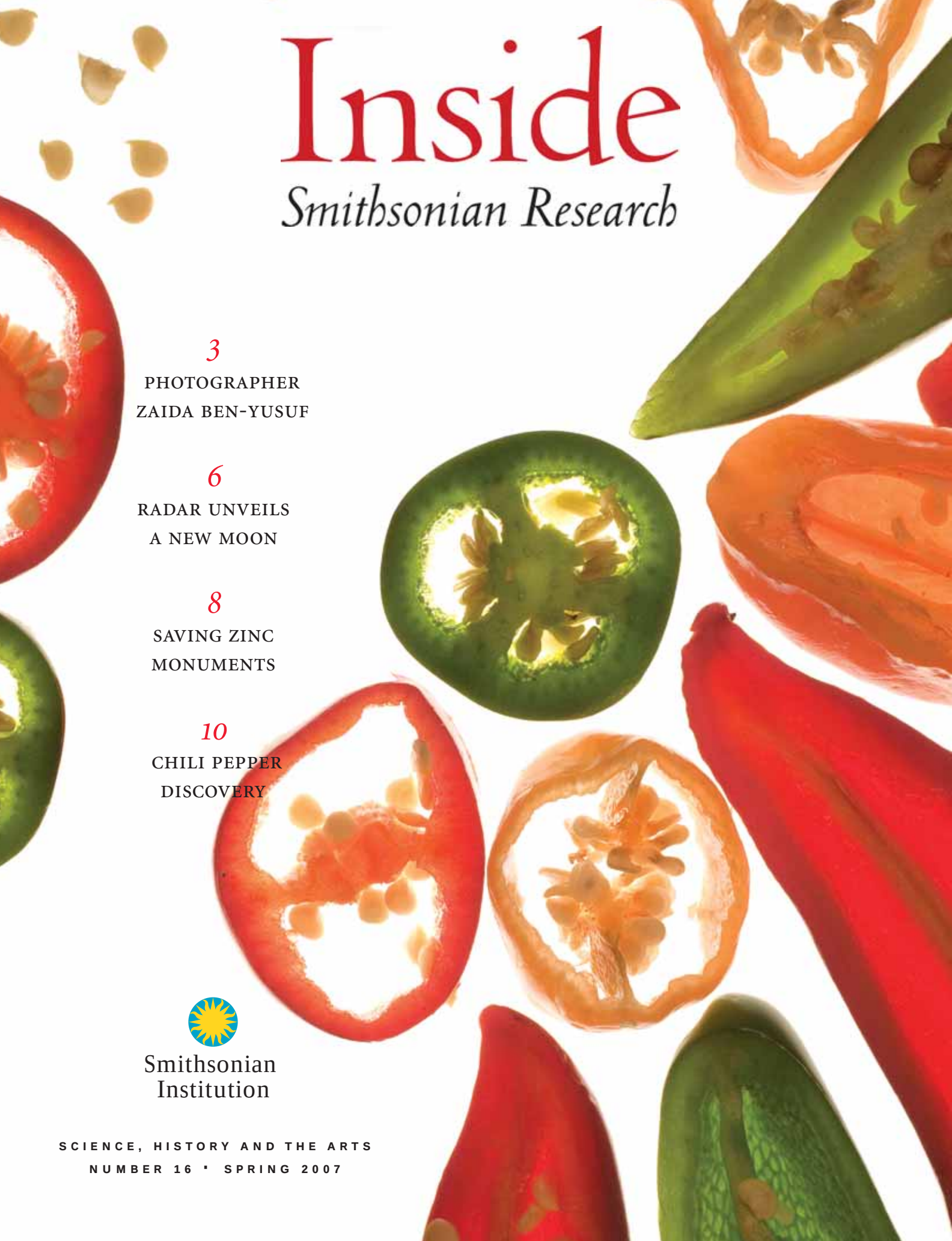
Inside
Smithsonian Research



Smithsonian Institution

SCIENCE, HISTORY AND THE ARTS
NUMBER 16 • SPRING 2007

Studebaker. Starting business in 1852 in South Bend, Ind., with the H&C Studebaker blacksmith shop, the Studebaker brothers quickly gained a reputation for their high-quality horse-drawn wagons and carriages. Abraham Lincoln rode to Ford's Theater in a Studebaker carriage in 1865, on the day he was assassinated. "From Horses to Horsepower: Studebaker Helped Move a Nation" is a new Web site that revisits the Studebaker Corp., using materials from the collections of the Smithsonian Institution Libraries. In the early 1900s, Studebaker made the transition to automobiles, and by the 1920s, the former wagon company had become a giant in the manufacture of gasoline-powered automobiles. Studebaker Corp. was an innovator in introducing new technology and safety features to automobiles, such as four-wheel hydraulic brakes in 1925. Despite a series of popular models designed by Raymond Loewy and produced after World War II, financial problems plagued Studebaker. The company closed its doors in 1966.—www.sil.si.edu/ondisplay/studebaker/

Studebaker's Champion Regal Starlight Coupe for Five was introduced in 1953.

'Sharing Knowledge.' Seals sink quickly when shot with a rifle, so Iñupiaq hunters in Northern Alaska use a wooden seal retriever, called an "igilhaq," to hook the carcass and pull it to shore. This tool is essentially a pronged buoy attached to the end of a long rope. "It's made out of heavy wood, the heavier the better, so you can throw it farther," explains Iñupiaq elder Ron Brower Sr. The seal retriever is one of 300 Alaskan objects from the Smithsonian's National Museum of Natural History and from the Smithsonian's National Museum of the American Indian featured on the new Web site "Sharing Knowledge: The Smithsonian Alaska Collections." This new site unveils the breadth and beauty of clothing, masks, carvings, tools and traditional equipment used for hunting, fishing and domestic life by Alaskan Natives. Each object features elders' commentaries, translated and transcribed from seven indigenous languages; summaries; citations to historical and anthropological sources; and supporting images.—alaska.si.edu

An Iñupiaq seal retriever collected by the Smithsonian in 1910 (Photo by Don Hurlbert)

Correction: An article on Page 3 of the Winter 2007 issue of Inside Smithsonian Research, "Fossils Hold Clues to Predicting How Plants Will Respond to Global Warming," should have referred to the Paleocene and Eocene as geologic epochs, not geologic eras.

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On the cover: A variety of common chili peppers are shown in this photo. Recent research by Linda Perry, a scientist at the Smithsonian's National Museum of Natural History, and her colleagues has revealed that prehistoric Americans, from the Bahamas to Peru, used chili peppers to flavor their food. See story, Page 10. (Photo by Eric Long)

Smithsonian Institution

Research brings the life of a little-known portrait photographer into focus

By Michael Lipske
Special to Inside Smithsonian Research

Frank Goodyear holds a self-portrait taken by Zaida Ben-Yusuf in 1896, now in the collections of the National Museum of American History. (Photo by Owen Macdonald)

He calls her "the mystery lady" and keeps a reproduction of her portrait pinned to the wall by his desk. She is a late 19th-century beauty in a low-cut gown with a lilac corsage, and Frank Goodyear knows her only as "Miss S."

She also is one of the last remaining puzzles the Smithsonian National Portrait Gallery's assistant curator of photographs still hopes to solve from the career of Zaida Ben-Yusuf. This accomplished yet little-known photographer focused her lens on what Goodyear calls "a who's who of modern New York"—and one unknown beauty wearing a lilac corsage—between 1897 and 1906.

