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Civil War. Union Col. Elmer Ellsworth's death on May 24, 1861, in Alexandria, Va., was one of the flash points of the start of the Civil War. Ellsworth, the first Union officer to be killed in the war, was shot by innkeeper James Jackson after Ellsworth removed a Confederate flag from atop the Marshall House hotel. Jackson, in turn, was killed by one of Ellsworth's men. Both guns used in this widely publicized event are in the Armed Forces History collections of the Smithsonian's National Museum of American History, Kenneth E. Behring Center. Images of Ellsworth, Jackson and the weapons can be seen on CivilWar@Smithsonian, a Web site dedicated to examining the Civil War through images and objects in the collections of the Smithsonian. Its holdings include portraits of Civil War leaders, stamps, uniforms, letters and a wealth of other items related to soldiering, weapons, navies, and slavery and abolition. A timeline and resource list enhance this informative site.—www.civilwar.si.edu/home.html



Portrait of Julia Ward Howe (detail), author of "Battle Hymn of the Republic."

Art podcasts. Wish you could attend the series of fascinating artists' talks held regularly at the Smithsonian's Hirshhorn Museum and Sculpture Garden? Want to know more about an artwork you've seen or heard about? The Hirshhorn is now offering on its Internet home page free podcast downloads of interviews with artists whose works are featured



"Zobop" (detail), a floor installation by Jim Lambie

at the museum. Hirshhorn podcasts will play on any digital music player or computer. Listen to conversations with artists and lectures about works on view or take audio walk-throughs of the Hirshhorn for a deeper understanding of the art and artists of our time. Podcasts currently available include "Sugimoto's Vision," a lecture by renowned art historian Michael Fried about the "new" art photography of Hiroshi Sugimoto, and a video podcast of the creation of "Zobop," a new floor installation by Jim Lambie.

—www.hirshhorn.si.edu/programs/podcast.html

Correction: An article in the Spring 2006 *Inside Smithsonian Research* referred to the lens of the Hubble Space Telescope. The Hubble collects light with a mirror, not a lens.

Inside

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On the cover: "Farm Couple at Well," a hand-colored linocut created by American artist William H. Johnson, circa 1940-1941. This is one of 42 prints in "William H. Johnson's World on Paper," an exhibition in the newly open Smithsonian American Art Museum.



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Scientists coax secrets from 9,300-year-old remains of Kennewick Man

By Michael Lipske
Special to Inside Smithsonian Research

In archaeological terms, Kennewick Man—the popular name of a human skeleton discovered on the banks of the Columbia River near Kennewick, Wash., in 1996—received an “extended burial.” Simply, he was laid on his back, hands at his sides, palms down and feet rolled outward. His body was placed parallel to the Columbia River, head oriented upstream and gazing toward the rising sun.

Incredibly, scientists believe Kennewick Man was buried some 9,300 years ago—roughly 7,300 years before the birth of Christ and 8,700 years before Columbus sailed to the New World. His discovery has revived age-old questions about the first Americans: Who were they? From where did they come? How did they live?

Now, scientists from a variety of disciplines are intensely studying the bones of Kennewick Man, mining them for answers to these and other questions about the early human history of North America.

Accidental discovery

Kennewick Man is one of the oldest, best preserved and, as of now, most studied human skeletons ever found in North America. “Yet it started out to be one of the least studied,” says Douglas Owsley, a physical anthropologist at the Smithsonian’s National Museum of Natural History.

Accidentally discovered in July 1996 by two college students wading in the Columbia River, the bones had eroded out of the riverbank on land managed by the U.S. Army Corps of Engineers.

A few months later, the Corps was on the verge of handing over the skeleton to



From left, Douglas Owsley; Kari Bruwelheide, museum specialist at the National Museum of Natural History; C. Wayne Smith, director of the Archaeological Preservation Research Laboratory at Texas A&M University; and Tom Stafford, geochemist with Stafford Research Laboratories in Boulder, Colo., examine the articulated skeleton of Kennewick Man at Seattle’s Burke Museum. (Photo by Chip Clark)

one of five American Indian tribes that had claimed ownership and sought to re-bury the bones. Federal law mandates the return of Indian remains to Native groups demonstrating a tribal affiliation to the remains. Reluctantly, after the Corps denied many requests by scientists to examine the skeleton, Owsley and seven other scientists sued the Corps. They argued that the Corps had not followed the process, as defined in the Native American Graves Protection and Repatriation Act, to demonstrate that the skeleton was, in fact, Native American.

At most, a few dozen skeletons of comparable age have been discovered in the

New World. “This was an opportunity to add substantially to what we know about the people of this time period,” Owsley explains. Ultimately, the case went to the U.S. Court of Appeals, and the scientists won the right to study the skeleton.

Taphonomic analysis

“Such a sense of relief!” Owsley recalls of finally being allowed to examine the remains in July 2005, after eight years of waiting for a decision on the lawsuit.

As the leader of the team of 11 scientists studying Kennewick Man, Owsley

(continued)

has studied more than 10,000 human skeletons—bones belonging to Confederate sailors and Jamestown, Va., colonists, as well as remains from recent high-profile disasters, including the Sept. 11, 2001, attack on the Pentagon.

With more than 380 bones and fragments of Kennewick Man to study, the work of the anthropologists began painfully slowly. During the first in-depth session—10 days in July 2005 at the Burke Museum at Seattle's University of Washington, where the bones reside—scientists wearing magnifier goggles and latex gloves searched for evidence of taphonomic, or post-mortem, chemical, geological and biological processes that had affected the skeleton.

They inventoried and measured bones, drew diagrams and wrote lengthy descriptions of their observations. Using a Munsell scale—a standardized color key for coding bone surfaces—they determined the precise hue of each fragment, thus indicating subtle distinctions in its degree of weathering.

The team hopes to learn which groups of people Kennewick Man resembles most and least.

A stone spear point can be seen in the right of this photo of Kennewick Man's right hip bone. As the wound healed, the point became encased in bone. The inset shows a 3-D computer reconstruction in clear plastic of the spear point after it was digitally extracted from the bone with a CAT scan. (Photos by Chip Clark)



“All of the coding was so detailed in terms of written descriptions, computerized charts and hand-drawing on bone diagrams,” Owsley says. “The first day, we worked on one femur, and I thought, ‘Oh, my gosh! We’re not going to get done with this thing.’ But we got faster.”

