A Rare Look at Chimney Rock

SPRING 2010

HAZARDOUS DIGS • REMOTE SENSING FROM SPACE • ARCHAEOLOGY AND THE ENVIRONMENT

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COVER FEATURE

18 A ONCE IN A LIFETIME DIG
BY DAVID MALAKOFF
For the first time in decades archaeologists had the opportunity to study Chimney Rock.

12 CAN ARCHAEOLOGY SAVE THE ENVIRONMENT?
BY KRISTIN OHLSON
Archaeologists believe their voices should be heard in the environmental conversation.

25 WORKING TO REVEAL THE WORKING CLASS
BY MIKE TONER
Several investigations examine the lives of workers during the rise of American industry.

32 EXTREMELY REMOTE SENSING
BY JULIAN SMITH
Researchers can detect evidence of archaeological sites from satellite images that can’t be seen at ground level.

38 EXCAVATING HAZARDOUS SITES
BY TAMARA STEWART
It’s definitely not business as usual when archaeologists excavate these dangerous sites.

44 new acquisition
SAVING AN IMPORTANT STOCKADE
Fort Gibson played an important role in 19th-century Oklahoma.

46 new acquisition
ACQUIRING A MYSTERIOUS MOUND
Very little is known about Bates Mound Number 2.

47 new acquisition
THE CONSERVANCY PRESERVES AN ANCIENT PENNSYLVANIA SITE
Ebbert Spring has been a source of water for thousands of years.

48 point acquisition
A GLIMPSE OF ANCIENT LIFE ON THE NORTHWEST COAST
An unusual wet site in Washington State could yield valuable information.

2 Lay of the Land
3 Letters
5 Events
7 In the News
Mysterious Jamestown Tablet · Nine Mile Canyon Agreement · New Maize Research

50 Field Notes
52 Reviews
54 Expeditions

COVER: The rising moon is seen at Chimney Rock. It’s thought that prehistoric people observed lunar standstills here.
Photograph by John Ninnemann
One of the key practical consequences of modern archaeology is to gather a great deal of information about the prehistoric environment. Human garbage tells us how much mercury was in the Great Lakes thousands of years ago, before they were greatly impacted by humans. This provides a baseline of data from which to measure the conditions of the lakes today. And so it goes around the nation and the world. Archaeologists are digging up past environments to compare with those of today.

In this issue of American Archaeology (see “Can Archaeology Save The Environment?”, p. 12), we take a look at how archaeologists are studying past environments. We learn that the Mimbres people of southwestern New Mexico depleted local animal life as well as forests. Other data indicate that changes in the ecosystem became fatal during a small climate change like the Little Ice Age of the 15th century A.D.

As the planet faces major global warming, archaeologists have much to add to what climatologists, biologists, and other scientists have to tell us. Relatively small environmental changes have been causing large human consequences for thousands of years. Knowing what happened in the past can only help us deal with the large environmental changes that lie ahead.
Expose Them, and They Will Come
Anabel Ford’s view on the proper marketing of El Pilar (“Understanding El Pilar,” Winter 2009-10) is to leave the ruins covered, and that the tourists will come for that experience. Ford should stick to her profession, archaeology. I have visited Mesoamerican ruins that combined the covered and uncovered and few, if any, tourists were looking at the covered ruins. At two sites in Mexico where uncovered structures were located next to similar structures that remained covered, 90 percent of the tourists were visiting the uncovered structures.

My profession is not marketing, but I do have common sense. What is sad is the inhabitants of the area around El Pilar need the money that comes from tourism. Ford’s misguided ideas will result in wasted development money and lost revenue.

Flo Samuels
Hayward, California

Living Next to an Archaeological Treasure
I was just reading about your coverage of the Troyville Mound complex in Jonesville (“Reconstructing the Great Mound,” Winter 2009-10). I no longer live in Jonesville, however, my childhood home, where my mother lived until her death, is located on the corner of what was once the Great Mound. My sister and I never lost sight of the incredible location of our home; and we continue to share the unfortunate story of its destruction with our students—hers in Lawrenceville, Georgia, and mine in Palm Bay, Florida.

Rosa Ann Sadler
Palm Bay, Florida

Editor’s Corner

Not so long ago, it was hard to imagine that archaeology would be conducted from space. But, unlikely as it seems, that very thing has been going on for several decades. Archaeology in space has nothing to do with digging and everything to do with producing satellite remote sensing images that can penetrate dense ground cover.

NASA is known for space exploration, but it also dabbles in archaeology. (See “Extremely Remote Sensing,” p. 32.) Back in the 1970s, Tom Sever, who then worked for NASA, had the epiphany that aerial remote sensing—some of the images are taken from planes as well as satellites—would become an invaluable tool for archaeologists. He managed to persuade others of its importance, and by the 1980s NASA was involved in a number of investigations.

Strangely enough, an archaeological site that goes undetected at ground level can be discerned from an altitude of hundreds of miles by a satellite or thousands of feet by a plane. Collaborating with Sever and NASA, University of Colorado archaeologist Payson Sheets discovered prehistoric footpaths in Costa Rica. Some of the footpaths, which dated as far back as 500 B.C., could be seen at surface level. But others could only be seen by infrared ARS images.

Sheets’ project is just one of a number of investigations that have benefitted from aerial remote sensing. Sheets said he is “colossally fortunate” to have NASA technology at his disposal.
Why Save Archaeological Sites?
The ancient people of North America left virtually no written records of their cultures. Clues that might someday solve the mysteries of prehistoric America are still missing, and when a ruin is destroyed by looters, or leveled for a shopping center, precious information is lost. By permanently preserving endangered ruins, we make sure they will be here for future generations to study and enjoy.

How We Raise Funds:
Funds for the Conservancy come from membership dues, individual contributions, corporations, and foundations. Gifts and bequests of money, land, and securities are fully tax deductible under section 501(c)(3) of the Internal Revenue Code. Planned giving provides donors with substantial tax deductions and a variety of beneficiary possibilities. For more information, call Mark Michel at (505) 266-1540.

The Role of the Magazine:
American Archaeology is the only popular magazine devoted to presenting the rich diversity of archaeology in the Americas. The purpose of the magazine is to help readers appreciate and understand the archaeological wonders available to them, and to raise their awareness of the destruction of our cultural heritage. By sharing new discoveries, research, and activities in an enjoyable and informative way, we hope we can make learning about ancient America as exciting as it is essential.

How to Say Hello: By mail: The Archaeological Conservancy, 5301 Central Avenue NE, Suite 902, Albuquerque, NM 87108-1517; by phone: (505) 266-1540; by e-mail: tacmag@nm.net; or visit our Web site: www.americanarchaeology.org
NEW EXHIBITS
Bowers Museum of Cultural Arts
Santa Ana, Calif.—The new exhibit “California Legacies: Missions and Rancho (1768–1848)” features objects related to the settlement of Alta, California through Spanish land grants, life at the California missions, and the wealth and lifestyles of the first families who flourished under Mexico’s rule of California, known as the Rancho period. The collection, which came from Orange County’s missions and ranchos, includes the first brandy still to be brought to California, a statue of St. Anthony that originally stood in the Sierra Chapel at Mission San Juan Capistrano, a dispatch pouch used by Native Americans to deliver messages between missions, and fine clothing, paintings, and everyday objects. (714) 567-3600, www.bowers.org (Through December 31)

Field Museum
Chicago, Ill.—The new exhibit “Mammoths and Mastodons: Titans of the Ice Age” takes you back to the time when colossal mammals roamed Europe, Asia and North America. From the gigantic mammoth to the massive mastodon, these creatures have captured the world’s fascination. Meet “Lyuba,” the best-preserved baby mammoth in the world, and discover all that we’ve learned from her. Monumental video installations allow you to roam among saber-toothed cats and giant bears, and wonder at some of the oldest human artifacts in existence. (312) 922-9410, www.fieldmuseum.org (Through September 6)