Until recently, the real mystery was Ben-Yusuf herself. At the age of 26, the British-born photographer opened a Fifth Avenue studio in New York City that quickly began attracting celebrities of the day, including President Theodore Roosevelt, novelist Edith Wharton, painter William Merritt Chase and actress Julia Marlowe.

"You had the great theater stars, the great artists, the great writers, the great politicians" flocking to Ben-Yusuf's studio to be immortalized in richly toned platinum prints, Goodyear says.

Encouraged in her efforts by Alfred Stieglitz, the era's great advocate of fine-art photography, Ben-Yusuf managed to publish portraits of her illustrious subjects in dozens of leading periodicals, all while circulating among New York's Bohemian avant-garde and even squeezing in a couple of round-the-world trips. And then, suddenly, she turned her back on her brief but brilliant career and vanished from the history of American photography, at least until Goodyear began teasing out her story a few years ago.

A life discovered

His sleuthing was sparked by a 2003 exhibition at the Portrait Gallery featuring 100 photographic portraits from the pages of Art News magazine, which was celebrating 100 years of continuous publication that year. Many of the portraits had come from the Art News picture morgue, and most hadn't seen the light of day since their original publication decades earlier. Two pictures in particular piqued Goodyear's curiosity—portraits of Everett Shinn, the Ashcan School painter, and Daniel Chester French, sculptor of the statue of Abraham Lincoln at the Lincoln Memorial.

(continued)

"I immediately liked the pictures," Goodyear recalls. They were "luscious, velvety, artistic prints," made by someone clearly "sensitive to new creative possibilities in the field of photography." However, the curator was puzzled when he didn't recognize the name of their creator—Zaida Ben-Yusuf. His surprise increased when a check of the scholarly literature on photography turned up hardly any references to Ben-Yusuf.

"She was somebody who had been almost completely lost," Goodyear says, still sounding astonished at Ben-Yusuf's ability to fall through the cracks in the history of photography. Soon, he was hunting for more of her pictures.

Two turned out to be hiding in his own museum—Portrait Gallery-owned portraits of author William Dean Howells and of James Burton Pond, New York's leading manager of celebrity lecture tours 100 years ago. In the storerooms of the Smithsonian's National Museum of American History, Kenneth E. Behring Center, Goodyear found a Ben-Yusuf self-portrait, plus the photo of the young woman identified only as "Miss S." In fact, after a few months of searching, "I began to realize that Ben-Yusuf's pictures were included [although not displayed] in many major photographic collection in this country."

Ben-Yusuf's photos were quietly waiting to be discovered at the Library of Congress, at both the Metropolitan Museum of Art and the Museum of Modern Art in New York, and in archives at Harvard, Yale, Princeton and several other places.

Mystery photographer

So how had Ben-Yusuf been overlooked by photography historians? One reason, Goodyear thinks, is that her works had never been gathered together in one place where they might have attracted scholarly notice. "There's not a single archive where you'll find a huge repository of her papers and her photographs," he says.

Instead, traces of Ben-Yusuf's career are scattered across a number of institutions, with her letters and even some of her photographs sometimes hidden in the archives of other artists. And until Goodyear became intrigued by the Art News portraits, no one knew to look for a mystery photographer named Zaida Ben-Yusuf.

Supported by a Smithsonian Scholarly Studies grant that he was awarded in 2004, Goodyear went on to conduct research in London at the National Archives that established the basics of Ben-Yusuf's biography—her birth in London in 1869 to an Algerian father and a German mother and her move to New York in 1895.

Although Ben-Yusuf first worked as a milliner upon arriving in New York, Goodyear believes she also was an active amateur photographer by then. Within two years, she had launched her career as a portrait photographer, announcing in a letter to Stieglitz that she was "very much in earnest about it all."

Vintage prints

To track down portraits by Ben-Yusuf, Goodyear trolled through online data-

"I immediately liked the pictures," Goodyear recalls. They were "luscious, velvety, artistic prints...."

bases—ProQuest and the American Periodicals Series—that together provide access to the content of more than 1,000 U.S. newspapers and magazines published a century ago. Entering the photographer's name in the powerful search engines led him to digitized reproductions of her portraits in magazines. Armed with printouts of those images and other clues, Goodyear next went looking for the original prints that he suspected were hidden in archives and museum collections.

Unexpected finds

Goodyear's picture-hunting sometimes yielded unexpected results. In trying to locate a portrait of wildlife artist Ernest Thompson Seton, who Ben-Yusuf photographed for a magazine assignment in 1899, Goodyear began by sending a copy of the magazine illustration and a request for help to a blog visited by Seton fans. That eventually brought a tip that many of Seton's papers had ended up at the New York Public Library.

A trip to New York and four hours at the library rummaging through "the depths of their graphics files" produced the original platinum print "stuffed in an old manila envelope," Goodyear recalls. But that was just part of the day's catch.

His thumbing through the files turned up a total of eight vintage prints by Ben-Yusuf—not just of Seton but also a casual study of former President Grover Cleveland on a fishing outing; a photo of Leonard Wood, who led the Rough Riders with Teddy Roosevelt; and several other portraits. Not a bad haul from a place that had earlier told Goodyear they were sure they had no photographs by Ben-Yusuf.

Those eight photographs and about 40 others by Ben-Yusuf will be the subject of an exhibition opening in April 2008 at the National Portrait Gallery. The show will bring together Ben-Yusuf works from 15 museums and other institutions and will be paired with an exhibition of National Portrait Gallery-owned portraits by Ben-Yusuf's far more famous contemporary, photographer Edward Steichen.

For Goodyear, the Ben-Yusuf exhibition and a related book he is writing are a way to restore the overlooked photographer to her rightful position as someone in the vanguard of early 20th-century portrait photography.

In an era when most photographers were still planting their subjects in front of painted backdrops and forcing them into contrived poses (the painter holding his palette, the politician hefting a weighty tome), Zaida Ben-Yusuf, like Stieglitz and Steichen, was working to legitimize portrait photography as a fine art, Goodyear says.

"Ben-Yusuf needs to be added to that list of people who were doing something, who were really pushing forward the creative possibilities for portrait photography," he says.

Ben-Yusuf's portrait of "Miss S" also will be in the exhibition, among a group of portraits of writers, painters and others in their 20s labeled New York's "Young Moderns."

Showing a visitor some of the portraits that will be in the Ben-Yusuf exhibition, Goodyear gets a curatorial gleam in his eye when he says, "I'll tell you, there are few things that are more fun than finding new things that someone else didn't know about." ❖

Above: James Burton Pond, platinum print, circa 1900, by Zaida Ben-Yusuf. (Courtesy National Portrait Gallery, Smithsonian Institution)

Opposite top: "Portrait of Miss S," circa 1899, by Zaida Ben-Yusuf (Courtesy National Museum of American History, Kenneth E. Behring Center, Smithsonian Institution)

Opposite bottom: American painter John White Alexander, taken by Zaida Ben-Yusuf in 1901, from the John White Alexander Papers of the Smithsonian Archives of American Art

Radar unveils the ancient face of the moon

By Rita Zeidner
Special to Inside Smithsonian Research

Littered inside and out with a thick layer of ejecta blasted loose by a meteorite more than a billion years ago, the moon's Shackleton Crater is 11 miles wide and perhaps one mile deep. Because of its location on the exact southern pole of the moon, the crater's rim is bathed in sunlight 80 to 90 percent of the time while its interior lies in perpetual darkness.