Teeth, hands

In February this year, a total of 20 specialists were brought in during the course of several days to consult on narrower questions about the skeleton. “It was very choreographed,” Owsley says of the study session he organized, giving scientists appointments with Kennewick Man. “I didn’t want to have a situation in which multiple individuals needed the same bone to take their measurements.”

Among the specialists was a Johns Hopkins University scientist taking dental peels—high-resolution casts of tooth surfaces—that will be studied with a scanning electron microscope for an analysis of tooth-wear patterns.

“He has a very unusual wear pattern,” Owsley says of Kennewick Man’s teeth. Scientists suspect he was using his teeth for as yet undefined tasks, “some sort of activities that were causing rapid tooth wear.”

Another scientist, a hand-bone specialist, analyzed the size, robusticity and muscle-attachment areas of the skeleton’s hands, collecting information that may yield more clues about Kennewick Man’s activities as he roamed the Pacific Northwest.

“We’re looking at multiple lines of investigation,” Owsley says. “So there are all these little bits of information that are very specialized but come together into a beautiful assessment of what’s going on.”

Algae stains

Natural History Museum Botanist James Norris helped the Kennewick team by analyzing algae stains on the bones. Algae colonizes surfaces—including bone—that are exposed to sunlight. Norris’ identification of the species of algae, and his knowledge of its life cycle, helped the anthropologists form a clearer picture of

how and over what span of time the skeleton eroded out of the riverbank. This information further enabled researchers to fine-tune their conclusions about the position of the bones before they emerged out of the dirt and into sunlight.

With that and many other “little bits of information,” Owsley says, the team was able to clear up one of the biggest mysteries about Kennewick Man. Although some experts had hypothesized that the remains may have belonged to a drowning victim, the research team’s ruling is that Kennewick Man was buried intentionally.

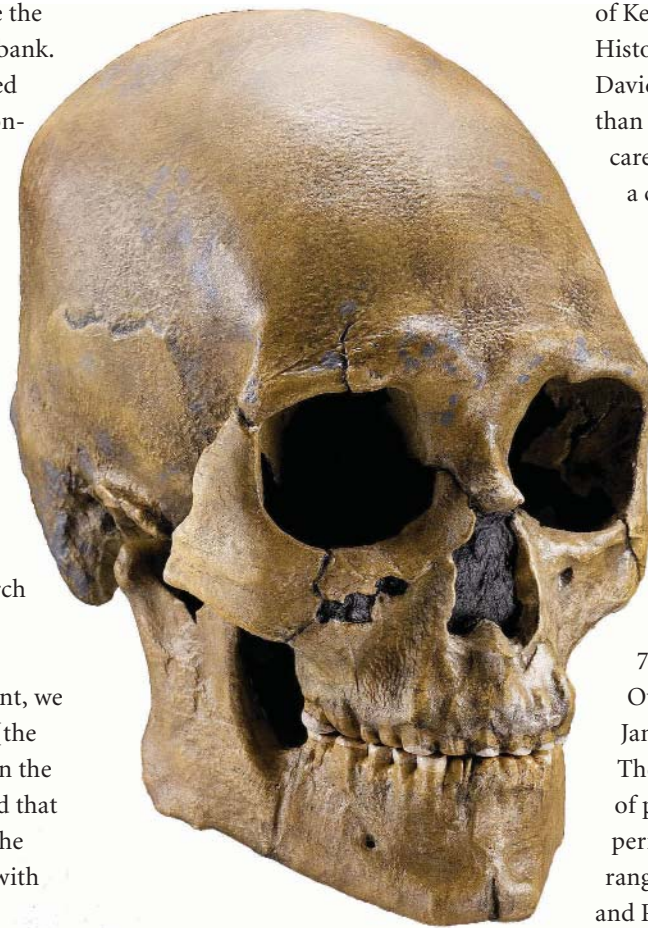
“In our taphonomic assessment, we were able to reconstruct where [the skeleton] was stratigraphically in the soil horizons,” Owsley says, “and that this is an extended burial, that the person was resting on his back with his hands prone at his sides.”

Spear point

The researchers also established that a stone spear point lodged in Kennewick Man’s right hip did not kill him and that the wound had healed over years before his death. The spear wound was one of several healed injuries anthropologists discovered in Kennewick Man, whom Owsley has described as being “tough as nails.” The cause of the ancient man’s death is still unknown.

Smithsonian Archaeologist Dennis Stanford is comparing the shape of the spear point to other projectile points in the Natural History Museum collection, looking for similarities to points with known archaeological dates. However, because the point is still stuck deep in Kennewick Man’s hip bone, Stanford is working from a plastic replica.

The Kennewick Man’s team of experts arranged for the hip to undergo



This exact replica of the skull of Kennewick Man was created with a CAT scan that generated 3-D digital replicas of the skull’s 11 different pieces. First fashioned in clear plastic, the pieces were then assembled to form the skull. Next, a replica of the skull was molded in Hydrocal, a gypsum-based compound, as seen here.

a high-resolution CAT scan at an industrial laboratory in Chicago. Owsley explains that the spear point was thus “digitally extracted” from the hip and reassembled as a 3-D computer image. Next, in a process known as stereo lithography, a special laser printer was used to build up an exact physical model of the point—printing it out, in layers .0006 of an inch thick, on photo-sensitive polymer.

Skull reconstruction

The same process was used to create resin replicas of each of the 11 separate pieces

of Kennewick Man’s skull. Then, Natural History Museum Physical Anthropologist David Hunt, who has reconstructed more than 200 craniums during his museum career, assembled the plastic pieces into a complete skull.

Finally, because the plastic pieces will shrink over time, a Hydrocal, or gypsum, version of the skull was cast by Steven Jabo, a fossil preparator in the Natural History Museum’s Vertebrate Paleontology Division. Owsley calls Jabo’s model the team’s “hard copy” of the skull.

