that formed as the inclusion cooled and the rock containing it came to the Earth's surface.

Sorena Sorensen in the cathodoluminescence lab of the Smithsonian's National Museum of Natural History (Photo by James Di Loreto)

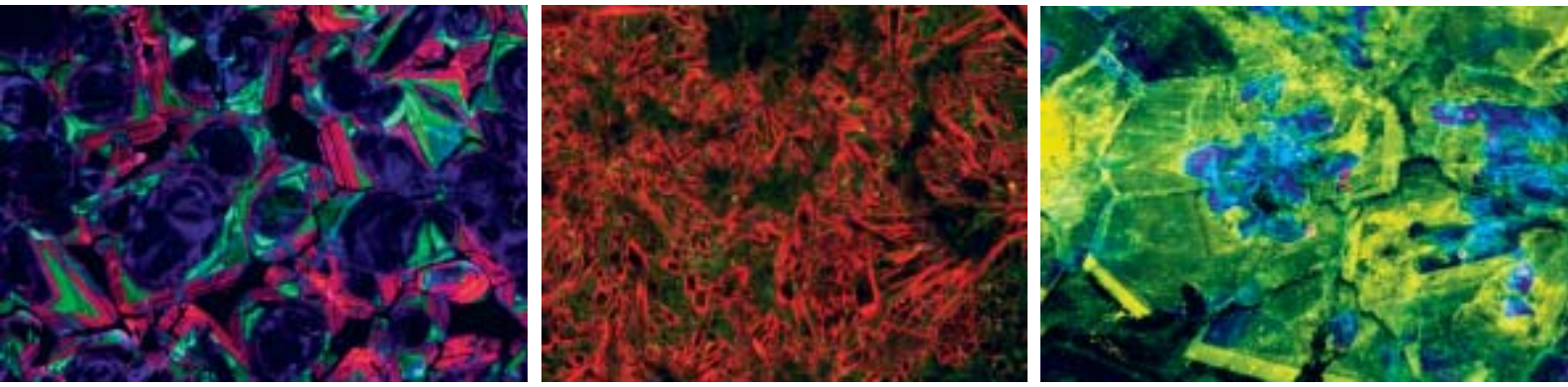
Subduction zones

Sorensen specializes in studying rocks that form from fluids. In particular, she examines the chemical effects of subducted, or sunken, seawater in the Earth's crust.

"Subduction zones form when two plates of the Earth's crust—which consist of the crust and the uppermost mantle beneath it—converge," Sorensen says. "The oceanic crust sinks beneath either an older oceanic crust—which is thicker, colder and denser—or the edge of a continent."

The descent of the cool, water-rich oceanic crust deep into the hot mantle produces a subduction zone, a region within the crust and mantle characterized by high pressure and low temperature. "That's where jade begins," Sorensen says.

Jade, and the rock known as jadeitite that contains it, is created when seawater trapped in ocean-floor rocks sweats out in the subduction zone. The high pressure found at depths of 18 to 25 miles beneath



Colors in cathodoluminescence images of jade allow geologists to determine the sequence in which the minerals grew. Blue crystals in the jade specimen at far right, for example, are older than the yellow-green crystals in the same sample. Yellow-green crystals are older than the darker, nonluminescent crystals. Black parts in the images are the mineral albite. The left and center jade specimens are from Guatemala. The one at far right is from the Ural Mountains of Russia. (Images by Sorena Sorensen)

the Earth's surface, combined with the subducted plate's relatively low temperature of about 752 degrees Fahrenheit, causes the minerals trapped in the seawater to condense and crystallize into veins of jade.

In recent years, Sorensen has collected jade samples in Burma and Guatemala at sites where jade has returned to the Earth's surface inside "host rocks" of serpentinite. Geologists locate areas of ancient subduction zones by looking for telltale rocks, such as eclogite and blueschist, that Sorensen says function like "fossils representing the deep cold parts of plate boundaries. The rocks themselves tell you that this was once an area that had high pressure and low temperature," Sorensen explains.

Cathodoluminescence

Sorensen came to the study of jade in 1997 after she was asked to present a short lecture about the geology of jade at a Smithsonian forum. Reading about jade in preparation for her talk, she came across a paper in French by a group of gemologists and petrologists who were using a technique called cathodoluminescence to examine microstructures within jade.

Cathodoluminescence of a mineral is created when a high-energy electron beam is aimed at an ultra-thin sliver of rock. In addition to other radiation products, minerals in the rock emit visible light that reveals the distribution patterns of trace element groups within the mineral grains.