Although Shackleton and its surrounding terrain are more than 238,854 miles from Earth, scientists at the Center for Earth and Planetary Studies at the Smithsonian's National Air and Space Museum and at Cornell University are using radar to create new close-up maps of this region, as well as many other areas of the Earth-facing side of the moon.

Unlike previous maps, these new images are revealing a secret side of the moon, one that lies beneath the thick layer of ancient dust and debris scattered across its surface. The images are forging a better understanding of the moon's ancient geologic history.

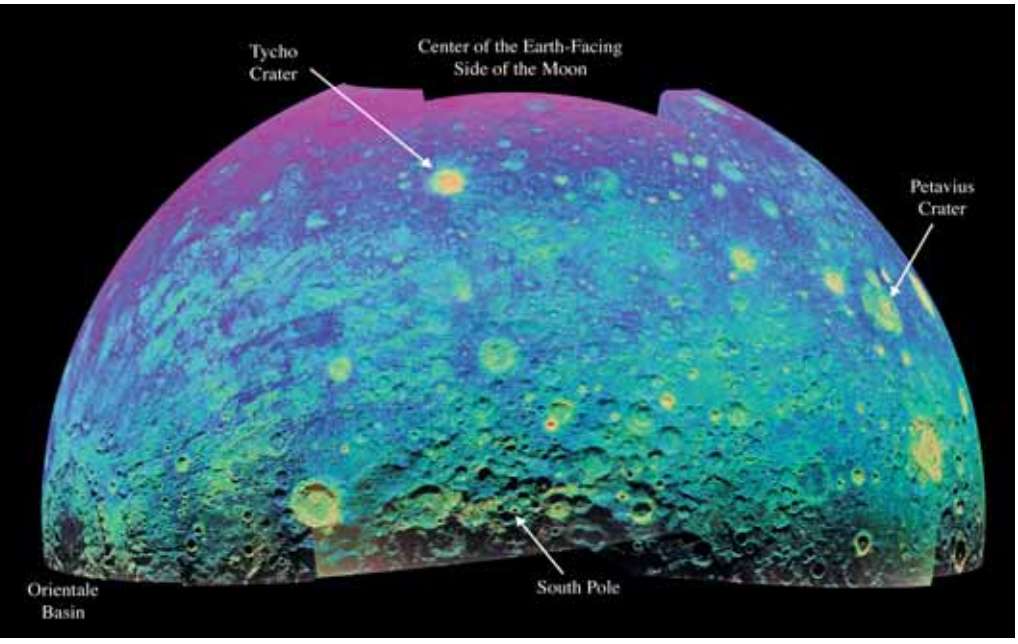
Three seconds

From the 1,000-foot radio telescope at Arecibo Observatory in Puerto Rico, part of a national research facility run by Cornell University, the scientists transmitted a series of radar signals—in 5-inch wavelength and 27.5-inch wavelength—at the moon. In less than three seconds, the waves struck the moon's surface and bounced back to Earth, where they were captured by a 330-foot dish at the National Radio Astronomy Observatory in Green Bank, W.Va. Each radar echo (called backscatter by scientists) varied in strength, depending on the shape, size and composition of the surface material it struck on the moon. Compiled by computer, the echoes were used to create detailed maps.

Radar wavelengths of 27.5 inches were used to create maps of lunar surface features as small as 1,500 feet across for much of the moon's Earth-facing side. These wavelengths penetrated the moon's surface debris—in some areas as deeply as 120 feet through the rock and dust—revealing that the "moon has a lot more vertical structure than might be apparent from photographs," according to Bruce Campbell, a geologist at the Center for Earth and Planetary Studies and one of the project's key researchers.

The lunar regolith, or soil, is made up of dust and rubble from impacts that excavated the moon's craters and basins. Thanks to the radar's deep probing, "we're starting to understand more of how the regolith is built up and see where the large basins put down their ejecta blankets," Campbell says.

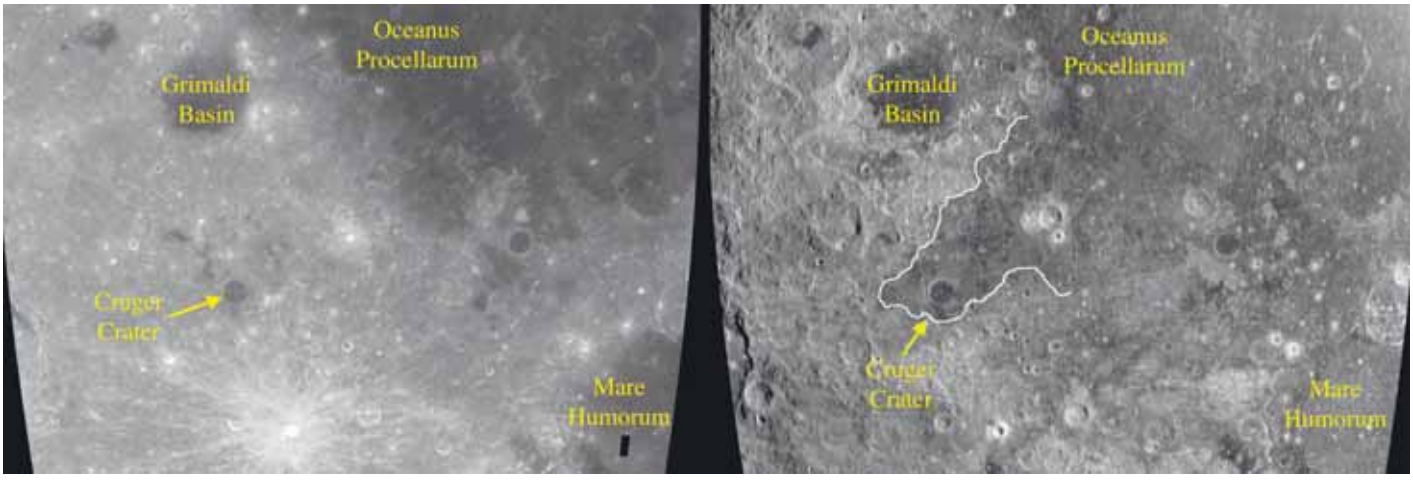
For example, the moon's south polar region is covered with a substantial amount



Left: This radar image of the southern half of the moon's Earth-facing side reveals the magnitude of the debris field of Orientale Basin, seen at far left. Ejecta from this impact crater covers the moon's surface at depths of 1000 feet or more in some areas.

Opposite top: The white outline on the radar image on the right marks the location of a newly discovered 3 billion-year-old basalt lava bed. The left side of this image shows a less-revealing optical view of this same area of the moon.

Opposite bottom: The 330-foot dish of the National Radio Astronomy Observatory in Green Bank, W.Va. (Images courtesy of Bruce Campbell)



of material that was thrown up during the creation of the Orientale Basin, at the far western edge of the moon's visible side. The center of this crater is some 1,250 miles from the moon's South Pole. Much of the material displaced by the crater's creation appears to have been molten when it landed, leaving the floors of distant, older craters covered with a layer of glasslike rock, Campbell says.