Measurements of the reconstructed skull will be statistically compared with a database of some 7,000 skull profiles compiled by Owsley and Anthropologist Richard Jantz of the University of Tennessee. The team hopes to learn which groups of people, throughout different time periods and across geographic areas ranging from North America to Asia and Polynesia, Kennewick Man resembles most and least. Those findings could add measurably to what is known about how humans colonized the Americas. “That’s the next phase,” Owsley says.

Also included in the next phase are bone-histology tests the team hopes to perform—which would firmly establish Kennewick Man’s age at the time of his death—and isotope studies that can, by measuring carbon and nitrogen levels in the bones, provide information about his diet.

And those are just the studies that Owsley is aware of. Future researchers will undoubtedly have other questions to ask the bones. Keeping open the possibility of such research is the reason, Owsley says, that he and his fellow scientists took the dramatic step of suing the government.

“If we couldn’t get access,” he says, “then others aren’t going to have a chance. The whole thing is about the right to ask questions of the past.” ❖

Simple and stark: William H. Johnson's world on paper

By Donald Smith
Special to Inside Smithsonian Research

Aficionados of African American art have long celebrated the paintings and prints of William H. Johnson (1901-1970). The South Carolina native turned his back on the classical styles of painting he learned at a prestigious New York art school and became one of the nation's most original painters. In his own words, Johnson was committed "to give, in simple and stark form, the story of the Negro as he existed."

Johnson's oil paintings and watercolors enliven the walls of many museums and private collections. But due to a combination of circumstances, few of Johnson's admirers have ever seen a completely different aspect of the prolific artist's output—the works he did on paper.

To help mark its reopening on July 1 after a six-year renovation, the Smithsonian American Art Museum is presenting "William H. Johnson's World on Paper," an exhibition of 42 prints from the museum's permanent collection, many of which never have been shown before.

"Johnson left a legacy of paintings, prints and drawings that range from European-inspired modernism to his own distinctive rhythms," says Elizabeth Broun, the museum's Margaret and Terry Stent director. "His works on paper, in particular, testify to a relentless imagination and powerful visual expression—hallmarks of an inspired American artist."

Acquisition, conservation

The prints in "William H. Johnson's World on Paper," provide an overview of

Johnson's career. Among the varied subjects of his work are early landscapes of Denmark, Norway and North Africa; portraits of his neighbors in Denmark; scenes of life in New York's Harlem and the rural South; religious subjects; and scenes of black enlisted men and women volunteers of World War II.

Mounting the exhibition posed special challenges for museum staff, as the prints were in very poor condition when they arrived at the museum almost 40 years ago. "Many were done on poor quality paper to begin with," says Joann Moser,

the museum's senior curator of graphic arts. "Whenever Johnson moved from place to place, the prints moved with him. Some suffered water damage during a fire in his apartment."

When Johnson entered a mental hospital in 1947, his oils and prints were relocated to a New York warehouse that had no climate or humidity control. They remained there until 1967, when the Smithsonian acquired them, an acquisition comprised of the largest and most complete assembly of Johnson's work.

Some of the museum's 69 prints by Johnson were so far beyond repair that all conservators could do was stabilize them against further deterioration. Of the prints in the exhibition, four are so fragile that they won't be included in a traveling exhibition planned for 2007.

Everyday lives

Born in Florence, S.C., in 1901, Johnson grew up in poverty with little education. His youthful interest in copying comic strips attracted the notice of a teacher that encouraged him. Eventually, Johnson decided to move to New York to be an artist.

After laboring several years to build up his savings, he enrolled in the National



Left: "Sitting Model" (detail), 1939, a hand-colored linocut, by William H. Johnson

Opposite: "Sowing," circa 1940-1942, a serigraph by William H. Johnson

Academy of Design, where he won several awards and came to the attention of a second teacher, who raised funds to send him to study in Europe. There, he was influenced by a number of prominent artists of the day, including French post-impressionist painter Paul Gauguin, Danish expressionist Edvard Munch and German expressionists.

Back in New York by late 1938, Johnson began to paint in what he called a “primitive” style, using starkly contrasting colors and two-dimensional figures. In time, he turned his attention to the everyday lives of African Americans.

Quest for accuracy

Because Johnson did not date his prints, American Art Museum staff also faced the challenge of figuring out when each print was created. Educated guesses had been made at the time the Smithsonian acquired them decades before. In preparing the exhibition, Moser questioned some of those dates because of what she had learned about the various phases of Johnson’s career.

Her quest for accuracy included communication with art historian Richard Powell, an authority on Johnson, as well as a Norwegian expert on Edvard Munch, whom Johnson met while in Europe. Munch’s experimental woodcuts and expressive lithographs appear to have inspired Johnson to try new techniques.

Moser was able to figure out which media Johnson was working with at various times in his career. Some of his earliest prints, for example, were woodcuts done in the German expressionist style. “When he returned to the United States, he continued making relief prints, but changed from working on wood to working on linoleum blocks. He also learned serigraphy, a perfect medium for creating the flat areas of bright color that characterize his work of the 1940s.”

Lithography

The only lithograph in the exhibition, a seated nude, had been dated to the early



1930s. But Moser knew that Johnson didn’t have access to a lithograph press during that period. “With a woodcut, or even a serigraph, you could make a print with handmade materials. But with a lithograph, it’s technically much more complex. You need a particular type of stone, or plate, and a certain amount of knowledge about inks and the way oil and water react to each other.”

Moser found that there were two periods in his life when Johnson would have had access to a litho press. Accordingly, she dated the print to between 1935 and 1940.

A personal tragedy—the death of his wife, Danish artist Holcha Krake in 1944—evidently contributed to Johnson’s growing mental illness. He remained in a mental hospital from 1947 until his death in 1970, unaware of the increasing recognition that his stunning body of works was receiving in the art world. ❖

“William H. Johnson’s *World on Paper*” is on view at the Smithsonian American Art Museum in Washington, D.C., through Jan. 7, 2007. It will then tour the United States.

His works on paper, in particular, testify to a relentless imagination and powerful visual expression—hallmarks of an inspired American artist.

Falling meteorites once brought fear, disbelief and religious prophecy

By Christine Pulliam
Smithsonian Astrophysical Observatory

The morning of Nov. 7, 1492, dawned clear and cool in the town of Ensisheim, in Alsace, France. While Christopher Columbus was sailing just north of Cuba on his first voyage to the New World, Ensisheim was about to receive a visitor of its own from a far more distant realm.