Sorensen borrowed some jadeitite specimens from the museum's mineral collection and made a few trial cathodoluminescence images. "What I saw changed everything," she recalls.

Growth history

Features revealed by Sorensen's jade images indicated to her that, contrary to what most of the scientific papers she was reading had said, jadeitite seemed to have crystallized directly from fluids and not from other rocks. Different colors in the images revealed different elements, such as iron, manganese, chromium, titanium and rare Earth elements.

In this jadeitite sample from Guatemala, arrows point to fluid inclusions that contain bubbles of gas and an aqueous fluid that is slightly saltier than seawater. Nearly every feature in this image is a fluid inclusion. (Sorena Sorensen photo)

Crystallization patterns, in combination with the trace element and oxygen isotope data that are uniquely associated with each color in each jade specimen, offer "a growth history of the order in which the trace elements had been deposited by seawater flowing in a subduction zone," Sorensen explains. "You get a timeline—this happened first, this happened second," she says of the information she could glean about the crystallization process of the jade. "It's kind of analogous to tree rings.

"The main value of my work," Sorensen continues, "is in interpreting the evidence for how aqueous, or water-rich, fluids move and transfer chemical components around in subduction zones. This is important in that it can lead to a broader understanding of the way continents grow and chemically evolve.

"Jade turns out to be a fairly sensitive 'tape recorder' of the compositions of one type of fluid [seawater] in one part of a subduction zone," Sorensen says. "It also reveals how, over time, this type of fluid changes in subtle ways that reflect the pressures and temperatures of its crystallization and the rocks it has passed through." ❖

Miniature American portraits on ivory embody feelings of love, loss and separation

By Caroline Taylor
Special to Inside Smithsonian Research

What a buttoned-up era it was. Just look at them, swathed in throat-hugging lace and starched collars. Not exactly grim-faced, but there are precious few smiles, even on the children. Nonetheless, these antique miniature portraits in the collection of the Smithsonian American Art Museum are captivating.

There's the handsome Col. Elija Rice, painted in 1839; gray-haired beauty Elizabeth Oliphant, painted in 1795; a young Beulah Appleton and her cat, done around 1840; a spectacled James Wilson from 1795; and the alluring (and smiling!) Mrs. John Willis Ellis, painted in 1846.

These and nearly 445 other portrait miniatures—dating from the late 1700s to the mid-1900s—will go on display in the Luce Foundation Center for American Art when the American Art Museum reopens on July 4, 2006.

A series of 32 pull-out drawers will house the miniature portraits, says Luce Center Curator George Speer. The display will allow visitors a face-to-face look at an artistic genre that originated in Europe, then became vogue in America from the mid-1700s to the mid-1800s.

Watercolor on ivory

An 1800 portrait, "Thomas Williams, of Annapolis," by artist Robert Field (1769-1819), is characteristic of the size and materials of most of the miniatures in the American Art Museum's collection. Small enough to fit in one's palm—measuring 3¼ by 2½ inches—the portrait was painted in watercolors on an oval slice of polished ivory. Ivory was preferred, as it imbues faces with a translucent glow.

Miniature-portrait artists often used a small easel and looked at their work with a magnifying glass to reduce the disparity between the facial proportions of the sitter and those in the painting. Before it was painted, the ivory oval or square "canvas" was glued to a paper backing so it could be handled when wet. Colors were applied with a short-handled paintbrush with a sharp point called a "pencil" that facilitated stippling, hash-marks and minute detail.

The Smithsonian's collection includes portraits by artists who specialized in miniatures, such as Eda Casterton (1877-1969), Sarah Goodridge (1788-1853) and Edward Greene Malbone (1777-1807), as well as artists renowned for working on a larger canvas, such as Charles Willson Peale (1741-1827) and John Singleton Copley (1738-1815).

During the late 1700s and early 1800s, the growing demand for miniature portraits in America saw the rise of many self-taught itinerant portraitists, as well as an influx of skilled artists from England, France and Italy, some of whom are represented in the museum's collection.

Personal mementos

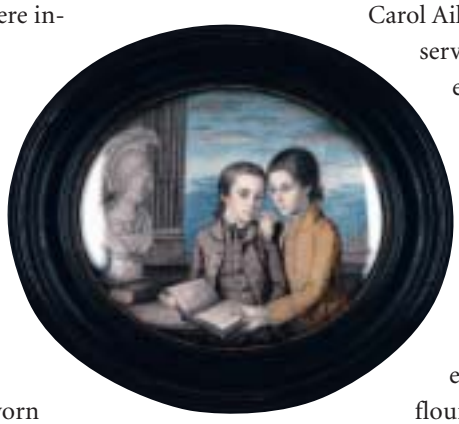
But the untold stories behind these tiny portraits are tales of love, loss and separation. Miniature portraits were commissioned mainly as personal mementos on the occasion of a death, marriage, birth or extended separation.