Lava bed

In one region on the west side of the moon's face, radar images have revealed a huge 3 billion-year-old basalt lava bed. "One area of buried lava we found is at least 69,000 square miles—a little smaller than Nebraska," Campbell points out. "This is a whole series of flows that filled in areas to form smooth sheets that might be hundreds of meters thick." These flows may extend even farther west, but the depth of the ejecta from Orientale Basin eventually becomes too deep for the radar to penetrate.

The same chemical properties of lunar lava flows that make them visible beneath the Orientale ejecta also are of interest to future explorers. Some of these flows have a high abundance of titanium, and over billions of years, meteorite impacts have churned up this titanium-rich rock into "a readily excavated surface layer of pulverized material a few meters deep," Campbell says. Someday, humans may be able to mine this valuable metal by simply scooping up the loose debris.

No sheets of ice

Smaller, 5-inch radar wavelengths that bounced off the moon were able to reveal surface features as small as 66 feet across. These wavelengths were aimed at targeted areas such as Shackleton Crater and its vicinity. Because the moon wobbles slightly in its orbit, the research team aimed its radar at the moon's South Pole in April and October 2005, when the viewing angle for this area was maximized. The radar-generated images have 25 to 50 times more detail than maps made with

Earth-based optical telescopes, and they even captured views of the polar areas not visible in photographs because these areas lie in eternal shadow from the sun.

One highly publicized result of the radar maps generated by Campbell and his colleagues—the Smithsonian's Lynn Carter, along with Donald Campbell and Jean-Luc Margot of Cornell University, and Nicholas Stacy of the Australian Defense Science and Technology Organization—is that they dispel the theory that the cold craters near the moon's poles contained thick sheets of ice. Temperatures in these permanently shaded craters never rise above minus 280 degrees Fahrenheit.

The lunar ice theory gained support in the early 1990s when Earth-based radar telescopes discovered ice deposits inside impact craters at the poles of Mercury. The new high-resolution radar images of the moon, however, reveal that radar patterns previously thought to be associated only with low-temperature water ice also occur in sunlit areas. This suggests that no large sheets of ice exist in the moon's polar craters. Still, some ice is likely to be present in polar craters at much lower concentrations in the lunar soil.

For technicians and scientists trying to decide where to land spacecraft or build a future moon base, the newly generated high-detail radar images also are proving quite useful.

"We want to find the areas that have few large boulders, both at the surface and in the subsurface layers," Campbell explains. "The areas that are the most rock-free are best for collecting samples and processing lunar resources and safest for landing." ❖

Conservator's research devoted to preserving America's zinc sculpture

By Donald Smith
Special to Inside Smithsonian Research

Still under its inaugural shroud, the monument towered nearly 20 feet into the Illinois sky on that bright fall day in 1889. Cmdr. M.F. Ellsworth of McHenry County's Grand Army of the Republic post gave the order to "unveil," and the heavy cloth fell away to reveal the somber statue of a Union soldier.

Cast from what a local newspaper referred to as "white bronze," the soldier held a musket at parade rest, his greatcoat hanging past his knees in graceful folds. At his feet, the names of living and dead veterans were etched into blue-gray metal, along with the major battles in which they had fought: Gettysburg, Shiloh, Vicksburg and Stones River.

For more than a century, the soldier in the Crystal Lake, Ill., cemetery stood solid, unyielding and ready to endure the ages. Yet last summer, a visitor strolling through the cemetery noticed he had developed a pronounced backward tilt. The local historical society formed a committee to look into the matter—that's when its members encountered Carol Grissom.

"Her name kept coming up when we were searching for information on the Internet," explains Christopher O'Connor, a board member of the Crystal Lake Historical Society.

Grissom, senior objects conservator at the Smithsonian's Museum Conservation Institute in Suitland, Md., is an expert and adviser on the care of statuary made—like the McHenry County warrior—from white bronze, or zinc.

Today, zinc is the primary metal used in pennies. A century ago, its affordability

made the metal a popular choice for 19th-century works of metal, from children's toys and chandeliers to cemetery markers and life-size statues of soldiers and firemen.

Easy to work

For the purposes of large monument-making, zinc was easier to work with than bronze. It can be cast in separate pieces and soldered together, Grissom says. If desired, a bronze-colored coating can be added to disguise its seams and humble origins. It can even be made to look like granite by sand-blasting.

"Zinc sculptures are important because they reflect cultural history during the 19th century throughout the United States, especially in smaller towns," Grissom says. Other common examples of zinc in public places include statues of Justice on the roofs of county courthouses and statues atop cast-iron park fountains.

Many of these zinc objects were mass produced. For example, the soldier guarding the memories of the Prairie State veterans was listed in the catalog of a Connecticut foundry as "American Soldier Model No. 220." With pedestal, it cost $1,500, roughly $30,000 in today's dollars. That price was as little as one-tenth of what larger cities were spending on bronze statues.

Corrosion and creep

As these zinc monuments continue into their second century of existence, often in harsh outdoor environments, many are deteriorating, Grissom says. Pieces of the hollow structures break off when struck by falling tree branches. Vandals sometimes steal whatever they can pry away, including weaponry and the lanterns typically held aloft by stoic zinc firemen.

Broken pieces can be resoldered, Grissom adds, but the job requires considerable skill. Polyester or epoxy resin can be used to repair broken pieces. These adhesives may have a more limited life span but they are easier to apply and remove.

Most of the environmental damage Grissom has documented stems from sulfur dioxide emissions from fossil fuel-burning power and industrial plants. Sulfur dioxide combines with water and oxygen in the atmosphere to produce sulfuric acid. Chlorides, found in the air near the sea, also may cause surface pitting of zinc.

More unsightly than damaging are bird droppings—which can be washed off—and growths of organisms, such as lichen and fungus, that tend to form on statuary located near trees.

To prevent corrosion, Grissom suggests cleaning and, in some cases, repainting with a protective paint.

Another problem for zinc statuary is "creep." Essentially, a statue slowly fails so it cannot support its own weight. This results in bulges, leaning and other distortions and can be exacerbated by a treatment all too often applied by well-meaning custodians: filling the hollow statue with concrete. More often, the weight of the concrete only adds to the stress.

In the sad cases where statues have been filled with cement, "there's not much you can do that wouldn't be prohibitively expensive," Grissom says. A trend in recent years, which she dislikes, has been to replace battered zinc statues with new ones made of bronze.

In an effort to monitor America's zinc statuary and make certain that caretakers don't damage them with improper conservation measures, Grissom has identified some 800 zinc statues across the United States.

SOS!

Her single biggest source of data has been Save Outdoor Sculpture!, a program launched in 1989 that continues today under the auspices of the Smithsonian American Art Museum and the National Institute for Conservation. SOS volunteers have scoured the country to catalog every outdoor sculpture they can find.

"Often, zinc is not correctly identified," Grissom points out. "If I can see an image of it, particularly a color image, I can sometimes tell what the statue is made of."

When in doubt about the material, one of the surest identification tools is a magnet. Like lead, zinc has no magnetic properties and a magnet won't stick. If she is still unsure, Grissom uses an attachment to an electron microscope called an energy dispersive spectrometer. When the electrons of a tiny sample of a material are excited, each element releases a distinctive energy pattern. This method is especially useful in determining the makeup of a statue's original coating, even when only scraps remain in crevices, Grissom says.