Heard Museum
Phoenix, Ariz.—The traveling exhibit “Arctic Spirit: Inuit Art from the Albrecht Collection” highlights the Canadian Inuit people’s rich artistic history. The Inuits are a society of natives who live mainly in Siberia, Alaska, Greenland, and the Canadian Arctic. Chosen from the collection of Daniel Albrecht, the exhibition’s 150 sculptures, textiles, and graphics offer a rare opportunity to view more than 2,000 years of Canadian Inuit artwork crafted from stone, antlers, tusks, whalebone, paint, wood, pencil, and pen. (602) 252-8848, www.heard.org (Through January 20, 2011)

Peabody Essex Museum
Salem, Mass.—Based on new scholarship, the exhibit “Fiery Pool: The Maya and the Mythic Sea” reveals and interprets the importance of water to the ancient Maya through over 90 recently excavated works of art, many never before seen in the U.S. Forms and images of sea creatures and waterfowl in stone and clay artifacts offer new insights into Maya culture, where the sea was a defining feature of the spiritual realm and inspiration for powerful works of art. Recent translation of a Maya glyph for the sea (literally “fiery pool”) is part of a growing awareness of the centrality of the sea in Maya life. (866) 745-1876, www.pem.org (March 27-July 18)

University of Nebraska State Museum
Lincoln, Nebr.—The new exhibit “Weapons Throughout Time” explores weapons from the museum’s extensive collection that span 9,000 years of history. From prehistoric stone arrow points used on the Great Plains to World War I firearms, the exhibit features select artifacts that have been used for defense, survival, and ceremony, exploring their technology and cultural influences. (402) 472-3779, www.museum.unl.edu (Through mid-September)
CONFERENCES, LECTURES & FESTIVALS

2010 Archaeoastronomy Workshop
March 11–12, Pueblo Grande Museum and Archaeological Park, Phoenix, Ariz. Building on the success of the 2009 first biennial Conference on Archaeoastronomy of the American Southwest, a two-day technical workshop will be held on topics such as survey and documentation techniques, geodetic referencing, and 3-D laser scanning. www.caasw.org/workshop.html

52nd Caddo Conference and 17th East Texas Archeological Conference
March 18–20, Ornelas Activity Center, University of Texas, Tyler, Tex. This year’s conference features an evening reception on Thursday, followed by presentations Friday and Saturday concerning the region’s latest research and findings. Auctions and social events will also take place. Contact Thomas Guderian at tguderjan@uttyler.edu or visit www.52ndcaddo-17thetac.com

Southwest Seminars
“Ancient Sites and Ancient Stories II”
March 15–May 17, Mondays 6 p.m., Hotel Santa Fe, Santa Fe, N.M. As a benefit for The Archaeological Conservancy, this year’s seminar series features distinguished scholars from across the country. A special seminar entitled “Perspectives on Paleo-Indians: Origins and Issues” with short presentations by Paleo-Indian and linguistic experts, followed by a panel discussion regarding the latest research, findings, and theories about the peopling of the New World, will be held on April 12. (505) 466-2775, southwestseminar@aol.com, www.southwestseminars.org

Society for California Archaeology Annual Meeting
March 17–20, Riverside Convention Center, Riverside, Calif. This year’s conference features papers, posters, and symposia. The plenary session will focus on current and ongoing curation concerns in California cultural heritage management. There will also be a curation workshop and tours to local sites. (530) 342-3537, scaoffice@scahome.org, www.scahome.org

37th Annual American Rock Art Research Association Conference
March 26–29, Ramada Inn, Del Rio, Tex. The highlights of the conference include workshops and research presentations, with a special session on the red linear pictograph style found in western Texas and southeastern New Mexico. There will be a Friday night reception, followed by a banquet with award presentations on Saturday evening. Field trips to the magnificent lower Pecos River rock art sites are also planned. Contact Donna Yoder at (520) 882-4281, donnayoder@cox.net, www.arara.org

75th Annual Meeting of the Society for American Archaeology
April 14–18, the America’s Center, St. Louis, Mo. The meeting features numerous presentations, forums, symposia, and posters. Other events include the Ethics Bowl, the Cultural Resource Management Expo, film festival, and field trips. (202) 789-8200, www.saa.org

Alliance for Historic Landscape Preservation 2010 Annual Meeting
April 21–24, Hotel Albuquerque, N.M. The 32nd annual conference theme is “Enchanted Landscapes: Exploring Cultural Traditions and Values.” The meeting will focus on regional landscapes and will feature presentations from local landscape experts, as well as students and faculty from the University of New Mexico School of Architecture and Planning. The Alliance for Historic Landscape Preservation is dedicated to the preservation and conservation of historic landscapes. Contact Carrie Gregory, Statistical Research, Inc. at (505) 323-8300, www.ahlp.org

Archaeological Society of New Mexico 2010 Conference
April 30–May 2, Courtyard by Marriott, Santa Fe, N.M. This year’s meeting highlights the dual themes of continuity and tradition and honors Glenna Dean, associate director of the Northern Rio Grande National Heritage Area, Inc. and former New Mexico State Archaeologist, who has championed efforts to protect and preserve New Mexico’s unique cultural heritage throughout her career. Topics will cover a wide array of multicultural themes ranging from indigenous agricultural practices to Hispanic sheepherding. Contact Matthew Barbour at (505) 220-3270, matthew.barbour@state.nm.us, or www.newmexico-archaeology.org

ANCHORAGE MUSEUM
Anchorage, Alaska — The new 10,000-square-foot Smithsonian Arctic Studies Center opens this spring, displaying more than 600 objects on long-term loan from the Smithsonian Institution. Each of these indigenous Alaska artifacts was selected and interpreted with help from native advisers and most have never been exhibited. Among the remarkable objects are an 1893 Tlingit war helmet and an 1866 Gwich’in Athabascan tunic with dyed quill designs. The center, which partnered with the Anchorage Museum in 1994, is part of the Smithsonian Institution’s National Museum of Natural History. (907) 929-9201, www.anchoragemuseum.org (New center)
Experts Study Mysterious Jamestown Tablet

The 17th-century tablet contains numerous inscriptions.

Archaeologists are beginning to decipher mysterious text and images, including symbols from an obscure Algonquian phonetic alphabet, etched into a rare 400-year-old slate tablet discovered last summer at Jamestown, Virginia, the first permanent English settlement in America. It's the first slate with extensive inscriptions found at any 17th-century colonial American site, according to archaeologist William Kelso, who is directing the investigation of the site.

"Just like finding the Rosetta Stone led to a better understanding of the Egyptians, this tablet is beginning to add significantly to our understanding of the earliest years at Jamestown," Kelso said. It conveys messages about literacy, art, symbols, and signs personally communicated by the colonists who used it, he explained.

The tablet was discovered in the center of James Fort in a 14-foot-deep barrel-lined well most likely dug in 1609 under the direction of Captain John Smith, one of the founding leaders of Jamestown, which was established in 1607. When the water in the well went bad, colonists used the well as a trash pit. Butchered bones from horses and dogs found near the slate may have been deposited in the well during the winter of 1609-1610, when the fort was under siege and colonists had to eat their horses and dogs to survive.

The nearly intact 5-by-8 inch tablet is covered on both sides with words, numbers, flowers, birds, armorial symbols, and people, including a man wearing a ruffled collar. Differences in the style of handwriting may mean that more than one person used the tablet. The inscriptions are difficult to see. The colonists wrote on the slate with a sharp slate pencil, which made a white mark and left a scratch. Marks could be erased, but the scratches remained, leaving multiple layers of drawings. "It's like a mini-archaeological site," Kelso said. Eventually, he hopes to sort out the sequence of the images.

One of the most visible inscriptions appears to read: "A minon of the finest sorte." According to Bly Straube, the project’s curator, "minon" has numerous meanings, including servant or companion. It’s also a type of cannon. Written above that is "El nev fsh htlbms 508." "We don’t know what it means, yet," Kelso said. Kelso has also identified two symbols on the slate that are similar to characters in a phonetic Algonquian alphabet invented in 1585 by Thomas Hariot, an English scientist who helped establish an ill-fated colony on Roanoke Island.