"Death was a larger presence in people's lives back then," Speer says. "Sweethearts died at sea, wives died in childbirth, chil-

Below, from far left: James Wilson (1795), by Jean Pierre Henri Elouis; Beulah Appleton (circa 1840), by Sarah Goodridge; George Partridge Richardson (circa 1835), artist unknown; self-portrait (circa 1824), by Sarah Goodridge; Mrs. John Willis Ellis (1846), by John Henry Brown; and Mrs. Gardner D. Stout (circa 1940), by Elsie Dodge Pattee. Bottom: Matthias and Thomas Bordley (1767), by Charles Willson Peale

dren were taken by illness, and miniatures served as charms against these losses."

Many of these tiny paintings were framed and sealed under beveled glass in elaborately worked metal lockets and brooches. A lock of the beloved's hair was often hidden somewhere inside.



Men about to head off to war or sea carried with them a likeness of their wives or sweethearts. Those they left behind also kept miniatures—sometimes displayed on a ring or a locket worn on a chain.

Charles Willson Peale's 1767 miniature of Matthias and Thomas Bordley, for example, was commissioned by their father after the brothers were sent to England to be educated at Eton. In the portrait, Peale included a bust of Minerva, Roman goddess of wisdom. St. Paul's Cathedral in London is seen in the distance.

Glass cases

In preparation for the display of the American Art Museum's portrait miniature collection, "we needed to determine which pieces were exhibition-ready and which needed to be treated," Speer says.

Carol Aiken, an expert art conservator with 20 years' experience, was summoned by the museum. "Some of the glass cases holding the 18th-century miniatures had never been opened and cleaned," Aiken explains. "Mold often flourishes inside the closed cases, which can diminish the appearance of the images, sometimes to the point of disfigurement." One important treatment, Aiken says, is replacing deteriorated cover glasses with custom-made replicas.

As watercolor paints fade easily in light, the miniatures are kept under dark and low-light conditions.

Revival

Small early miniatures eventually gave way to larger watercolor-on-ivory portraits "about the size of today's snapshots," says Caroline Little, design assistant for the Luce Foundation Center. These were put into folding frames that could be propped open on a tabletop or piano. As the daguerreotype portrait gained popularity in the mid-1800s, painted portrait miniatures gradually fell out of favor.

In the early 1900s, Speer says, painted portrait miniatures were again popular in America. "Some of the miniature portraits in our collection are from a brief revival period that blossomed in the United States after the turn of the century."

Colorful, more-modern clothing and even red lipstick make these 20th-century miniatures stand out from the earlier portraits. One tradition, however, held fast. All the sitters appear just as somber as their 18th- and 19th-century forebears. ❖

White crocodiles. The Smithsonian Tropical Research Institute and Panama's Agriculture Research Institute signed a memorandum of understanding in September to collaborate on the study of the biological diversity of the white crocodile in Panama. This species, *Crocodylus acutus*, is protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, an agreement among governments aiming to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Oris Sanjur, manager of STRI's Naos Island Laboratories, and Miriam Vanegas de Anaya of Panama's Agriculture Research Institute will coordinate the two-year project.

White crocodiles at a crocodile farm in Chilibre, Panama (Marcos Guerra photo)

BioInvasion Institute. In an effort to study ways to reduce invasions of alien species into marine and freshwater ecosystems in the United States, the Smithsonian Environmental Research Center in Edgewater, Md., and Portland State University in Oregon have created a new organization called the Aquatic BioInvasion Research and Policy Institute. Established in October, the new institute will blend a wide range of disciplines—biology, environmental sciences, economics, engineering and social sciences—to develop new ways to mitigate the impact of alien species invasions and reduce future invasions.

Space Hangar opens. In November, the Smithsonian's National Air and Space Museum opened the new 52,067-square-foot James S. McDonnell Space Hangar in the museum's Steven F. Udvar-Hazy Center in Chantilly, Va. A total of 113 large space artifacts are on display in the hangar, including the space shuttle Enterprise; Pegasus, the first aircraft-launched rocket booster to carry a satellite into space; the unmanned Mercury test capsule "Big Joe"; and the Subroc, the first underwater-launched, guided nuclear antisubmarine missile. Some 500 small artifacts also are on view in cases, including advanced spacesuit prototypes; research crystals formed in space; space toys from the 1950s and 1960s; and even borscht prepared for Soviet cosmonauts.