Grissom is currently writing a book on zinc statuary and its care. As for the Union Cemetery soldier in Crystal Lake, Ill., she provided background information and some general advice to get the local historical society started on its own rescue mission. The group is working with a local conservator who is proposing putting a new stainless steel armature inside. This they believe, could halt or slow the soldier's "creep."

Until the estimated $50,000 to $125,000 funding to do this can be raised, the old trooper has been placed on leave status. He reposes in a climate-controlled storage space, patiently awaiting restoration to his place in the hearts and memories of McHenry County. ❖

Opposite: Carol Grissom with two of the many small zinc statues she keeps in her laboratory at the Smithsonian's Museum Conservation Institute (Photo by Owen Macdonald)

Above: This hatchet is an ornament from a 19th-century zinc chandelier, one of many zinc objects that Grissom keeps on hand in her laboratory. (Owen Macdonald photo)

Right: The weight of this statue from the City of New York Civil War Monument in Green-Wood Cemetery in Brooklyn caused its seams to spread apart. The pitting seen here is due to air pollution and copper plating that once covered the statue. This statue has since been replaced with a bronze replica. (Photo by Carol Grissom)

Chili pepper starch grains linked to ancient settlement sites across the Americas

By Donald Smith
Special to Inside Smithsonian Research

The eye-watering moment when chili peppers first spiced up the palates of early Americans has long been a subject of speculation for New World archaeologists and culinary historians alike. For years, archaeologists have assumed that the organic remains of the first chilies—plants of the genus *Capsicum*—eaten by humans did not survive the ravages of time well enough for their appearance to ever be chronicled in the archaeological record.

Now, a scientist at the Smithsonian has discovered evidence in the form of microscopic starch grains that, when linked with archaeological stone tools, reveal precisely when and where early Americans began enjoying chilies in their meals.

The discovery by archaeobiology postdoctoral fellow Linda Perry of the Smithsonian's National Museum of Natural History and her colleagues was recently published in the journal Science. Their work is yielding new information about a food that is popular worldwide and gives insight into early human settlements in Central and South America.

"It is hard to imagine modern Latin American cuisine without chili peppers," says Delores Piperno, an archaeobotanist at the Natural History Museum and the Smithsonian Tropical Research Institute in Panama and one of the co-authors of the article. Scientists now know that "prehistoric people, from the Bahamas to Peru, were using chilies in a variety of foods a long time ago. Peppers would have enhanced the flavor of early cultivars, such as maize and manioc, and may have contributed to the rapid spread of these cultivars after they were domesticated."

The antiquity of chili peppers sheds a revealing new light on the day-to-day existence of early Americans.

Indigestion

The discovery of ancient chili pepper starch grains was a "eureka!" moment of sorts, Perry explains, "something that came up quite by accident." It occurred after Perry deduced that the unidentified microscopic remains of plants that she and her colleagues had been finding at various ancient settlement sites in the Americas might, in fact, be chili pepper starch grains.

"There are just a few researchers in the Americas who work with starch microfossils," Perry says. "We know one another well and communicate and share images.

Left: Linda Perry displays a folder of microscope slides containing chili pepper starch grains found on stone tools from Venezuela. (Photo by Owen Macdonald)

Opposite top: In her office at the Smithsonian's National Museum of Natural History, Linda Perry keeps a box of seeds from plants found associated with early human settlement sites in the Americas. (Photo by Owen Macdonald)

Opposite bottom: Through a microscope, this chili pepper starch grain appears as a smooth, transparent circle. (Photo courtesy of Linda Perry)

People were sending me images of microscopic starch grains they'd found at archaeological sites. They were grains that we couldn't identify yet were simply everywhere. Nobody knew what they were."

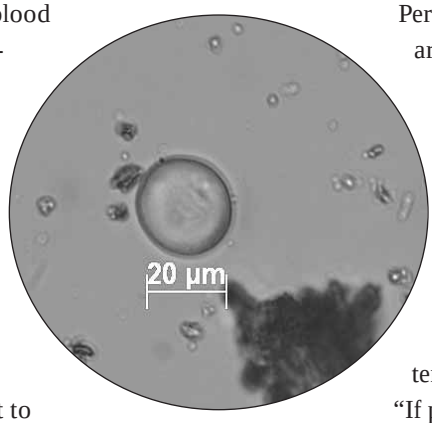
The researchers had previously identified starch from a number of domesticated plants, such as corn, beans and squash, at archaeological sites. Noting that chili peppers sometimes cause indigestion and that undigested starch is often the source of this condition, Perry's suspicions were aroused.

"I thought, 'My goodness, what if peppers have starch?'" she recalls. "So I came back to the lab, got a little sample of a pepper out of my reference collection, smeared it on a microscope slide, and there was our unknown." As it turns out, the starch grains are the only part of the pepper plant that can survive the passage of millennia in a tropical climate.

Distinctive shapes

Starch grains are the equivalent of fat cells for plants, Perry explains. Through photosynthesis, plants process carbon dioxide with the energy from sunlight to produce glucose. This winds up as food that can be stored for later use in the form of starch—packaged in starch grains. The grains themselves are semi-crystalline structures that under a microscope resemble smooth river stones. Through processes not yet understood by scientists, starch grains can persist for eons.

While searching for blood residue on 28,000-year-old stone tools in the Solomon Islands in 1994, Australian archaeologist Tom Loy first identified the microscopic remains of plant starch grains crushed into the crevices of the implements. Loy was the first to realize the identity of the plants could be determined by the distinctive shapes of their starch grains. Loy's work opened a new window onto the past. Now, instead of theorizing about the development of agriculture, researchers could analyze physical evidence of the plants themselves.



Complex cuisine

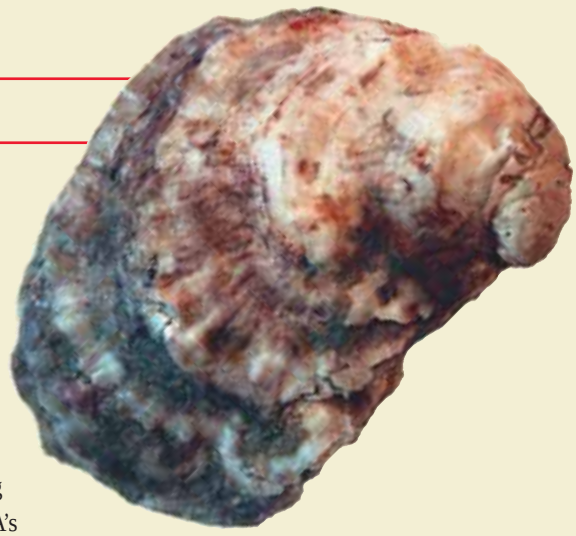
To date, the oldest chili starch grains have been found in southwestern Ecuador at two human settlement sites dating to 6,100 years ago. The chili remains were associated with previously identified starch grains of corn, arrowroot, yuca, squash, beans, palm fruit and other plants, adding to the picture of an early, complex agricultural system in this region.

But Ecuador is not considered to be a center of domestication for any of the five domesticated chili species. A more ancient record of the domestication and spread of chili peppers awaits investigators working in other regions where wild chilies were first brought into cultivation.