Various scholars, including Heather Wolfe, an expert in Elizabethan script at the Folger Shakespeare Library, have been contacted to help with the analysis. Wolfe said cursive writing on the slate appears to be a style called "Secretary Hand," taught in England during the 16th and 17th centuries. So far, she has also identified the words "Abraham" and "book."

Tests to identify the origin of the slate are also being conducted.

—Paula Neely
A popular theory regarding the diffusion of maize from Mexico to the Southwest suggests that farmers of southern Mexico, in need of more land, expanded northward, bringing their crops, ways of life, and their Uto-Aztecan language with them. This resulted in the development of various dialects that later evolved into distinct languages. But in a recent issue of the *Proceedings of the National Academy of Sciences*, an international group of anthropologists challenged this theory.

“We argue that the introduction of maize agriculture to the Southwest and the diversification of the Uto-Aztecan language family were separate processes,” said coauthor Robert Hard, an archaeologist at the University of Texas at San Antonio. “Based on an innovative synthesis of archaeological, linguistic, genetic, and paleoecological data, we argue that maize spread from Mexico into the Southwest via group-to-group diffusion, rather than the northward migration of Uto-Aztecan farmers.” The anthropologists also contend that the Uto-Aztecan language didn’t originate in Mexico, but in the western Great Basin, in what is now central Nevada.

The earliest evidence for maize in the Southwest comes from five sites in Arizona and western New Mexico, where radiocarbon dates cluster around 2100 b.c., which was too early to be explained by the migration of settled Mexican farmers. Instead, if maize had been brought by migrating farmers from Mexico, the researchers assume the farmers would have also brought their material culture and technology, but there’s little evidence of this. For example, though the earliest ceramics in the Southwest and Mesoamerica did appear around the same time, roughly 2000 b.c., they differed in size and form and they were also fired at different temperatures. And irrigation canals, which were used in ancient farming, were present in Arizona’s Tucson Basin by 1750 b.c., more than five centuries prior to the earliest evidence for irrigation in Mesoamerica.

Linguistic evidence, mainly similar word forms among the various modern Uto-Aztecan languages, indicates that the ancient Uto-Aztecan homeland was not in central Mexico, as has recently been thought, but in the western Great Basin in what is now Nevada. Paleoclimatological data indicates that around 6900 b.c. this area became increasingly arid, and that motivated the Uto-Aztecan hunter-gatherer bands to migrate to the west and south, resulting in the initial break-up of their speech community and the subsequent diversification of the language family into over 30 different languages that are spoken as far away as Central America. A lack of shared words and meanings for maize between the northern and southern Uto-Aztecan-speaking groups suggest that farming occurred after their separation. The researchers argue that it was after Uto-Aztecan languages had expanded southward that maize diffused northward, likely involving some southern Uto-Aztecan speakers, who by this time occupied some of the region between Mexico and the Southwest.

—Tamara Stewart
Georgia Looters Sentenced

Four men penalized for looting Late Archaic site.

Four men were found guilty in January of looting a Late Archaic shell midden on the Ogeechee River in Burke County, in east-central Georgia. Georgia Department of Natural Resources Rangers arrested two of the men who were carrying digging tools on private property. The other two men were arrested the next day at the same location when they were found excavating the shell midden. They were in possession of various artifacts, including a bone tool, several spear points, and a shell gorget.

Tom Gresham, an archaeologist with the Georgia Council on American Indian Concerns, a state agency focusing on Native American issues, went to the site to examine the extent of the damage. He found a large number of pottery sherds and stone and bone artifacts that he took to a laboratory to be washed, inventoried, and analyzed in hopes of retrieving some information from them.

These artifacts were ignored, Gresham believes, because the looters were searching for more valuable items. The looting resulted in the “loss of important archaeological information from a critical period in prehistory, when Indians had just invented pottery and were becoming more sedentary,” he said. “This is a very rare type of site, one that was intensively occupied during only one period. As a rare, single-component site it could have given us a well focused snapshot of life about 3,500 years ago.” It’s thought that the site was professionally excavated in the 1950s, but only sketchy records remain.

State Court of Burke County Judge Jerry Daniel “made it very clear that he wanted to send a message to looters in Burke County about the seriousness of the crime,” said David Crass, Georgia’s state archaeologist, who testified at the sentencing. The two men who were caught excavating the shell midden were sentenced to 24 days in jail, a $3,000 fine, three years probation, and 80 hours of community service. They will also bear the cost of restoring the site, which is estimated to be at least $7,500 and could be as high as $25,000, according to Crass. The other two men were sentenced to 12 months probation and a $2,000 fine.

Many sites in Georgia have been looted, and the archaeological community has worked to educate the public about the importance of protecting sites. “We hope this case will help get the message across that site looting is a very serious offense that hurts the public, the State of Georgia, and Native Americans,” says Gresham. —Iris Picat
Agreement Reached to Protect Nine Mile Canyon

The archaeologically-rich canyon is threatened by traffic from energy development.

This past January, the Bureau of Land Management (BLM), the Utah State Historic Preservation Office, the Bill Barrett Corporation, and a coalition of preservation groups signed an agreement to protect the rock art and other archaeological sites in eastern Utah’s Nine Mile Canyon from further degradation by industrial traffic from oil and gas drilling on the adjacent West Tavaputs Plateau. (See “Drill, Baby, Drill?” American Archaeology, Winter 2008-09.)

Nearly 100 natural gas wells are currently in operation on the plateau, and 807 more wells are currently proposed by the Denver-based Bill Barrett Corporation. Vehicles reach the plateau by traversing a dirt road that runs through the canyon. In 2001, the National Trust for Historic Preservation and other groups, concerned about the effects of the traffic, the dust it generates, and dust-suppressant chemicals on the canyon’s rock art, began to lobby for the canyon’s protection. Three years later the National Trust listed the canyon as one of America’s 11 Most Endangered Historic Places.

Since 2004, the BLM, which owns a large section of the canyon, had restricted the number of parties who participated in discussions about protecting it. But in 2008, the Advisory Council on Historic Preservation, a federal agency that works to preserve the nation’s historic resources, stated that broader public input was required, forcing the BLM to include a number of other organizations in the discussions.

“We’ve been doing this for about a year and finally got to an agreement,” said Jerry Spangler, the executive director of the Colorado Plateau Archaeological Alliance. “There are aspects of it we wish were different, but it’s a dramatic improvement over what we had.”

The agreement calls for additional archaeological surveys, National Register of Historic Places nominations for sites in the canyon, the development of conservation treatments for rock art affected by dust, continuing research into the effects of dust and dust suppressant chemicals on rock art, limits to the amount of dust that traffic can generate, and the development of visitor interpretation sites in the canyon. Local landowners, preservation groups, and the BLM will monitor the dust to ensure it doesn’t exceed the agreement’s limits.

Until recently, magnesium chloride, which is essentially a salt, was used in the canyon to suppress dust, but a study showed the chemical to be highly corrosive and detrimental to the rock art. The agreement prohibits the use of magnesium chloride unless further studies show it doesn’t harm the rock art.

“The positive outcome of the whole thing is not the nuts and bolts of the agreement, but the fact that we’re all at the same table due to the intervention of the Advisory Council,” said Spangler. “There’s a lot to be done, but the fact that we’re at the table is great, and hopefully will translate into something better for Nine Mile Canyon than we’ve had.” — Tamara Stewart
Turkeys Domesticated Twice in the New World

DNA and coprolite analysis of ancient turkey bones and dung reveal separate domestications.

A team of researchers from Simon Fraser and Washington State universities recently reported in the Proceedings of the National Academy of Sciences that turkeys, the only New World animal domesticate now used globally, were domesticated twice—by pre-Aztec groups in south-central Mexico as early as 800 B.C., and by groups living on the Colorado Plateau of the American Southwest around 200 B.C. The study, which was based on DNA analysis of 149 turkey bones and 29 turkey coprolites (fossilized feces) from 38 different archaeological sites, also confirmed that the turkeys we eat today descended from the Mesoamerican breed.