A Lark missile from the McDonnell Space Hangar

Pierre-Noel papers. The Smithsonian's National Postal Museum recently acquired the papers of Louis Vergniaud Pierre-Noel (1910-1982), a Haitian artist well-known in philatelic circles as the designer of the United Nations' 20th-anniversary postage stamp. The stamp was issued by the U.S. Postal Service on Oct. 25, 1965. Pierre-Noel's papers—bequeathed by his wife, American artist Mailou Jones— include a number of preparatory drawings for stamps, print proofs for stamp designs, first-day covers of Pierre-Noel's stamps, correspondence and newspaper clippings.

The 1965 United Nations stamp designed by Louis Vergniaud Pierre-Noel (detail)

Ocean Hall. The Smithsonian's National Museum of Natural History, in collaboration with the National Oceanic and Atmospheric Administration, is creating a new exhibition hall dedicated to the appreciation and understanding of the Earth's oceans. Scheduled to open in 2008, the hall will explore the history of the ocean and its importance to modern society. It will be the major component of the new Ocean Science Initiative at the Natural History Museum. This multifaceted initiative will include the public through state-of-the-art exhibitions, an integrated Web site and a newly established scholarly Center for Ocean Science. For more information, see the Web site www.mnh.si.edu/ocean.

Consortium for the Barcode of Life centered at the National Museum of Natural History

Someday soon, scientists predict, a hand-held device will exist with the ability to instantly identify every plant and animal species on Earth, just as a supermarket scanner can discern the difference between a box of cereal and a gallon of milk.

A new initiative called the Consortium for the Barcode of Life, centered at the Smithsonian's National Museum of Natural History, is now working toward this futuristic vision. The consortium's membership, which includes some of the world's largest natural history museums and herbaria, are collaborating to compile a database of the unique DNA sequences of the world's estimated 10 million plant and animal species.

Initiative members plan to establish an electronic public library of these sequences linked to species names, images and associated scientific data.

The group also plans to promote the development of portable scanning devices—similar to supermarket barcode scanners—that scientists can use anywhere to identify different species.

Barcoding research focuses on a uniform location on the genetic material of an organism that consists of about 650 nucleotide base-pairs. Recent research shows that, in many animal groups, the sequence in this location is unique and diagnostic for each species. A profile of this sequence can be analyzed and digitally stored in a computer database. These records can then be matched with the DNA profile taken from a tissue sample by a hand-held scanner.

By providing a simple and convenient molecular diagnostic tool, DNA barcoding is intended to enhance both the identification of existing species and the discovery of new ones. Other uses might include testing processed food for undesirable animal or plant material and determining whether endangered species are being sold in international markets.

Information on the work of the Barcode of Life Consortium may be found at the Web site barcoding.si.edu/consortium launch.htm. —*John Barrat*

Unique DNA sequences of many plants and animals, like this box turtle, may soon be quickly accessible to scientists in an electronic database. (John Barrat photo)

Do-it-yourself guide for recording family history

When Mrs. T.A. Lewis of Knoxville, Tenn., turned 95, her children decided it was time to document just how "Mamoo"—as she was known by friends and family—created her much-celebrated soggy coconut Christmas cake. With a camera and tape recorder, they hovered around Mamoo and asked questions as she grated coconut, cracked eggs and told stories in her kitchen. Afterwards, her family created a booklet that they gave to relatives, friends and neighbors. In the process, "far more than a recipe was recorded," says Marjorie Hunt, a folklorist at the Smithsonian's Center for Folklife and Cultural Heritage. On tape and film, the Lewis family captured many "cherished recollections, stories, traditions, values and attitudes associated with making the cake," Hunt adds.

"Mamoo" Lewis and her soggy coconut cake

Mamoo's story is an example taken from a new resource aimed at helping and inspiring people to gather their own families' stories and traditions. Written by Hunt, "The Smithsonian Folklife and Oral History Interviewing Guide" is a 50-page do-it-yourself handbook of information developed by Smithsonian folklorists for collecting folklife and oral history from family and community members.

For example, there's a basic checklist of equipment you need to bring to an interview and a comprehensive list of questions to consider. "Having a clearly defined goal is key to conducting a successful interview," the guide points out in its "Getting Started" section. "What are you curious about? What do you want to find out?"