In Panama, chili peppers have been found with evidence of corn and domesticated yams dating back some 5,600 years. Chilies also were found at a site occupied 4,000 years ago in the Peruvian Andes, along with microscopic remains of corn, arrowroot and possibly potato. In this case, the chilies were identified as the species *C. pubescens*. The rocoto pepper, a cultivar of this species, is still a staple in the Peruvian diet. More recently settled sites in the Bahamas and Venezuela also have yielded remains of both corn and chilies.

Perry's discovery has given archaeobiologists an important tool for understanding how New World agriculture developed.

The antiquity of chili peppers sheds a revealing new light on the day-to-day existence of early Americans. "If people were deliberately cultivating chilies, a nonstaple crop, this is an indication that they weren't living on the margins. They had to have enough to eat in order to be able to experiment with other foods just to add to their enjoyment," Perry says. Her pepper discovery is revealing evidence of "a complex cuisine at a very early time." ❖



A Chesapeake Bay oyster

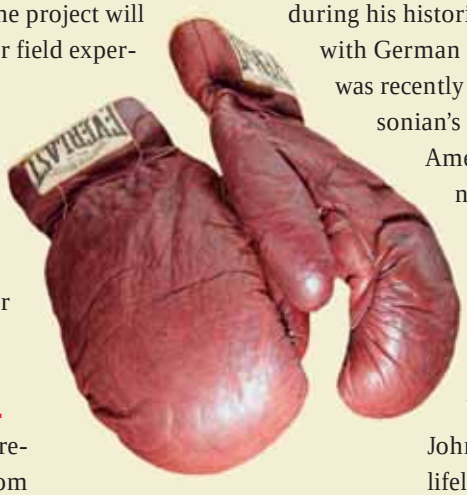
Sea nettle decline. Declining oyster populations in the Chesapeake Bay may be linked to the decline of a second bay species, stinging jellyfish or sea nettles, say two scientists from the Smithsonian Environmental Research Center in Edgewater, Md. A study by Denise Breitburg and Richard Fulford suggests that a reduction of oyster reefs in the Chesapeake, a habitat where young sea nettles safely spend the winter as polyps, is the cause of reduced sea nettle populations. In an added twist, adult sea nettles prey upon comb jellies, or ctenophores, a major predator of oyster larvae. With fewer sea nettles making it to adulthood, populations of comb jellies have risen, resulting in a negative impact on oyster larvae populations.

Researchers at the Smithsonian Tropical Research Institute monitor newly planted trees in the watershed area of the Panama canal. (Marcos Guererra photo)

Cloaked planet. A planet in orbit around a star located some 60 light-years away from Earth has surprised scientists from the Spitzer Science Center and the Harvard-Smithsonian Center for Astrophysics by its apparent lack of the common molecules water, methane and carbon dioxide. Known as HD 189773b and located in the constellation Vulpecula, the planet's spectrum was recently analyzed by scientists using the Infrared Spectrograph aboard NASA's Spitzer Space Telescope. "We think it may be cloaked in dark silicate clouds," says Astronomer David Charbonneau of the Harvard-Smithsonian Center for Astrophysics. Theoretical calculations predicted that water vapor and methane would be the most evident molecules in a profile of the planet's spectrum.

Forest science. An $8 million grant from HSBC, one of the world's largest banking and financial services organizations, will be used by the Smithsonian Tropical Research Institute in Panama to expand its Center for Tropical Forest Science into a new, coordinated Global Earth Observatory system. The new initiative will monitor the long-term effects of global change on forest dynamics and compare climate change and forest carbon data from 17 countries around the world. In addition, the project will create the largest-ever field experiment on the role of forests in regulating the quality and quantity of water flow in the Panama Canal, the most important watershed for world commerce.

Artist fellowships. Nine artists recently received fellowships from the Smithsonian to conduct research at the Institution as part of the new Artist Research Fellowship Program, a pilot program launched last year. A panel of art curators and administrators from the Smithsonian and other institutions reviewed the applications and selected the artists from among 27 nominees. The nine artists are Ghada Amer (New York), Sandow Birk (Long Beach, Calif.), Björn Dahlem (Berlin), Terence Gower (New York), Shih Chieh Huang (New York), Nene Humphrey (Brooklyn, N.Y.), Sergio Palleroni (Austin), Tim Rollins (New York) and Sue Williamson (Cape Town, South Africa). For information on the Artist Research Fellowship Program, artists may call (202) 633-5090.



Boxing gloves worn by Joe Louis in his 1936 bout with Max Schmeling

Joe Louis. A pair of boxing gloves worn by American boxing legend Joe Louis during his historic first bout in 1936 with German boxer Max Schmeling was recently donated to the Smithsonian's National Museum of American History, Kenneth E. Behring Center. The gloves and accompanying photographs of Louis once belonged to Earle Cuzzens, a business partner of John Roxborough, Louis' lifelong manager. They were donated by Cuzzens' nephew, Ken Milburn.

In bat harems, a female's location determines if she is well- or badly treated

For female fruit bats clinging upside down in harem clusters to the ceilings of caves in Yucatán, Mexico, life on the harem's edge means being attacked more, getting groomed less and being frequently expelled. This was one of the findings in a recently published study by researchers Jorge Ortega of the Ecological Institute of the National Autonomous University of Mexico and Jesus Maldonado of the Smithsonian's Genetics Program, a joint project of the Smithsonian's National Zoological Park and the Smithsonian's National Museum of Natural History.

Their study focused on the interactions of female Jamaican fruit bats (*Artibeus jamaicensis*) living in harems averaging 14 females. Harem bats were classified by the scientists according to their position in the cluster—those on the edge, those in the central core and those in between.

Females on the edge of the harem did not interact with females in the harem's central core and were often greeted with grunts and wing flicks (signs of aggression) when they approached the middle-position bats. Edge bats shifted their positions more often, trying to maneuver to a better spot. This behavior frequently earned them ejection from the harem. Accordingly, edge bats were more often new arrivals from other areas of the cave.

Blood and tissue samples taken from the bats showed no significant genetic subdivision, as well as a low degree of family relationship among the harem members. Bats at the harem's central core had less turnover of individuals and received mainly positive interactions—in the form of licking and grooming—from middle-position bats. Females temporarily removed from the harem by the researchers quickly regained their original positions when they returned to the harem.

During breeding season, females became more tolerant and during rearing time, the bats clustered in compact groups without moving. This suggests that one possible benefit of roosting together is that it provides a more suitable place to nurse newborns and keep them warm.

"Studying the degree of association among individuals and their influences in the group can help us address questions about the importance of membership in groups, the social structure of the groups and the type of relationships between different groups," Ortega and Maldonado say. "It can also help us understand why such groups are formed, be it protection against predators, the availability of resources or the structure of a mating system."

—John Barrat

Astronomers propose eavesdropping to detect life in other regions of the galaxy

In the search for intelligent life in other regions of the galaxy, scientists on Earth have long been listening for a cosmic "Hello!" beamed deliberately across space. They have been listening at frequencies higher than one gigahertz to avoid interference from radio transmissions on Earth and other transmissions from natural sources out in space.

Now, theorists Avi Loeb and Matias Zaldarriaga of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., are proposing a different tack: listening for the random signals leaked into space by the everyday activities of civilization. They propose using a radio telescope now under construction in Australia, known as the MWA-LFD, or the Low Frequency Demonstrator of the Mileura Wide-Field Array, to listen for Earthlike civilizations around a thousand or so nearby stars.