Researchers Camilla Speller and Dongya Yang of Simon Fraser University in Canada were studying ancient DNA derived from turkey bones and Brian Kemp, William Lipe, and their colleagues from Washington State University were analyzing DNA from early turkey coprolites, when the two groups decided to join forces. “When we found out about each other’s projects, we decided that it would be most productive to collaborate and combine our complementary datasets,” said Speller.

The ancient DNA data suggests that the Mesoamerican turkey domestication involved the South Mexico wild turkey subspecies and the Ancestral Puebloan domestication involved Rio Grande/Eastern wild turkey populations. Unlike most other domesticated animals, these turkeys were originally raised for ritualistic purposes and for the use of their feathers in blankets, robes, and other clothing and ornaments rather than for food. But around A.D. 1100 turkey bones began appearing in much greater frequencies in middens, indicating the birds were also being eaten.

The DNA data revealed that a single domestic lineage was bred intensively in the ancient Southwest. “The presence of just one dominant lineage of turkey tells us that the same domestic breed was raised both for feathers and for food (after A.D. 1100),” Speller said. “Since the same turkey lineage occurred over thousands of square miles, it is almost certain that domestic turkeys were traded between sites, and between territories of different cultural traditions, including the Ancestral Puebloans, Salado, Mimbres, and Mogollon. This long history of turkey use also reflects the economic and symbolic importance of domestic turkey for the Ancestral Puebloans, and other pre-contact Southwestern cultures.”

The Spanish transported the Mesoamerican turkey breeds from Mexico to Europe in the 1500s, where they quickly spread, with several varieties developed over the next two centuries. In the 18th century these European turkey breeds were imported back to the U.S., where they eventually became the forerunners of the turkeys we eat today. The Southwest domestic turkey breed dramatically declined with the arrival of the Spanish in the 1500s, and researchers found no genetic evidence to indicate that these breeds still exist, though more testing of the turkeys being raised by the Pueblo people could prove otherwise. —Tamara Stewart
Can Archaeology Save the Environment?

Archaeologists are in the unique position of studying the relationship between humans and their environments over millennia. Consequently, a number of them believe their work should inform current environmental debates.

By Kristin Ohlson
Fire sometimes introduces people in the Maya lowlands to their past. In this area comprised of parts of southern Mexico, Guatemala, Belize, and western El Salvador, farmers often burn down patches of rainforest to create new farmland. During one such fire in the 1990s, Q’eq’chi Maya from the Guatemalan southern highlands exposed the remains of housing and a complex system of agricultural terraces that had been hidden by vegetation for nearly a thousand years.

Archaeologists who have spent decades studying ancient systems of land management, such as these terraces, know that the ruins hold secrets of how some people adapted to their environments and thrived while others, for various reasons, failed.

“It’s ironic to watch the settlers expose these ancient terraces but not always realize that they need to emulate the ancient people who lived there and protected the soil,” says Nicholas Dunning, a geographer at the University of Cincinnati who studies soil conservation and adaptation in the Maya lowlands. “There often isn’t a stable system of land tenure in these areas—people move in and start farming, then are kicked off by people who say they just bought the land. This makes people very reluctant to be good land stewards.”

Dunning has been working with the United States Agency for International Development in Guatemala, passing on the ancient secrets of good land management to local soil-conservation policymakers. He and several archaeologists are determined to bring the insights of their research to the public discussion of global warming and other contemporary environmental concerns. They believe that archaeology offers a unique understanding of the relationships between humans and their environments throughout history, and that this understanding is crucial to our ability to optimally manage that relationship in the future. Dunning and a number of other researchers make this case in a new book titled *The Archaeology of Environmental Change.*

Environmental degradation isn’t a new concern—in fact it has occurred throughout human history. “There is no such thing as the noble savage,” says Scarborough, an archaeologist from the University of Cincinnati who studies land use and water management in Mesoamerica, including the Maya region. “People always take advantage of the environment, but it is dynamic.” Archaeologists can describe how various human societies have changed the environment, found themselves having to change in response, wrought further environmental transformations, changed again in response, and so on. It is a complex and recursive back and forth process that goes on for centuries. The changes often transpire so gradually, over such a long period of time, that they go unnoticed.

“Each of these prehistoric cases is what I’d call a ‘natural experiment,’” says Margaret Nelson, referring to the studies covered in the book. An archaeologist at Arizona State University, Nelson cowrote a chapter that addresses how cultures in the Southwestern United States and northern Mexico interacted with the environment. “It’s one possible outcome of that back and forth between people and their environment. The more of these outcomes you know about, the better you are at being able to make decisions.”

Other researchers and policymakers are also starting to realize that archaeologists should be included in discussions of environmental concerns. “I became involved in this kind of work through a project sponsored by the biology division of the National Science...
Foundation,” says Charles Redman, director of Arizona State University’s School of Sustainability, which describes itself as the nation’s first comprehensive degree-granting program with a transdisciplinary focus on finding real-world solutions to environmental, economic, and social challenges. “The federal government sponsors a lot of large interdisciplinary research projects mostly focused on biology, chemistry, and engineering, but there’s now a real interest in a historical and archeological perspective, too.”

Redman, who is one of Nelson’s coauthors, notes that archaeologists, in collaboration with other experts, are being asked to help analyze future environmental scenarios. “This is a real opening for archaeologists to be a resource in constructing possible futures based on pasts with similar contexts,” he explains.

Lessons of the Maya Collapse

For centuries, the Maya proved to be remarkably resilient. During much of the Late Preclassic period, from 400 B.C. to A.D. 100, denizens of many communities in northern Guatemala lived and grew crops along the edges of extensive wetlands, called bajos. Over time, erosion and sedimentation made wetland agriculture in the bajos more difficult. The Maya responded by building terraces on the hills surrounding the wetlands, which kept them from filling with silt and provided more stable cropland on the sloping terrain.

Things began to change around A.D. 100 as the climate became dryer. According to Dunning, core samples from lakes in several areas of the Maya region show that the ambient temperature was changing. Samples that were radiocarbon dated to this time show that there was a spike in the death rate of some microscopic creatures that require lower water temperatures. The samples also show that the chemistry of the water in these lakes changed because they became shallower. Even the bajos began to change. Core samples taken from some bajos dating to the early Preclassic period show pollen from water lilies and other aquatic plants in the sediment, indicating the presence of water year round. But toward the end of this period, the bajos became (and still are) seasonal wetlands, full during the rainy months but dry the rest of the year.

“Some groups were better prepared given their particular cultural toolkit and the ways they had adapted to the environment up to that point,” says Scarborough, who wrote about wetlands management in a chapter for The Archaeology of Environmental Change. “Some had overexploited their environment so that even a small climate change or other external force pushed them over the edge.” A number of cities were abandoned as a result. But the people of other cities, like Tikal, responded creatively. They moved their residences away from the bajos and up onto the slopes—what Scarborough characterizes as a movement from a concave to a convex utilization of the watershed. Instead of relying on water in the bajos for irrigation, they built reservoirs on the slopes to catch and hold water that fell during the shorter rainy season. Because the landscape in the area is highly karstic and water quickly percolates down through the soil, the Maya paved their plazas and courtyards to collect and divert rainwater into the reservoirs.

The Classic Period (A.D. 250–900) represented the flourishing of Maya culture. But around A.D. 800–900, drought again struck the Maya lowlands. “This was a substantial drought, the kind that might only occur once in several thousand years,” says Scarborough. “In their whole time as a culture, they had never experienced a drought of that severity.” He believes it was a major factor in the Maya collapse.

What lessons can modern people learn from this story? Although all the factors aren’t well understood, Scarborough believes that the Maya eventually stopped practicing the kind of wise land stewardship that had created their success and weren’t able to make new adjustments to a dramatically changed environment.
changed environment. He suspects that this failure stemmed from the hubris of an elite class that became increasingly distant from the concerns of ordinary people and the humdrum business of land and soil management.

“From my vantage, a good administration could have creatively weathered the changes, as the earlier Maya did,” he says. “But whenever you have an elite that’s buffered from the day-to-day essentials that ordinary people provide, you lose sight of what’s going on.”