We hope this guide "inspires you to turn to members of your own family and community as key sources of history, culture and tradition," Hunt writes in the guide. "The stories people tell, and the cultural traditions they preserve, say volumes about what they value and how they bring meaning to their lives."

"The Smithsonian Folklife and Oral History Interviewing Guide" may be downloaded at no cost from the Web address www.folklife.si.edu.

—*Barbara Wells*

Nelson's Purse: The Mystery of Lord Nelson's Lost Treasures, by Martyn Downer (Smithsonian Books, 2004, $32.50). The compelling story of Lord Nelson's long-lost letters and personal effects.

The New Smithsonian Book of Comic Book Stories: From Crumb to Clowes, edited by Bob Callahan (Smithsonian Books, 2004, $39.95). The definitive collection by the most celebrated and notorious comic book artists of our time.

Slacks and Calluses: Our Summer in a Bomber Factory, by Constance Bowman (Smithsonian Books, 2004, $15.95). A fascinating firsthand account of two women who assembled B-24 bombers on a production line in San Diego during World War II.

The Longest Winter: The Incredible Survival of Captain Scott's Lost Party, by Katherine Lambert (Smithsonian Books, 2004, $24.95). The little-known 1912 saga of Robert Scott's northern party and its desperate struggle for survival at the South Pole.

5,000 Years of Textiles, edited by Jennifer Harris (Smithsonian Books, 2004, $32.50). A classic, comprehensive, full-color survey of textile art, from prehistory to the present.

Crafts of Mexico, edited by Margarita de Orellana and Alberto Ruy Sánchez (Smithsonian Books, 2004, $45). From textiles to tinworks, a lavishly illustrated celebration of the incredible variety of Mexican crafts.

Luiz Bonfá: Solo in Rio 1959, (Smithsonian Folkways Recordings, 2004, $15). A reissue of this stunning recording session by bossa nova innovator Luis Bonfá. Digitally remastered with 14 previously unreleased bonus tracks.

Havana & Matanzas, Cuba ca. 1957: Bata, Bembe and Palo Songs (Smithsonian Folkways Recordings, 2004, $15) This CD of ritual music recorded in the late 1950s provides a snapshot of Cuban culture just before the rise of Fidel Castro.

cEllabration: A Tribute to Ella Jenkins (Smithsonian Folkways Recordings, 2004, $15). Today's finest folk and children's performers pay tribute to Ella Jenkins—"The First Lady of Children's Music"—with sparkling new renditions of her timeless repertoire.

Back Roads to Cold Mountain (Smithsonian Folkways Recordings, 2004, $15). Various artists perform music that comes from the source and spirit of Appalachia.

Elizabeth Cotten: Shake Sugaree (Smithsonian Folkways Recordings, 2004, $15). Twenty-six essential songs recorded between 1965 and 1966, including 10 previously unreleased tracks.

Books published by Smithsonian Books can be ordered from Smithsonian Books, c/o W.W. Norton & Co. Inc., National Book Co. Inc., 800 Keystone Industrial Park, Scranton, Pa. 18512. To order by phone, call (800) 233-4830.

Recordings can be ordered from Smithsonian Folkways Mail Order, Smithsonian Folkways Recordings Dept. 0607, Washington, D.C. 20073-0607. To order by phone, call (800) 410-9815 or (202) 275-1143.

How the Great Pyramid Was Built

By Craig B. Smith (Smithsonian Books, 2004, $27.95)

They stand stark and silent in the burning desert sun south of the Nile Delta in Egypt. More than 4,000 years ago, thriving communities surrounded them, existing for decades to construct the magnificent stone pyramids that served as the final resting places of the pharaohs.

Thousands of workers united to prepare these massive, towering tombs. Families died and were buried together on the job sites, where hulking limestone and granite blocks—some weighing as much as 50 tons—were cut and hauled by hand.

In *How the Great Pyramid Was Built*, a new book from Smithsonian Books, engineer Craig Smith takes a revealing look at the Great Pyramid of Giza as a colossal engineering and construction project.

In the book, Smith asks, how did project managers and laborers achieve such monumental and precise architecture before the age of mechanized construction?

The 288-page book and its accompanying illustrations—including nearly 100 exclusively commissioned photographs, charts and detailed drawings—offer a blueprint of the planning and construction of the Great Pyramid, which stands nearly 459 feet high.