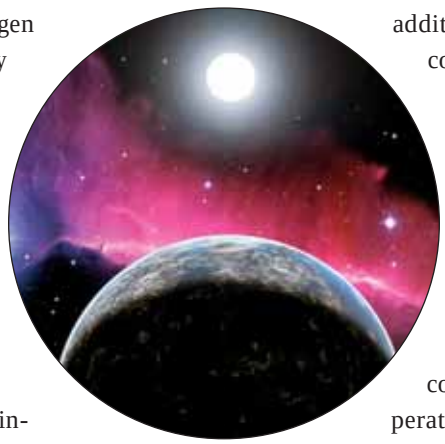
They point out that the new MWA-LFD, which is designed to study frequencies of 80 to 300 megahertz, will pick up the same frequencies used by Earth technologies, such as radar, television and FM radio. If similar broadcast sources are being used on other planets, the MWA-LFD may detect them.

The MWA-LFD radio telescope is designed to detect and characterize emission from hydrogen molecules in the early universe. Its key goal is to create a 3-D map of ionized "bubbles" that formed as the first quasars and galaxies flooded space with ultraviolet light billions of years ago.

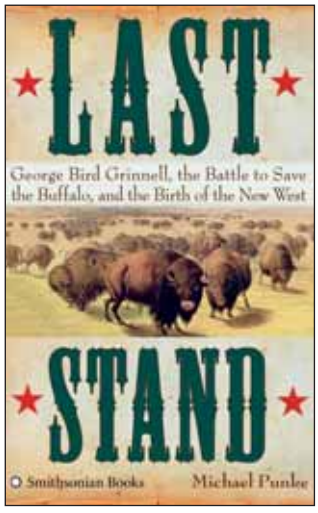
"The MWA-LFD is intended to study the distant, young universe," Zaldarriaga says. "By piggybacking onto its normal observations, researchers could look for extraterrestrial civilizations."

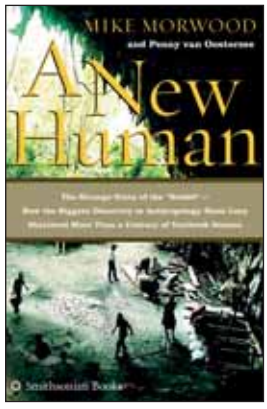
Loeb and Zaldarriaga calculate that, by staring at the sky for a month, the MWA-LFD could detect Earthlike radio signals from a distance of up to 30 light-years.

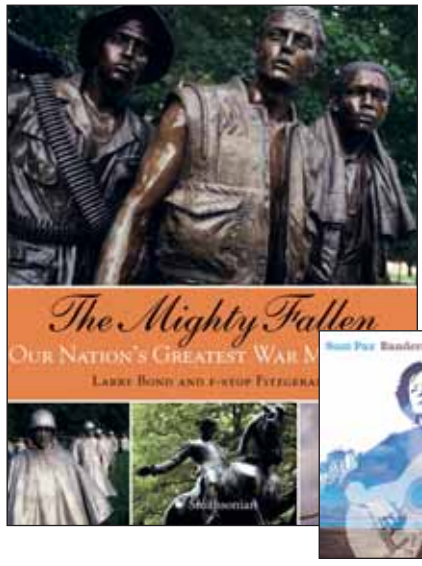
If alien broadcasts are detected, additional observations could measure characteristics of the source planet, such as how fast it rotates or how long its year is. By combining that information with knowledge of the parent star, astronomers could estimate the temperature on the planet's surface to assess whether it may contain liquid water and perhaps support life as we know it.



This artist's hypothetical rendering shows how a distant world inhabited by intelligent aliens might look from space. (Image by David Aguilar)







The Story of Science: Einstein Adds a New Dimension, by Joy Hakim (Collins, 2007, $27.95). The third and final installment in a special series that recounts how Einstein developed a new kind of physics that pointed the way to recent theories of particle physics and quantum mechanics.

A New Human, by Mike Morwood and Penny Van Oosterzee (Collins, 2007, $25.95). The strange story of the extinct "Hobbit" people of the Indonesian island of Flores and the wild adventures of the archaeologist who discovered them. This book is an accessible introduction to a contentious debate.

Vaccinated: One Man's Quest to Defeat the World's Deadliest Diseases, by Paul Offit (Collins, 2007, $26.95). A compelling look at Maurice Hilleman, director of virus and cell biology at Merck Research Laboratories, who was responsible for the development of nine major vaccines.

Rocketeers: How a Visionary Band of Business Leaders, Engineers and Pilots Is Boldly Privatizing Space, by Michael Belfiore (Collins, 2007, $26.95). The first book to tell the story of the people who are succeeding in making private space travel a reality, from Richard Branson of Virgin Galactic to Las Vegas hotelier Robert Bigelow.

The Mighty Fallen: Our Nation's Greatest War Memorials, by Larry Bond and F-Stop Fitzgerald (Collins, 2007, $29.95). A beautiful photographic tribute to our country's veterans and fallen soldiers, showcasing America's war memorials from the Revolutionary War through Vietnam.

Last Stand: George Bird Grinnell, the Battle to Save the Buffalo and the Birth of the New West, by Michael Punke (Collins, 2007, $25.95). A tale of the great fight for the soul of the West that followed the Civil War and a man who was determined to protect the land and the bison.

Perfect Spy, by Larry Berman (Collins, 2007, $25.95). The incredible double life of Pham Xuan An, a Time magazine reporter and Vietnamese Communist agent who helped change the course of the Vietnam War.

¡Tierra Caliente! Music From the Hotlands of Michoacán by Conjunto de Arpa Grande Arpex (Smithsonian Folkways Recordings, 2006, $15). Music that is the country cousin of the Mexican mariachi, with two violins, two guitars and a harp that doubles as a drum.

Suni Paz Bandera Mia: Songs of Argentina (Smithsonian Folkways Recordings, 2006, $15). Veteran folksinger and guitarist Suni Paz paints a musical mosaic of favorite Argentine rhythms: tango, chacarera, bailecito, carnavalito, gato, zamba and vidalita.

Por Por: Honk Horn Music of Ghana (Smithsonian Folkways Recordings, 2007, $15). The La Drivers Union Por Por Group uses squeeze-bulb honk horns, bells, drums and voices to celebrate the 50th anniversary of Ghana's independence.

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) 633-6450.

The Lost World of James Smithson: Science, Revolution and the Birth of the Smithsonian

By Heather Ewing (Bloomsbury, 2007, $29.95)

Since its founding in 1846, one of the most enduring mysteries of the Smithsonian Institution in Washington, D.C., has been the man who was its founder, British chemist James Smithson (1765-1829). For more than a century and a half, only the sketchiest of details have been known about the man.