The Maya’s story reminds Scarborough of today’s elites and the sparring of nations that occurred at the recent United Nations Climate Change Conference in Copenhagen. “We are the elites,” he says, “and there are lessons we can learn from the way the humans before us have acted and reacted to the environment.”

The Danger of Homogeneity

Archaeologists raise intriguing questions about how the choices ancient peoples made could have influenced their ability to live in relative harmony with their environment. Margaret Nelson points to an intriguing facet of the Mimbres culture, a people who lived in southwestern New Mexico.

The Mimbres farmed along the region’s waterways, creating terraces on the hillsides for their crops. Excavations of their middens revealed that, prior to the Classic Mimbres period (A.D. 1000–1130), they had depleted the once abundant wild game, such as deer and elk, that they had previously relied on. Analysis of the soil from their cooking hearths indicates that the Mimbres then resorted to local crops like maize, beans, and squash. The remnants of charred wood in these hearths are from trees that grow far from the riverbank, suggesting that the Mimbres had depleted the riparian vegetation that protected the riverbanks from erosion.

By the middle of the 12th century, the Mimbres villages were abandoned. Archaeologists attribute this to several factors. Rainfall was less predictable, there were social stresses because so many people were living together, and the Mimbres had depleted their environment to the point that it was hard to live there. Nelson thinks the iconic Mimbres pottery—white slipped pottery with black designs—may offer a clue as to why they weren’t able to find a creative adaptation to the changing conditions.

Archaeologists like Nelson equate social diversity with the diversity of the material culture, such as the different styles of architecture, tools, clothes, and the like that often resulted from trade. Most prehistoric people were involved in trading networks that exposed them to other styles and techniques, which they often replicated. Oddly, the Mimbres of A.D. 1000—when their population was densest—only produced one style of pottery and did not trade for other types.

“Social diversity represents the opportunity for people to have options,” explains Nelson. “If everyone always does things the same way, they have a hard time responding when situations change and problems arise. The Mimbres of A.D. 1000 didn’t seem to trade with others. That means they didn’t have the regional connections that could have buffered them in hard times.”
Nelson is a member of the Resilience Alliance, an interdisciplinary group of researchers who study adaptability and transformability as a foundation for sustainable development. From her perspective, modern people should learn from the Mimbres’ insularity, lest we meet their fate.

**Unintended Consequences**

Today, the Lake Pátzcuaro Basin, just south of Morelia in central Mexico, is a highly degraded landscape that is difficult to farm. But during the heyday of the Purépecha Empire, from a.d. 1350–1520, the area was rich and productive because its people had successfully modified their environment over many centuries. Their downfall wasn’t poor soil management, as was believed until Christopher Fisher began to study the area. He discovered that their downfall was caused by the perturbations of European contact, which forced the local people to abandon their careful control of erosion through a system of terraces.

“Those folks created a landscape that was stable for centuries,” says Fisher, an archaeologist from Colorado State University and one of the editors of The Archaeology of Environmental Change. “It was stable longer than the United States has been a country and probably would have continued to be stable except for the changes resulting from conquest.”

Fisher came to this conclusion by correlating ancient occupation and change to the landscape. Fisher excavated near the terraces as well as the nearby dry bed of Lake Pátzcuaro to examine the effects the Purépecha had on their environment. Their various settlements were built on sediment and soils that vary in color from bright red to white to black, so when he found sediments of these colors in the lakebed, he assumed they eroded from the settlements. By radiocarbon dating samples of the sediment, he found that significant erosion occurred between a.d. 300–600, and then greatly diminished until about 1520, when the Spanish arrived. Then there was a huge amount of erosion after that time.

This suggests that erosion began with the onset of agricultural production in the area and increased as people built villages and cities. But as the population grew, the erosion nearly stopped as they stabilized the landscape. By the time the Spanish invaded, the area’s population was at its highest and the level of erosion its lowest in the 2,000-year period Fisher studied. But due to contact with the Spanish, the Purépecha were afflicted by diseases such as smallpox, to which they had no resistance. The Spanish also forced them from their lands, using them as slave laborers at mines in northern Mexico. As a result, the Purépecha’s terraces were no longer maintained and erosion devastated the landscape. “It was the unintended consequences of conquest that did it,” says Fisher.

Our modern environmental issues seem different, but archaeologists insist that the same factors are at work. When Hurricane Katrina struck, commentators focused on the inadequacy of the rescue effort and the behavior of people scrambling to survive in the shambles of New Orleans. However, archaeologists saw the culmination of people altering the natural environment over centuries in ways that assured an eventual crisis—unintended consequences again. Modern people continue to make many of the same mistakes ancient

*For centuries the ancient Maya lived and farmed near wetlands such as this one. But as the climate became more arid, these wetlands, known as bajos, were dry part of the year. Some Maya groups adjusted to this change, but others could not.*
people made. The biggest difference is that our technology allows us to make more massive mistakes.

“The whole point of our book is that environmental degradation is not something that happens to people,” says Brett Hill, another of the book’s coeditors. “It’s a process involving the relationship between people and their environment, and between people and other people. Changes in the environment cause changes in the relationship between people, and that’s what leads to societal collapse. It’s not environmental degradation that’s going to get us—it’s the ensuing social conflict.”

Archaeologists already know this story, having observed it through decades of fieldwork. They realize that environmental problems are decades or centuries in the making and that solutions won’t be quick. But policymakers generally lack that perspective, as they often look at relatively recent history for guidance. “People need to learn to think in long-term increments,” says Fisher. “We need to make a long-term commitment to nature. Longer than a presidential term, longer than modern political will. I think we need to be thinking in century and millennial increments.”

Many archaeologists are using complex computer modeling to demonstrate the long-term transformations that seemingly small changes can make. These programs can model the effects of past strategies as well as project the very long-term impact of new strategies on both the environment and human societies.

Archaeologists aren’t used to standing on a soapbox. “I’m trained to look at dead people’s garbage, not talk to live people,” Fisher says. “This underscores the point that we need to work with cultural anthropologists and other scientists who are better trained to help us deliver our message.” Nonetheless, many archaeologists are finding that their training and methodology make them good at working with other specialists on difficult environmental issues. Interdisciplinary teams often include biologists, city planners, wildlife conservationists, transportation and air quality experts, all of whom are heavily invested in a niche and don’t necessarily see the bigger picture.

“I think archaeologists always know we can’t answer questions all on our own,” says Charles Redman. “We’re always pulling in other people to help us figure out what we’ve found. It’s an organizational attitude that’s particularly valuable for these deliberations.”

Chimney Rock derives its name from the sandstone “chimneys” seen here.
A Once in a Lifetime Dig

The recent excavation of Chimney Rock was the first in nearly 40 years. It gave archaeologists a rare opportunity to study this Chaco Canyon outlier known for its astronomical features.

By David Malakoff

Archaeologists often curse rain for flooding their digs and making fieldwork miserable. In Colorado, however, researchers can thank some ferocious storms for providing a once-in-a-lifetime opportunity to excavate Chimney Rock, one of the most dramatic and intriguing sites in the Southwest, last summer. "It was an awesome opportunity to study a truly remarkable site," says Brenda Todd, a doctoral student at the University of Colorado, Boulder (CU-Boulder) who codirected the month-long project. "It's been nearly 40 years since anyone's been able to do a major dig there, so I feel really lucky."

That good fortune has its roots in some torrential downpours that slammed southwestern Colorado in the summer of 2006. The storms were hard on Chimney Rock's stone ruins, which sit on a towering, exposed mesa that overlooks a pair of imposing sandstone "chimneys" that give the site its name. "Some of the rooms filled up with water, and some walls were literally collapsing," recalls Julie Coleman, an archaeologist with the U.S. Forest Service, which manages the site. "It was pretty clear we were going to have to do something to stabilize" Chimney Rock's flagship structure, called the Great House Pueblo. Archaeologists had reconstructed parts of the Great House—which they believe once boasted at least 35 rooms—in the 1970s and '80s, and it now attracts more than 12,000 visitors a year.

It took several years for Coleman and others to raise the money to fund the work by the CU-Boulder team. The team's task was to remove sediment that had piled up in two rooms of the Great House so that engineers could ultimately shore up the walls.