Shortly before noon, a horrendous explosion heralded the fall of a large stone outside the city walls. A lone boy watched as the stone plunged into a nearby wheat field, making the ground shake and opening a hole about a meter deep. Townspeople surrounded the hole and dragged out a heavy, black stone. They then fell upon it, whacking off pieces to take away as souvenirs.

More than 500 years later, geologist Ursula Marvin of the Smithsonian Astrophysical Observatory in Cambridge, Mass., is taking a closer look at the Ensisheim fall, as well as that of dozens of other historic meteorite falls. While the study of ancient accounts of meteorites may yield new scientific data, Marvin also is fascinated by the powerful affect these random, natural events have had on human society and how, over time, human thought has evolved to explain meteorites from an entirely scientific perspective.

An authority on the chemical and mineralogical composition of meteorites, Marvin recently wrote a chapter on notable meteorite falls in a book on the history of meteoritics, the study of meteorites, published by the Geological Society of London.

Hands-on samples

Today, “meteorites provide us with hands-on samples of planets, moons and asteroids while we await future space missions to these distant bodies,” Marvin says. In 1492, however, a meteorite was seen as a sign from God.

Within weeks of the Ensisheim fall, Marvin explains, leading German scholar and poet Sebastian Brant (1457-1521) authored two broadsheets—the equivalent of political leaflets.

Brant interpreted the fall as a sign from the heavens. King Maximilian (1459-1519), son of Holy Roman Emperor Friedrich

III, was leading his army toward Ensisheim on his way to battle the French. Brant, an ardent supporter of Maximilian, declared that the stone had been sent from on high as a pledge to Maximilian. His interpretation was confirmed when Maximilian won the impending battle. Brant then declared that the Ensisheim stone was a sign of divine favor that would continue throughout Maximilian’s lifetime.

In an unsigned and undated painting, German painter Albrecht Dürer (1471-1528) depicted a dramatic explosion in the sky, with long, red rays flaring out from a small, yellowish projectile. Although Dürer never explained what the object was, Marvin has studied the work and is certain it represents an exploding meteoritic fireball.

She reached this conclusion, in part, after learning Dürer spent November 1492 in Basel, Switzerland, just 25 miles south of Ensisheim. He could easily have seen the fireball and heard the explosion. As an indication of the religious importance Dürer gave to this event, he painted the fireball on the reverse side of a small wood panel depicting St. Jerome, one of the fathers of the early Christian Church.

Science of the stones

Learned scientists of the 18th-century Enlightenment were certain that stones could not possibly fall from the sky. “They brushed off meteorite reports as wild tales from superstitious and uneducated peasants,” Marvin says.

Dismissal became impossible, however, after a dramatic shower of stones at Siena, Italy, in 1794, witnessed by hundreds of people. Siena was a university town, so the fall drew the attention of local scholars. Carefully studied, the stones were found to be unlike any rocks on Earth.

Over time, examinations of other falls led 19th-century scientists to acknowledge that meteorites truly were stones from outer space.

Late 20th-century research revealed that some meteorites preserve matter from 4.5 billion years ago, when dust grains first be-



gan to stick together and form the planets of our solar system. Other meteorites hold even older mineral grains that originated from star systems that were in existence before our sun formed.

Hunting for meteorites

Today, what remains of the Ensisheim meteorite rests in an elegant case in the Regency Palace in Ensisheim. Pieces of the meteorite also have ended up in the hands of collectors and in museums around the world—even for sale on eBay.

While early scientists waited for meteorites to fall from the sky, modern researchers are more proactive, hunting their quarry in deserts of sand or ice where these rocky newcomers from space stand out from the barren background.

Marvin herself has made three trips to a remarkably fruitful meteorite hunting ground—Antarctica. There, scientists have learned that the ice sheet acts as a continental conveyor belt, carrying entombed meteorites toward natural traps behind barrier hills, where they accumulate. Antarctic meteorite fields have yielded tens of thousands of specimens, including a handful of prized and much-studied meteorites from the moon and Mars.

“After traveling halfway around the globe to one of the remotest spots on Earth, encasing oneself in layers of clothes, mounting a snowmobile and riding through the vastness, there’s nothing like the thrill of spotting a piece of rock from another planet!” Marvin exclaims.

Marvin’s thrill in finding a meteorite on the Antarctic ice is vastly different from the mixture of fear, fascination and religious awe the citizens of Ensisheim experienced in 1492. Dozens of small meteorites land on Earth every day, and each new find adds to human knowledge of the cosmos. As Marvin knows, it is a knowledge that has been evolving for a very long time. ❖



Above top: Ursula Marvin believes this unsigned and undated painting by Albrecht Dürer depicts the explosion that accompanied the arrival of the Ensisheim meteorite on Nov. 7, 1492.

Above bottom: Dressed in a thick parka and lying on ice, Ursula Marvin gets a close-up view of a just-discovered meteorite in Antarctica. (Photo by Ghislaine Crozaz)

Voracious worms thrive on the eggs of their crab hosts

By Donald Smith
Special to Inside Smithsonian Research

It could serve as a monster from a horror movie, except that even Hollywood might shrink from showing it on the screen. It has slimy skin and a razor-sharp barb on the end of its tonguelike proboscis, and it spends most of its life crawling around the nooks and crannies of its victims' bodies, devouring the unborn.

The villain in this story is a tiny marine worm of the genus *Carcinonemertes*. Its preferred meal is crab eggs, including those of the blue crab, a menu favorite among humans and a mainstay of commercial fisheries from Massachusetts to the Gulf of Mexico.

"These worms have been known as predators of blue crabs for some time," says Jon Norenburg, curator of worms at the Smithsonian's National Museum of Natural History and one of only two scientists in the world engaged in the full-time study of these creatures. "They feed on developing eggs brooded by the female crab but do no direct harm to the adult crab. It seems that some populations of crabs are more affected than others, and the infestations of these worms go up and down. The risk to blue crabs is always there."