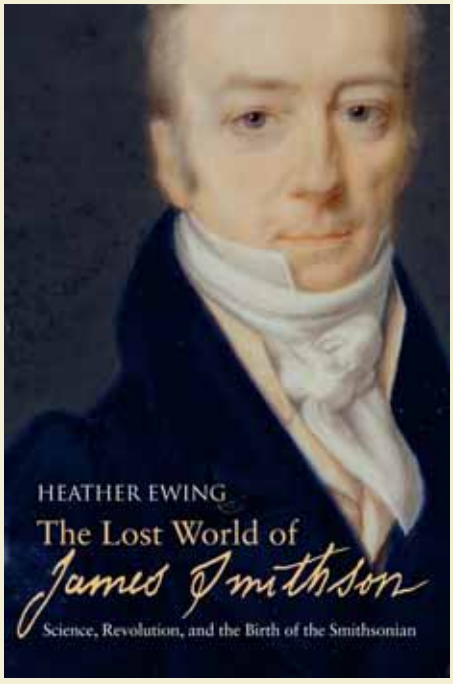
Equally puzzling were Smithson's intentions in writing the sentence in his will that led to the founding of the Smithsonian. He bequeathed his fortune to the United States—a country he never visited—to "found in Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men."

Compounding Smithson's mystery, an 1865 fire destroyed nearly all of his personal effects—journals, correspondence, some 200 unpublished scientific papers and his mineral collection.

In *The Lost World of James Smithson*, author Heather Ewing resurrects the life and scientific career of James Smithson by tracking down old diaries, letters, probate records, bank books, police dossiers, organizational minutes and other documents long buried in archives and libraries across Europe. Using this information, Ewing meticulously constructs a solid portrait of Smithson from hundreds of scattered sources.

Smithson, who went by the name James Macie until he was 35, was the illegitimate son of Hugh Smithson, the first Duke of Northumberland (1714-1786) and Elizabeth Hungerford Keate Macie (1728-1800). Smithson's mother, Ewing reveals, was high-strung, haughty, tempestuous and "a domineering, emotionally erratic presence for her fatherless son."

After attending Oxford University, during which he pledged himself to the study of chemistry and mineralogy, Smithson soon gained the respect of his colleagues for his skill in chemistry and geology and enthusiasm for science. He and his young contemporaries "felt themselves to be on the cusp of greatness," Ewing writes. "They had discovered a life imbued with purpose, founded upon a belief that chemistry could be an engine of improvement and prosperity. Smithson in particular stood out as exceptional...."



On April 18, 1787, Smithson became, at 22, the youngest member of the Royal Society. In 1791, he published his first scientific paper, "An Account of the Tabasheer," in the Royal Society's prestigious journal Philosophical Transactions.

In *The Lost World of James Smithson* Ewing not only resurrects Smithson but recreates the optimistic atmosphere of the scientific age of enlightenment in England and Europe and the turmoil of the French Revolution. In researching her book, Ewing retraced Smithson's footsteps across Europe "walking the streets, visiting the museums and the mineral collections, looking as I might through his eyes," she writes.

Smithson's friends were a virtual who's who of European scientists between the 1780s and the 1820s—Sir Joseph Banks, Joseph Priestley, Antoine Lavoisier, Henry Cavendish, to name only a few. "Even as the world they inhabited was convulsed by war, they proclaimed themselves citizens of the globe and pledged allegiance first of all to truth and reason," Ewing writes. "Their highest aspiration was to be a benefactor of all mankind."

Smithson himself was "a man of infectious exuberance and ambition...," Ewing observes. "How can a man of his ardor ever be idle?" queried one of Smithson's friends. "Macie is my delight!" wrote another. "His brain like my own is fruitful in whimsies."

The *Lost World of James Smithson* is filled with fascinating details of Smithson's life. For example, he excelled at the use of the blowpipe, a mouth-driven implement for directing a hot flame upon a mineral specimen to study its chemical composition. He was a tireless collector of minerals and worked his entire life to complete his cabinet of mineral specimens. In 1807, Smithson was arrested and spent nearly two years as a prisoner of war in Tönning, Denmark.

In writing this book, Ewing has done a great service to the Smithsonian, finally giving the Institution a very clear image of the humanity, vision and voice of its founder and namesake. —*John Barrat*

Barney Clark's Jarvik 7 heart on view in Smithsonian "Treasures" exhibition

Twenty-five years ago, in 1982, Seattle dentist Barney Clark became the first recipient of a Jarvik 7 artificial heart. Clark survived for 112 days after his natural heart was removed and replaced with the Jarvik 7. In January, the Jarvik 7 that pumped blood through Clark's body—a compressed-air machine made of polyurethane, polyester, plastic and aluminum—went on view in the Smithsonian's "Treasures of American History" exhibition after its inventor, Robert Jarvik, loaned it to the National Museum of American History, Kenneth E. Behring Center.

The Jarvik 7 captured the world's attention in 1982 "because of its symbolic meaning that technology was trying to save our lives," Jarvik explained during a special ceremony.

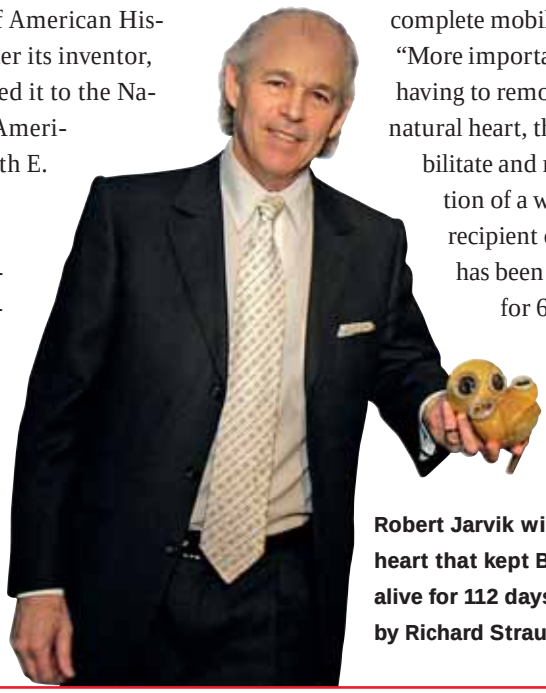
The Jarvik 7 was noisy and required a patient to be permanently connected to a large console with tubes through the skin. It is worlds apart from a second device Jarvik donated to the Smithsonian in January, a modern Jarvik 2000 FlowMaker, an electric-motor-driven machine that assists the heart's left ventricle in pumping blood.

The Jarvik 2000 "is the size of a C-cell battery, is quiet and its user has complete mobility," Jarvik said. "More important, rather than having to remove a patient's natural heart, the 2000 can rehabilitate and restore the function of a weak heart." One recipient of the Jarvik 2000 has been living with his for 6½ years.

Whenever technology is involved, Jarvik said, advances come about, in part, because "inventors are able to work with tools that people prior to them never had." For example, since 1982, several key breakthroughs have been made that facilitated the invention of the Jarvik 2000, "such as the development of very high strength magnets that exceed the magnetic strength and permanence of previous magnets."

With the magnets available in the early 1980s, "you just couldn't make a motor" like that used in the Jarvik 2000, which "has a big space between the windings of the motor and the magnet to allow blood to pass through," Jarvik pointed out. "Also, some of the biomaterials used in the Jarvik 2000, particularly to coat the electric leads, didn't exist" until recently.

And finally, Jarvik said, the Jarvik 2000 is so quiet that a patient does not hear or feel or think about it. Its battery pack allows its user mobility and the freedom to live a truly normal life. When the Jarvik 7 was making headlines in 1982, Jarvik notes, such a concept for an artificial heart like the 2000 "really hadn't been created" yet either. —*John Barrat*



Robert Jarvik with the Jarvik 7 heart that kept Barney Clark alive for 112 days in 1982. (Photo by Richard Strauss)

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