It was an irresistible assignment. Chimney Rock had been largely off limits to archaeologists for decades, in part because endangered peregrine falcons nested on nearby cliffs. And the site had long fascinated Steve Lekson, the project's other director and an expert on the Anasazi who flourished in the Four Corners region of Colorado, Utah, New Mexico, and Arizona between about A.D. 850 and 1200. He is a leading proponent of the idea that Chimney Rock and more than a hundred other Four Corners sites are "Chaco outliers" —outposts built or occupied by colonists from Chaco Canyon in northwest New Mexico. Some archaeologists believe this "greater Chaco" territory covered nearly 50,000 square miles within a north-south rectangle 300 miles long and 160 miles wide.

The outlier concept was once quite controversial, says Lekson. "A lot of archaeologists were pretty reluctant to say these sites were related to Chaco," which is roughly 93 miles south of Chimney Rock. But that began to change in the late 1970s, largely due to research
that showed that many of the outliers were occupied during Chaco Canyon’s heyday, and have architecture, construction techniques, or artifacts that mirror Chaco’s. Such studies prompted many researchers to adopt a more complex view of Chaco Canyon as a kind of “vibrant central capital that was exporting its culture,” says Lekson.

Sifting the Rubble

Some of that paradigm-shifting research took place at Chimney Rock, which is perched on a narrow, steeply sloped rock anvil some 1,000 feet above the Piedra River. The ruins were first excavated in the 1920s by teams led by Jean Allard Jeancon, the curator of archaeology and ethnology at the Colorado Historical Society. Working their way through a rubble mound up to 14 feet deep, the researchers uncovered the outlines of a large, L-shaped structure some 210 feet long and 70 feet wide. It included two circular, partly-sunken kivas. The structure showed “a more advanced knowledge of architecture than any other building seen in the vicinity,” Jeancon reported. In the valley below the Great House, for instance, they found smaller, cruder structures that appeared to be residential dwellings built by early inhabitants, whom archaeologists believe arrived around A.D. 850.

Up on the mesa, Jeancon’s teams also found an unusual, one-room “guardhouse” that blocked the steep, narrow path that leads up to the Great House. The diggers also unearthed huge wooden beams and numerous artifacts, including a clay fetish in the shape of a bear, stone axe heads, chisels made from antlers, and potsherds. And on the mesa’s highest point—from which you can see for miles—they found a bowl-shaped depression in the bedrock “in which great fires have burned, as is indicated by the red fire stains in the sandstone,” Jeancon wrote.

It would be another 50 years, however, before archaeologist Frank Eddy, now an emeritus professor at CU-Boulder, began making connections between these finds and Chaco Canyon. Between 1970 and 1972, Eddy directed the last major digs at Chimney Rock. They confirmed many of Jeancon’s findings and added important new information.

Eddy argued in a 1977 paper that the Chimney Rock Great House mirrored “in nearly every aspect,” from floor plan to masonry styles, so-called “Bonito-style” structures at Chaco Canyon. And he concluded that new evidence—including an analysis of the site’s stratigraphy, ceramic styles, and the tree rings in 14 wood samples taken from the Great House—suggested it had been built around A.D. 1076, undergone major renovations in 1093, and was abandoned by 1125.

Eddy proposed that the Great House was built by a group of colonists from Chaco Canyon who joined a small
community that was already established in the valley below. The newcomers were likely men, since males typically were the masons and architects in ancient societies. And they were likely spiritual leaders who knew the secrets of designing and building monumental ceremonial spaces.

Eddy didn’t think they brought women along. That idea is based on the fact that archaeologists have found relatively few ceramics at the site that bear the hallmark of Chaco potters, who would have been women. The male colonists “likely would have married local women, who would have manufactured local ceramic products,” Eddy wrote in the book *Chimney Rock: The Ultimate Outlier*.

**A Bunch of Lunatics?**

Exactly why these colonists would go to the trouble to undertake such a difficult project in such a difficult place, however, had long puzzled archaeologists. Laborers had to haul dozens of heavy logs and tons of rock and soil up to the mesa to build the Great House, Lekson notes. The closest good farmland is nearly a mile away. “It took a lot of planning and organization,” he says.

Some scholars hypothesized the outpost’s purpose was to oversee the harvest of timber, which could be floated down the Piedra River toward Chaco, where trees were scarce. Other speculated it might have been a hunting camp that provided meat for Chaco’s elites; the Chimney Rock region was rich in big game, while Chaco was not, and the

*Every 18.6 years the full moon rises between the chimneys.*

*A bird’s eye view of Chimney Rock. This photograph was taken in the early 1970s near the completion of Frank Eddy’s archaeological investigations.*
Great House holds numerous bones from elk and deer. Or it could have been designed to symbolize Chaco’s growing power and reach: Lekson says it would have been “the big house up on the hill that reminds you of who is important.”

The site’s highly-visible fire basin—now hidden beneath a Forest Service observation tower—could have been part of a line-of-sight communications system that kept Chimney Rock connected to the mother city.

Eddy, however, believes spirituality was the main inspiration for the Great House. Chimney Rock’s twin spires are an awesome sight, he notes, akin to a natural cathedral linking mere mortals to their deities. “A religious motivation to build and live up near the gods seems to be the most likely and compelling motive for what was otherwise a difficult living arrangement,” Eddy wrote in *The Ultimate Outlier*.

This hypothesis is supported by the site’s kivas and the discovery of artifacts believed to be linked to spiritual practices. Archaeologists have found nearly a dozen rare “feather holders” at Chimney Rock, for instance. These small ceramic bricks have holes that appear designed to hold the feathers of hawks and eagles, which were important to ancient Southwestern cultures. The birds were likely common on the site’s cliffs.

It wasn’t until the late 1980s, however, that researchers recognized what may be a major explanation for the Great House’s unusual location—the moon. While working at the site, Eddy realized it was an ideal platform for an astronomical observatory, and he mentioned the idea to J. McKim Malville, an astrophysicist at CU-Boulder with a passion for archaeoastronomy. In the summer of 1988, Malville began exploring the site’s celestial possibilities. At first, he focused on the sun, theorizing that Chimney Rock had been positioned so that, each year on the summer solstice, the residents would see the sun rise dramatically between the spires. But that idea, and another involving Venus, proved to be wrong.

When Malville studied the moon’s track across Chimney Rock’s night skies, however, he noticed something remarkable. Every month, the full moon rises in a different place on the eastern horizon, shifting south then north. And every 18.6 years, it completes a full cycle of this wandering, returning to roughly its original spot on the horizon. Astronomers call the end of the cycle a “lunar standstill,” and Malville realized that it could place the rising full moon squarely between Chimney Rock’s spires on numerous nights every 18 years or so.

Luckily for Malville, 1988 turned out to be part of a standstill cycle. “I calculated that, just possibly, on the early morning hours of August 8, the moon might just fit between the towers,” he recalled in a 2006 article for *The Pagosa Sun*, a local paper. “My students were justifiably skeptical that it would be worth staying up until two in the morning… and I swore them to secrecy, just in case my calculations didn’t work out. Fortunately, the moon behaved beautifully. Everyone was stunned.”

Even more stunning was the realization that the standstill cycle matched Eddy’s construction chronology for the Great House. The year the Great House appears to have been built, A.D. 1076, was a standstill year, and so was 1093, when the structure was renovated. That chronology suggests Chimney Rock’s residents were literally “lunatics,” a term that comes from the French word for moonstruck. Malville believes the Chacoans learned of the standstill cycle from them and then used celestial events in ceremonies at Chaco Canyon.

Still, he believes that Chimney Rock’s earliest residents may not have been interested in the moon. The settlement may have started simply “as a ceremonial and trading center.
due to its location and spectacular topography,” he says. Malville speculates that Chimney Rock’s elders could have observed a standstill that occurred around 1056 by chance and “got so fascinated by it that,” with the help of the Chacoans, they built the Great House in time to celebrate the next one.