Almost all commercially fished crabs are known to be susceptible to

infestations of one species or another of *Carcinonemertes*. A dramatic episode occurred about 15 years ago, when these egg-eating worms were considered responsible for crashes of red king-crab fisheries at several locations in Alaska and the Aleutian Islands. The worms also are suspect in a die-off of Dungeness crabs in central California about 25 years ago.

Because so few scientists are actively studying these worms, much remains to be learned about them and their potential for wiping out crab populations. Scientists are still trying to discover just what circumstances can alter the balance between predator and prey to trigger the crab die-offs.

Describing new species

The genus *Carcinonemertes* belongs to the phylum *Nemertea*—a large group of primitive marine animals lacking body cavities but with complete digestive tracts and simple brains. Only 11 species of *Carcinonemertes* have been described, yet Norenburg and his associate, Smithsonian postdoctoral fellow Cynthia Santos, who is the world expert on *Carcinonemertes*, are working to increase that number.

Two years of collecting have yielded as many as eight new worm species. The two scientists are now in the

process of officially describing and naming them.

"As with cave animals, these worms appear to have adapted to their habitat by becoming very simplified, making differences in appearance between species very subtle," Norenburg says. "Many of these differences disappear when the worms are collected and preserved."

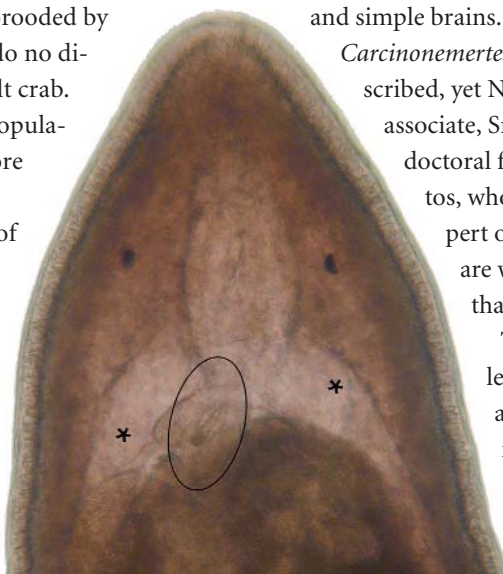
"Thus, when possible," he adds, "we start by studying living specimens, which means we need to collect their hosts by hand along the shore, with snorkeling and scuba, and with baited traps and trawling." So far, Norenburg and Santos have sampled along the East Coast of the United States, the central California coast and in Panama, Belize and southern Brazil.

"Sampling the living hosts also permits us to study infestation rates—percentage of individuals infested and number of worms per host," Norenburg says. "And when we are lucky, we can observe aspects of the feeding and reproductive biology of these worms."

Barbed stylet

Carcinonemertes are small—typically not more than four-tenths of an inch long—but visible to the naked eye and recognizable by their distinctive red-orange color. They live nearly their entire lives attached to crabs, in contrast to most nemertean, which are free-living in a variety of marine habitats and have long proboscises that are adapted for spearing crustaceans, such as sand fleas, as they pass by.

The proboscis on *Carcinonemertes* is rela-



tively short: less than four one-hundredths of an inch. When tucking in for a meal, a *Carcinonemertes* stretches its mouth wider than its own body diameter over the surface of a crab egg. This action causes its barbed proboscis tip, called a stylet, to puncture the egg's surface. Then it's just a matter of sucking out the yolk.

"Adult worms live in crevices along the bases of the legs and gill chambers of crabs," Norenburg says. "One study has found that the worms can sense the crab's reproductive hormones, enabling them to time their own reproduction with that of the host. The adult worms come out of hiding to feast on, as well as lay their own eggs among, the crab eggs. The worm eggs hatch to release tiny larvae that swim away and try to find a new host, preferably one with eggs to provide their first meal. The adult worms go back into hiding once the crab larvae hatch."

Virulence to crabs

After documenting the physical appearance of a worm collected from a new host, Norenburg uses DNA from its tissue to create a genetic profile. "We've found worms from different hosts that are indistinguishable in appearance, yet have such large genetic differences that there is no doubt they are separate species," he says. "We now have genetic data for worms from more than 30 host species."

Norenburg is also working on a genetic test for crabs that will reveal the presence of worms without researchers having to visually see the worms.

One question Norenburg hopes to answer is whether, as worms move from one crab species to another, they could sometimes prove more virulent to a new host. The question has taken on some urgency because of an invasion in the United States in recent years of the European green crab from the Mediterranean, Baltic and North seas.

The green crab already is thought to be

threatening commercial crabs along the West Coast of the United States, including Dungeness crabs, clams and oysters, through predation. Green crabs on the West Coast also have been found to be carrying worms. Green crabs that have invaded the East Coast are believed to be worm-free.

"Did the West Coast worms come with the green crab, or did the green crabs acquire them from native crabs?" Norenburg asks. "And to what extent could the green crab become a vector, carrying the worms around to other commercially fished crab hosts?"

Finding answers to these questions is of great concern to another, larger crab predator: Humans. ❖



Above: Jon Norenburg prepares to remove *Carcinonemertes* from a crab in his National Museum of Natural History laboratory. (Photo by Owen Macdonald) Inset: Pink *Carcinonemertes* worms can be seen escaping from the egg mass on the underside of this female crab. (Photo by Martin Thiel)

Opposite: Asterisks in this magnification of the head of a *Carcinonemertes* mark the animal's bilobed brain. Its stylet, which it uses to puncture the egg coating of its prey, can be seen inside the drawn oval.

NEWS AND NOTES

Clinton portraits. On April 25, President Bill Clinton and Sen. Hillary Rodham Clinton visited the Smithsonian to unveil portraits of themselves officially commissioned by the Smithsonian's National Portrait Gallery. President Clinton's portrait was painted by Nelson Shanks, a painter who has depicted such notable figures as Diana, Princess of Wales; President Ronald Reagan; and tenor Luciano Pavarotti. Sen. Clinton's portrait was done by Ginny Stanford, a native of Missouri and resident of northern California. The acquisition represents the first time the Portrait Gallery has commissioned



This oil-on-canvas portrait of President Bill Clinton, by Nelson Shanks, is on view at the National Portrait Gallery.



The Virgin Atlantic Global Flyer

and acquired a portrait of a first lady at the same time as the portrait of a president. Both paintings are on view in the Portrait Gallery, now open after extensive renovation.