Smith outlines in precise detail logistical problems of the pyramid's construction: what and how much the workers ate, how many stones per day they cut and moved, how often workers sharpened their copper tools and even how much rope the project required.

The author relies heavily on the knowledge and expertise of Zahi Hawass and Mark Lehner for archaeological facts. Hawass is Egypt's under secretary of state for the Giza monuments. Lehner is an American visiting assistant professor of Egyptian archaeology at the Oriental Institute of the University of Chicago.

The square base of the pyramid covers an area of 570,487 square feet. More than 2 million blocks, weighing an average of 1 to 5 tons, make up the structure. Roughly two-thirds the size of the Hoover Dam, the Great Pyramid was built for Khufu, Egypt's second pharaoh of the Fourth Dynasty. He reigned from 2551 to 2528 B.C.

"I have tried to resurrect the personalities of the principal players behind the Great Pyramid, because such a tremendous accomplishment could never have happened without strong-willed, talented, determined people driving the project," Smith writes. "These individuals bring the story to life for the reader who does not typically follow heavy construction, and their stories clarify some of the more abstract technical issues."

Smith brings to light the wide range of workmen and specialists it took to build the Great Pyramid. Some 4,000 stonemasons and associated quarry workers were supported by more than 400 carpenters, foundry workers, brick makers, rope makers and tool sharpeners. In addition, there was an administrative and program management group numbering 231.

Workers' tombs near the pyramid tell the story of their roles. Tomb inscriptions describe various categories of workers and supervisors and give their names. Some tombs contain three generations.

Inty-shedu was a carpenter who worked on boats. Nefer-teith's tomb is adorned with scenes of grain grinding and bread and beer making, suggesting he was a bakery supervisor. Job titles found in other tombs include "overseer of the side of the pyramid," "director of draftsmen," "director of workers" and "inspector of craftsmen."

Khufu's Pyramid at dusk (Photo by Andy Ryan)

Khufu's cousin, Hemiunu, appears to have had a major role in construction of the pyramid. Hemiunu's own tomb was discovered in 1912 in a cemetery near the pyramid. Inside, a life-size statue of him was found.

"It is the statue of a middle-aged man, a little on the stout side, with the confident face of one accustomed to wielding authority, a man who could conceive an enormous work and see it through to completion," Smith writes.

— Daniel Friend

Lance Armstrong's 2002 Tour de France jersey is added to the collections

In June 2004, American bicyclist Lance Armstrong wore the coveted leader's *malliot jaune*, or yellow jersey, of the Tour de France across the race's finish line in Paris for an unprecedented sixth consecutive time. Yet, in the minds of many, Armstrong is identified with a different, earlier victory: beating cancer.

In 1996, Armstrong—already recognized as one of the world's best bicyclists—was diagnosed with advanced testicular cancer, which had spread to his abdomen, lungs and brain. He underwent chemotherapy from October to December 1996 and had two surgeries. Today he is cancer-free.

During his treatment, he started the Lance Armstrong Foundation to promote cancer education, advocacy, public health programs and research. His subsequent victories in bicycle racing "destroyed overwhelming physical and psychological obstacles, clearing a path for others to follow," says Ellen Roney Hughes, cultural history curator for the Smithsonian's National Museum of American History. "Lance Armstrong proved that life-threatening illness can be a beginning, not an end."

At Hughes' request, the Lance Armstrong Foundation recently donated to the museum the yellow jersey Armstrong wore during the 2002 Tour de France. Today, the jersey is on tour across the United States in the exhibition "Sports: Breaking Records, Breaking Barriers." An online version of the exhibition can be viewed at the Web site address americanhistory.si.edu/sports.

The exhibition is filled with artifacts from the Smithsonian's sports collection that portray the pioneers who dominated their sports; championed their country, race or gender; and helped others to achieve. Included are Muhammad Ali's boxing gloves, a baseball signed by Babe Ruth, Arthur Ashe's 1975 tennis racket, Sonja Henie's ice skates, Arnold Palmer's 1960 Masters Trophy and many other artifacts from a collection that was started at the Smithsonian in 1882.

"The greatest champions stand for more than the records they break," Hughes says. "They stand for the barriers they shatter—physical, social, psychological, racial, cultural—and change the way we think about our world." —*John Barrat*

Lance Armstrong's 2002 Tour de France jersey (Photo by Eric Long)

SMITHSONIAN INSTITUTION
MRC 033 PO Box 37012
Washington DC 20013-7012

Official Business
Penalty for Private Use $300

Presorted Standard
U.S. Postage Paid
Smithsonian Institution
G-94