**Export or Emulation?**

Last May, as Lekson and Todd began working at Chimney Rock, such ideas were much on their minds. One of their goals was to find datable artifacts that could inform the Great House’s construction chronology. They also hoped the dig would shed light on another major question that has long surrounded Chimney Rock: was it the product of “export” from Chaco Canyon, as Eddy proposed, or rather “emulation” by local people eager to mimic, and perhaps compete with, their powerful neighbors?

Researchers have spent decades carefully examining the intricate stonework hidden inside the walls of great houses at dozens of other outliers and compared those to that of Chaco Canyon. Generally speaking, it’s assumed that a high similarity in the details of the stonework suggests the export of Chaco architecture and technology, while a lower similarity suggests the emulation of Chaco. “We were really eager to get underground and get a good look at the original, unreconstructed walls,” recalls Todd. In particular, they focused on two small areas—identified as Rooms 5 and 7—that flanked Room 8, which had been excavated by Eddy in the 1970s. Before they could examine the old walls, they had to remove several feet of recent sediment. “We got a lot of exercise taking out the fill, we just didn’t learn very much,” jokes Lekson.

They eventually dug down to the original footings. “It was great to see some walls that had never been touched,” Lekson says. The prehistoric masonry appeared to follow the Chaco blueprint. “They weren’t the best quality Chaco craftsmanship I’ve seen at an outlier,” he says, “but they were very clearly real Chaco-style walls.” Chimney Rock “wasn’t a local emulation,” says Todd. “I’m thinking people came from Chaco and claimed this special place.”

In Room 5 they found chunks of what appeared to be burned beams, samples of which are being dated by tree

![Astrophysicist J. McKim Malville (left) discovered that lunar standstills occur at the site. Brenda Todd and Steve Lekson hope their data will also make an important contribution to our understanding of Chimney Rock](image1)

*This burned corn was found in Room 7. Strontium analysis is being done to determine if it was imported or grown locally.*
ring specialists. The archaeologists are curious to see if the dates coincide with the 1076 and 1093 lunar standstills. If so, they would corroborate the lunar observatory hypothesis, Lekson notes.

On the floor in Room 7, “a really happy surprise was finding a big pile of burned corn,” says Todd. The blackened cobs and kernels are now being analyzed, with hopes that they will produce useful radio-carbon dates, and perhaps hold strontium isotopes that can be linked to specific soils, revealing where the corn was originally grown. “That could tell us if they were growing food locally or importing it,” says Todd.

The researchers also found stone tools and ceramics, including one intact, corrugated pot that Great House residents had carefully set into the floor in a corner of Room 7. The purpose of the pot isn’t clear, but the find “was very, very nice,” says Todd. The team also documented numerous features, including stone hearths and small alcoves, and determined the construction sequence of several walls.

Once all the data has been analyzed, Lekson hopes the excavation will make a significant contribution to the understanding of what he has called “the ultimate Chaco outlier.” Chimney Rock is already a site of superlatives, he notes, being the highest, most isolated, and one of the earliest outliers ever identified. U.S. Congressman John Salazar, who represents this district, is working to have it designated a national monument. For archaeologists, however, Chimney Rock has already achieved landmark status—as a special place you might get to dig just once in your career.

DAVID MALAKOFF is a writer living in Alexandria, Virginia. His article “Investigating French and Indian War Forts” appeared in the Spring 2009 issue of American Archaeology.
Historical accounts of the rise of American industry have often overlooked its effects on ordinary workers. A number of archaeological projects are remedying that.

By Mike Toner

This family resided at the Ludlow tent colony, where miners went on strike in 1913.
When Michael Nassaney and his team of archaeologists began digging through thick layers of industrial debris near Turners Falls, Massachusetts two decades ago, they were looking for traces of people who had inhabited the Connecticut River Valley up to 8,000 years earlier. They never found what they were looking for. But they did get a glimpse of a way of life that some contend is as poorly understood as the prehistoric past—that of working class Americans at the dawn of the industrial age.

"As we dug down through this industrial overburden, we started to wonder about what all this stuff was that we were going through," recalls Nassaney, an archaeologist at Western Michigan University. A little historical research showed that they were excavating the site of the John Russell Cutlery Company, a late 19th-century factory that, in its day, was the largest maker of tableware in the world, and one of the first to fully mechanize the process. Active until the early 1900s, the plant was torn down in the 1950s and the site was forgotten until a local utility built a power plant there in the mid 1980s.

Among their discoveries was a large quantity of defective cutlery along the riverbank near the plant's cutting room. At first, Nassaney thought it was just another industrial waste pile. But its location next to what was once a factory window suggested that it was evidence of worker defiance against the new industrialized system: they discarded these imperfectly made pieces rather than trying to correct the manufacturing flaws.

"In examining American global ascendancy in the 19th and 20th centuries, historians have typically celebrated the feats of industrial giants like the Rockefellers at the expense of telling the story of the working class," says Nassaney. Until recently, industrial archaeology has often focused on the factories, machines, and technology that fueled the rise of capitalism, and given short shrift to the role of labor, he says.

"Industrial archaeologists in the United States have been working frantically to record and preserve the remains of rusting factories, abandoned buildings, and deserted mines before they disappear from the landscape," says archaeologist Paul Shackel, the director of the Center for Heritage Resource Studies at the University of Maryland. "The omission of workers in the story of technology is, I am afraid to say, the norm rather than the exception." In a new book entitled *The Archaeology of American Labor and Working Class Life*, Shackel chronicles a growing number of projects around the country whose aim is to correct that omission.

One of the most thorough of these projects is the work by Stephen Mrozowski, the director of the University of Massachusetts' Andrew Fiske Memorial Center for Archaeological Research. Mrozowski and his colleagues spent a decade excavating the site of Boott Cotton Mills, a textile plant in Lowell, Massachusetts, which operated from the 1840s until the early 20th century.

The mill owners built housing nearby for the hundreds of workers it employed, and Mrozowski was able, from the old privies and back yard debris, to get a glimpse of the lives of ordinary people who were working 70 hours a week in the early days of the industrial revolution. The site included the remains of boarding houses where unskilled workers lived, sometimes six to a room, as well as tenement-style townhouses for the skilled workers, and the home of the mill agent, who supervised the laborers.

Mrozowski was surprised to discover that household and personal items varied little regardless of the status of
the employees. “We found some kind of jewelry in all of the houses, but it was the cheap knock-off kind, and little luxuries like cosmetic and cologne bottles. There weren’t any stark differences in the kind of ceramics or glassware either. And based on the discarded bones we found, there didn’t even seem to be much difference in diet. And despite a company prohibition on drinking alcohol, there was ample evidence that everyone did it,” he said. The material culture indicated that “class distinctions were probably more subtle than most people have suspected,” he says.

But other types of evidence, Mrozowski notes, suggested the contrary. Early in the mill’s history, when it was new and most workers came from nearby communities, the backyard soil samples contained an abundance of grass pollen—a testimonial to well-kept company housing. Later, as competition in the textile industry grew more intense, local workers were replaced by lower paid European immigrants and conditions deteriorated. “After about 1870, the pollen analysis shows that the yards of the boarding houses were choked with weeds,” he says. The mill agent’s yard, on the other hand, was still well maintained. Discarded bones in the tenements and boarding houses showed signs of being gnawed by rats, while there was no evidence of rodents at the agent’s house.

The lead content of the soil was high throughout the site, possibly due to peeling lead-based paint and corroding pipes. Although the company installed some indoor plumbing in the late 1800s, boarding house residents continued to depend on the privies well into the 1900s. Mrozowski is confident of that date because the team excavated a plastic button from one privy with a slogan suggesting that its owner had been vaccinated—probably during the epidemic of Spanish influenza—that struck Lowell in 1918.

As large factories began replacing skilled craftsmen with unskilled laborers to do assembly work, the communities where these factories were
located reflected the trend toward conformity and control as well as resistance to it. Shackel saw evidence of this during his seven-year investigation of Harper’s Ferry, West Virginia, which grew up around a government operated arms industry in the late 18th century.

Initially, gun makers at the Harper’s Ferry armory were skilled craftsmen who lived where they chose. Unlike the similarity of housewares and personal items unearthed in Boott Mills’ boarding houses, Shackel found very different ceramic assemblages from house to house and evidence that the gunmakers spurned the factory to do their work at home.