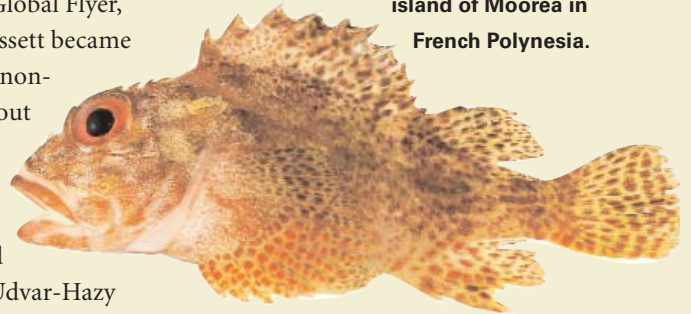
Global Flyer. The Smithsonian's National Air and Space Museum recently acquired the Virgin Atlantic Global Flyer, the plane in which Steve Fossett became the first person to fly alone non-stop around the globe without refueling. The aircraft, which also holds the aviation long-distance record, was delivered to the Air and Space Museum's Steven F. Udvar-Hazy Center after Fossett landed it at Washington Dulles International Airport. It was the airplane's final flight.

Algae blooms. Clay is being used in a series of field experiments by Biologist Mario Sengco of the Smithsonian Environmental Research Center on the Chesapeake Bay to gauge its potential in managing harmful algae blooms, such as Florida's red tides. By diluting clay into a slurry and spraying it into the water, Sengco has found that the clay sticks to algal cells and causes them to clump and sink. As the clumps sink, they capture more algal cells along the way. While this method of controlling algae blooms holds promise, Sengco also is assessing the impact that clay may have on creatures living on the ocean floor

Fish survey. Smithsonian National Museum of Natural History Ichthyologist Jeff Williams was among a team of scientists

who participated in the marine and freshwater fishes phase of an effort to obtain DNA information for every species of plant and animal living on and around the island of Moorea in French Polynesia. Williams and his colleagues collected some 500 different fish species, acquired tissue samples and took digital photos. Genetic data will be processed from the tissue samples by the Smithsonian and the

This fish (*Sebastapistes Tinkhami*) was one of 500 species collected on and around the island of Moorea in French Polynesia.



University of Perpignan in France. Photos and specimens will be used to confirm new taxonomic information revealed by the genetic data.

Corals and carbon. Simple sugars may prove deadly to coral. During a large-scale laboratory study of Caribbean coral, David Kline, a marine biologist at the Smithsonian Tropical Research Institute in Panama, tested the impact of some 40 different chemicals on the corals. Kline found that simple carbon sugar molecules caused explosive growth of normally symbiotic bacteria, disrupting the balance between the healthy coral and its associated bacterial community. This led to disease and the death of some coral specimens. If Kline's lab findings are found to apply in marine habitats, monitoring carbon levels in coral reef areas may be critical to slowing their loss.

Rare sei whale examined in Baltimore harbor

Struck and killed by a massive cargo ship that dragged it into Baltimore Harbor, a rare sei whale was autopsied and examined in April by scientists from the Smithsonian's National Museum of Natural History, the Maryland Department of Natural Resources, the Baltimore Aquarium and the National Marine Fisheries Service.

"It is unusual for us to get access to sei whales, especially one as pristine as this specimen," says Smithsonian marine mammal expert Charles Potter, who acquired the whale's skull for the museum's Marine Mammal Program.

Sei (pronounced "say") whales are an endangered species of baleen whale found in the deep waters of the Atlantic and Pacific oceans. Now protected, they were once targeted by the whaling industry after over-hunted populations of blue and fin-back whales declined. Sei whales can grow to 50 feet long and can weigh 40 tons. The

dead whale examined in Baltimore was 35 feet long and weighed 8.5 tons.

"This was a young male, probably not independent of its family group," Potter says. "In addition to the broken bones and internal damage caused by the ship strike that killed it, its body bore evidence of a probable previous ship strike—a scar on its back, right above the shoulder." Additional scars in the corner of its mouth and on its baleen and palate indicated that the animal had recently had some type of fishing gear stuck in its mouth. "Clearly, this whale had encountered more than its share of bad luck in its short life."

Study of stranded and accidentally killed whales is often the only means by which scientists can learn about whale species. The Marine Mammal Program is dedicated to collecting as much biological information as possible from these specimens. During the sei whale's necropsy,



Charles Potter, center, and others necropsy a sei whale. (Photo by Ken Rahaim)

Potter collected its stomach contents, determined its age and sex, measured its length and weight, and removed vital organs and tissue for analysis of parasites and toxic chemicals. Tissue samples also will be used to establish the animal's genetic profile. —John Barrat

Researchers work to corroborate accounts of dog hair use in Indian blankets

Researchers at the Smithsonian's National Museum of the American Indian and Museum Conservation Institute are using electron microscopy and DNA analysis to examine blankets made by the Coast Salish Indians of the Northwest Coast of North America in an effort to corroborate historic accounts that these Native Americans once made textiles with dog hair.

Thick white blankets are a central part of the textile tradition of the Coast Salish of Washington state and British Columbia, says Anne Murray, Andrew W. Mellon fellow in textile conservation at the American Indian Museum. "Coast Salish oral tradition says that dog hair was used in making blankets prior to European contact."

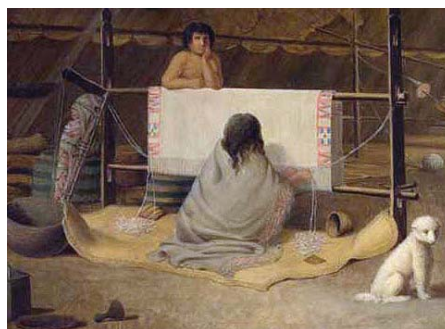
In addition, early European explorers to the Northwest Coast, such as Capt. George Vancouver, make reference to white, long-haired Pomeranianlike dogs kept by the Indians, who used the dog's fur to supplement wool for textile production.

These dogs were herded, isolated from common village dogs and shorn of their hair, which was used in blanket making, the explorers observed.

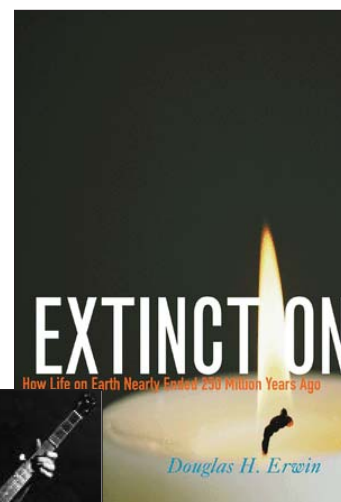
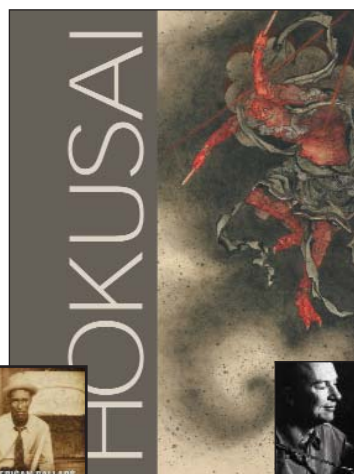
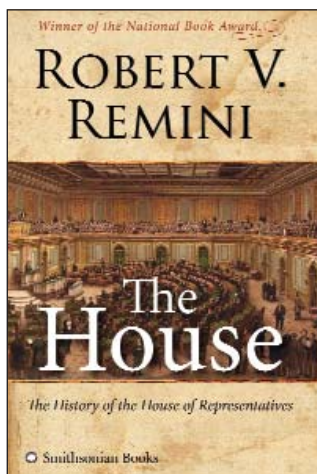
Despite these accounts and with limited archaeological evidence of the dogs' existence, some scholars have doubted that the Coast Salish ever kept these animals or used dog hair to make blankets.

By comparing hairs extracted from Coast Salish blankets in the collection of the American Indian Museum with hairs taken from dog, sheep and goat pelts collected in the 19th century from the Coast Salish region and now in the collections of the Smithsonian's National Museum of Natural History, Murray and others hope to get to the root of this query.

Using microscopy, they examined the internal structure of dog and goat hairs and compared them with the internal structure of hairs in the blankets. Tom Gluick, a research biochemist in the Natural History Museum's Laboratories of Analytical Biology, compared DNA extracted from the blanket hairs with DNA from the hairs taken from the animal pelts. "Both preliminary examinations indicate that some of the blankets consist of both dog and goat hair," Murray says. —John Barrat



This circa 1848-1856 painting by Paul Kane shows a Clallam woman weaving a blanket. (Courtesy Royal Ontario Museum)



Hope Diamond: Legendary History of a Cursed Gem, by Richard Kurin (Collins, 2006, \$24.95). From India's diamond mines and Europe's royal palaces to the jewelers of New York's Fifth Avenue and the exhibit halls of the Smithsonian, the true story behind the world's most famous gemstone is told.

The House: The History of the House of Representatives, by Robert V. Remini (Collins, 2006, \$34.95). This official history reveals the triumphs and failures of key figures of the U.S. House of Representatives. Henry Clay, John C. Calhoun, Gerald Ford, Shirley Chisholm and others who helped shape the House and, through it, the nation are included.

All the Money in the World, by Douglas Mudd (Collins, 2006, \$24.95). A complete and detailed tour of the art and history of paper money and coins, with more than 200 quality color illustrations.

A Song for the Horse Nation: Horses in Native American Cultures, edited by George P. Horse Capture and Emil Her Many Horses (National Museum of the American Indian and Ful-

crum Publishing, 2006, \$12.95). This stunning selection of objects from the collections of the National Museum of the American Indian illustrates the central role horses have played in Native cultures.

Extinction: How Life on Earth Nearly Ended 250 Million Years Ago, by Douglas H. Erwin (Princeton University Press, 2006, \$24.95). Using scientific evidence, a Smithsonian paleontologist examines the possible causes of a cataclysmic extinction event that unfolded 250 million years ago, resulting in the loss of nearly 95 percent of all living species.

Hokusai, by Ann Yonemura (Freer Gallery of Art and Arthur M. Sackler Gallery, 2006, \$45). Japanese painter Hokusai's achievements as a designer of commercial and privately commissioned prints, as an illustrator of printed books and as a painter are explored in depth.

Pete Seeger: American Favorite Ballads, Vol. 4 (Smithsonian Folkways Recordings, 2006, \$15). The fourth in a five-volume work originally issued by Folkways Recordings between 1957 and 1962, this series is considered a corner-

stone of Pete Seeger's remarkable catalog of recorded song.

Masters of Old-Time Country Autoharp (Smithsonian Folkways Recordings, 2006, \$15). Spirited breakdowns, sentimental music and gospel songs—some played as instrumentals—are presented in this re-release of music by traditional Southern autoharp players.

Classic African-American Ballads (Smithsonian Folkways Recordings, 2006, \$15). This historic and engaging slice of America's music heritage from the heyday of the black ballad tradition, 1890 to 1920, contains 22 tracks by various artists, with a 36-page booklet.

Books listed on Pages 14 and 15 can be ordered through online book vendors or purchased in bookstores nationwide.

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.

Temple of Invention: History of a National Landmark

By Charles J. Robertson (Smithsonian American Art Museum and Scala Publishers Ltd., 2006, \$19.95)

On the evening of March 6, 1856, in Washington, D.C., a ball was held for President Abraham Lincoln's second inauguration in the vast hall of the nearly complete north wing of the U.S. Patent Office Building. The hall was crammed with more than 4,000 guests, yet the 250-foot-long buffet table—adorned with such delicacies as terrapin stew, quail, venison and lobster—could serve only 300 at a time.

“When supper was announced, a mob rushed to the buffet,” writes Charles Robertson in his new book *Temple of Invention: History of a National Landmark*. “Foraging gentlemen grabbed large platters of food to carry to their guests, spilling much of it on the surging crowd....”

Lincoln's ball is one of many fascinating episodes in the history of the U.S. Patent Office Building chronicled in Robertson's richly illustrated, 100-page book.

Located on a two-block site between Seventh and Ninth streets and between F and G streets N.W., the Patent Office Building, home to the Smithsonian American Art Museum and the Smithsonian's National Portrait Gallery, reopened on July 1.

Renovations totaling \$166 million have restored the building's features to their original splendor, including a storied Greek Revival design, a curving double staircase, porticoes with fluted Doric columns mod-

eled after the Parthenon and vaulted galleries illuminated by natural light.

This massive 333,000-square-foot structure was once a hall of fame for the creations of American inventors and housed the Department of the Interior. It was the largest office building in the United States at the time of its completion in 1868. It also has served as a “museum of curiosities,” a Civil War hospital and headquarters of the U.S. Civil Service Commission.

The building's purpose, when President Andrew Jackson signed legislation for its



**The Patent Office Building in an 1857 chromolithograph
by Edward Sachse and Co.**

construction in 1836, was to house models and plans of inventions submitted to the U.S. Patent Office. It was to be a monument to American ingenuity and enterprise.

Construction of the south wing began in 1836 under the supervision of architect Robert Mills, when the nation's capital was a town of just 20,000 people and hogs ran down its dirt streets.

Poet Walt Whitman, who visited wounded Civil War soldiers in the Patent Office Building during its use, from September 1861 to April 1863, as a military hospital, called it “that noblest of Washington buildings.” He later worked in the building as a clerk for the Bureau of Indian Affairs.

American Red Cross founder Clara Barton worked in the building as a Patent Office clerk, earning an annual salary of \$1,400. She was the first woman employed in a regular position by the U.S. government at wages equal to those of a man.

Barton was unfazed by the resentment of male employees “who were habitually rude to her,” Robertson writes in *Temple of Invention*. “They blew cigar smoke in her face, spat tobacco juice at her and cast aspersions on her morality.”

By 1877, display cases in the Patent Office Building were filled with more than 200,000 patent models. That same year, a fire gutted the north and west wings. The majority of models were salvaged.

After the structure was rebuilt, the Patent Office stayed in the building until 1932, when the Civil Service Commission moved in. “The noble edifice suffered abuses and modernization during these decades,” Robertson writes.

In 1953, legislation was introduced in Congress to demolish the building for a parking garage. Spared in 1955 by President

Eisenhower, the building was given to the Smithsonian for use as a permanent home for its National Museum of American Art and National Portrait Gallery. It opened to the public in January 1968.

In July 2006, the newly renovated building opened again as the Smithsonian's Donald W. Reynolds Center for American Art and Portraiture.

An 1836 report authorizing construction of this building “called for ‘a place to celebrate and present the achievement of the American people,’” Robertson writes. “As it begins its third century of useful life, the venerable Patent Office Building perpetuates this transcendent purpose.”

—Daniel Friend

World's largest published book donated to Smithsonian Institution Libraries

It's bigger than your average coffee-table book. In fact, at 5 feet by 7 feet and 133 pounds, it could be your coffee table.

Bhutan: A Visual Odyssey Across the Last Himalayan Kingdom, a copy of which the Smithsonian Institution Libraries recently acquired, is the world's largest published book, according to Guinness World Records. And with a price tag of \$15,000 per copy, it is anything but a cheap read.

The book is big in every way. Published one copy at a time by special order, each volume consumes one gallon of ink, 24 hours of press time and more paper than the length of a football field. This Brobdingnagian marvel even strains the limits of the computers used to make it. Each digital image contains about two gigabytes (2 billion bytes) of data, the rough equivalent of 640 copies of Tolstoy's *War and Peace*.

Its contents are mostly photographs—which is like saying the Rockies contain mountains—made by Michael Hawley and his students at the Massachusetts Institute of Technology Media Lab on four extensive expeditions to Bhutan.

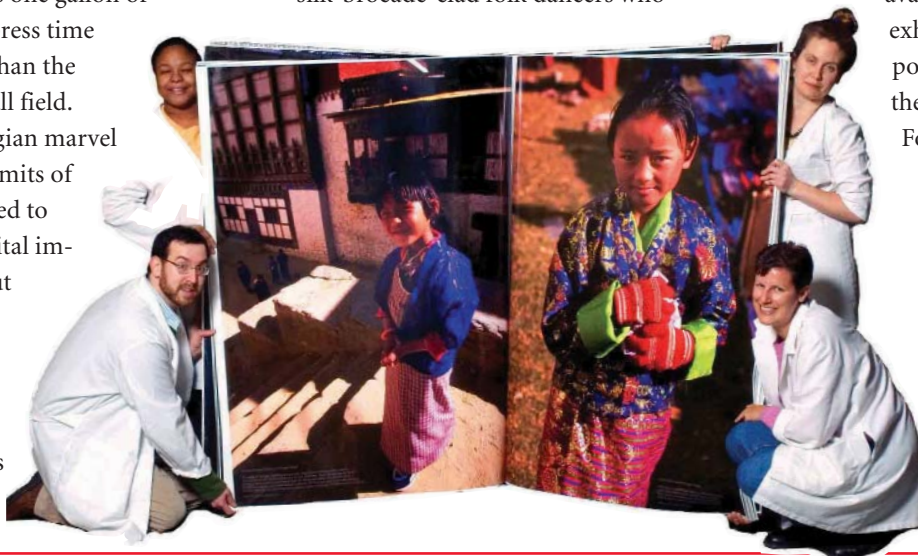
Although one of the world's smallest countries, this 16,000-square-mile kingdom is favored with some of the most stupendous geography on Earth, including part of the Himalaya Mountains. Sweeping panoramas, ancient architecture and silk-brocade-clad folk dancers who

seem to leap off the pages make this a book that readers find hard to put down. Or to pick up, for that matter.

Donated by Mr. and Mrs. Theodore P. Janulis of New York, *Bhutan: A Visual Odyssey Across the Last Himalayan Kingdom* is "an exciting donation to our collection that we hope will draw people into a fascination with books and libraries," says Mary Augusta Thomas, associate director of Smithsonian Institution Libraries. Thomas hopes to make the book

available to the public in future exhibitions, including a proposed program on Bhutan by the Smithsonian Center for Folklife and Cultural Heritage.

—Donald Smith



Staff from Smithsonian Institution Libraries hold up *Bhutan: A Visual Odyssey Across the Last Himalayan Kingdom*. (Photo by Owen Macdonald)

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