But change came quickly to Harper’s Ferry. By the 1840s, the armory was developing the ability to make interchangeable gun parts. Timesaving machinery was introduced. The military, seeking greater efficiency, imposed a rigid discipline on the factory and began redesigning the town with a grid and standardized architecture. Shackel says the impact of the changes is reflected in the changing landscape of the town.

Prior to the 1830s, industrialists justified the establishment of industry in non-urban areas by claiming that it could exist in harmony with nature.

The analysis of pollen remains showed that grasses predominated throughout the town, which Shackel states is a demonstration of the coexistence of the machine and the garden. “Once the military took control of operations, created a factory discipline, and tried to control the domestic lives of workers and their families, the grasses disappeared in the surrounding landscape and were replaced by weeds,” he says. “The new industrial order no longer needed to justify the harmony between the machine and the garden. Rather, the new emphasis in industry became the machine without regard to the natural landscape.”

“One of the strengths of historical archaeology is that it’s like a feedback system,” says Shackel. “When you have two different sources—the written record and the material culture—one informs on the other.” History records that Harper’s Ferry workers protested the regimentation of their lives, and archaeology reveals that resistance expressed itself in a variety of forms. Beside one of the armory walls, for instance, archaeologists have found a huge pile of discarded gun parts, many of them in such good shape that Shackel believes they were tossed out by workers who were unhappy at being forced to do assembly line labor. At the bottom of an elevator shaft, archaeologists also found hundreds of broken beer bottles, apparently thrown there by workers who were drinking on the job, despite a strict prohibition on alcohol in the armory.

Signs of rebellion were evident at home as well. Shackel’s excavations of workers’ houses show that despite easy access to new and fashionable goods after 1840, they increased their use of older, hand-painted ceramics and simple creamware. He contends that the use of unfashionable goods was a deliberate effort to emphasize “a material culture that was fashionable generations earlier when they had some control over their everyday lives.”

When coal miners in Colorado went on strike in 1913, they gathered in union “tent colonies” throughout the coalfields. Tensions escalated, and in April 1914 national guardsmen surrounded the largest camp at Ludlow, in southeast Colorado. Gunfire erupted and by the end of the day as many as 26 men, women, and children had died and the camp had been burned. The United Mine Workers erected a monument commemorating the “Ludlow Massacre” the following year, but the incident quickly faded into the pages of history. One recent opinion survey found that 60 percent of Colorado residents interviewed thought Ludlow was the site of an Indian massacre.

Since the late 1990s, archaeologists have been piecing together a graphic picture of the incident that history only hints at. They knew the approximate location of the tent camp from a historical photograph, and using remote sensing to guide their excavations, they discovered the outlines of the earthen berms that had been built around the tents. Beneath the tents, they also found hand-dug cellars where occupants stored their possessions and took refuge when the bullets started to fly.

“These cellars are windows to the daily lives of the striking miners and their families,” says University of Denver archaeologist Dean Saitta, who conducted the investigation.
Residents of the Ludlow tent colony pose for a photograph. The massacre occurred when the militia sprayed the colony with machine gun and rifle fire and then set it ablaze. Twenty-four hours after the massacre, Ludlow was in complete ruins.
with Phillip Duke of Fort Lewis College and Randall McGuire of Binghamton University. “Because of the violent and unexpected end to the tent colony, most of the personal belongings—toys, clothes, jewelry and religious medallions—were left at the site when they fled and were still there for us to study. We also found things that shed light on the battle itself, from expended bullets coming into the camp, to a coffee pot with bullet holes in it, and fired cartridges, possibly from strikers within the colony firing back. From what we can tell, it appears the strikers were armed mainly with shotguns, which would not have been much use against machine guns and high powered rifles.”

Saitta says the abundance of Mason jars, which were used for home-canned products, and “store-bought” food items, like cans of PET condensed milk, indicate the strikers got some of their support from outside the camp. A number of items associated with various nationalities confirm historical accounts that the strikers, who spoke at least 24 different languages, had managed to put aside ethnic differences in the interest of union solidarity.

Largely on the basis of recent archaeological work and the publicity it engendered, the Ludlow massacre site was designated a National Historic Landmark in 2009, which the National Park Service noted was due in part to the potential of archaeology to “provide a needed counterpoint to biased and sometimes inflammatory documents produced by both sides during this era of labor unrest.”

Archaeology’s revelations of working class America are not confined to factories and mines. Five Points, in lower Manhattan, was one of New York City’s most notorious 19th-century slums. In 1842, Charles Dickens described the neighborhood in lower Manhattan as...
“all that is loathsome, drooping, and decayed.” In the century and a half since, authors and filmmakers have portrayed “the bloody sixth ward” as a festering scene of crowded tenements, saloons, brothels, and gangster hangouts.

The last buildings of the Five Points slum were razed in the 1960s, but in the early 1990s, in preparation for the construction of a new federal courthouse, the government ordered an archaeological assessment of the site, which was then a parking lot. The excavation yielded more than a million artifacts as well as a very different picture of the mythic slum. “It was not at all what we thought,” says Rebecca Yamin, an archaeologist with John Milner Associates of Philadelphia, who directed the analysis of the artifacts recovered from more than 20 cellars, privies, and cesspools that had preserved the material culture of the working class families.

Where history recorded a drab, festering slum, the archaeologists unearthed traces of a diverse, dynamic working class community that included bakers and butchers, grocers and shoemakers, and, yes, saloonkeepers and madams. Deposits of pins and buttons attested to the presence of seamstresses. A stash of broken French wine bottles hinted at the location of a brothel. And from one stone-lined privy came the remains of a monkey, which puzzled the team’s zooarchaeologist until research indicated that it was likely an Italian organ grinder’s companion.

In some cases, city records enabled the archaeologists to link what they found with individual families. At the bottom of a wood-lined privy at the home of German baker Tobias Hoffman, they discovered fragments of elegant Chinese porcelain, fancy wine glasses, and a gilded porcelain smoking pipe. After Hoffman’s death in the early 1800s, his widow turned the building into rental apartments, but Yamin says the remnants of matching English tableware, snuff boxes, and perfume bottles from a newer privy suggest people were still living comfortable lives.

By 1850, a five-story tenement had been built next door, which census records show housed 51 people, most of whom were recently arrived Irish immigrants. Even as conditions grew more crowded, however, privy deposits, including clay flowerpots to decorate the home, children’s cups with their names on them, and respectable English tea ware, reflect a surprisingly vibrant lifestyle. “What all of this means is that from the archaeological perspective, Five Points looks very different from what history has led us to believe,” Yamin says. “From this one block, we have been able to see the hidden part of working class life.”

After Yamin’s team completed their analysis, the artifacts were stored in the U.S. Customs vault at Six World Trade Center. Except for 18 items that were on loan for an exhibit, all of them were lost when the World Trade Towers were destroyed on September 11, 2001.

Archaeological investigations have also clarified the roles of ethnic and racial minorities in American labor history. Near McAlla, Alabama, recent excavations by Jack Bergstresser, an archaeologist at the Tannehill Historical Iron Works State Park, have unearthed a line of simple cabins that he believes were the homes to black slaves who were transferred from nearby plantations to work at the blast furnaces during the Civil War, an experience that foreshadowed post-slavery participation in the region’s iron industry.

In south central Iowa, excavations by retired Iowa State University archaeologist David Gradwohl at the ghost town of Buxton have shed new light on a century-old “black man’s utopia”—a planned community of 5,000 mostly African-American coal miners and their families who enjoyed steady employment and minimal discrimination until the mines closed in the 1920s—in a predominantly white state.

Through their research, Shackel, Mrozowski, Saitta and other archaeologists are showing that, if the complete story of American industrialism is to be told, the role of the working class can’t be ignored.

MIKE TONER is a Pulitzer Prize-winning writer in Atlanta, Georgia. His article “Ancient Cavers” appeared in the Fall 2009 issue of American Archaeology.
Remote sensing images from airplanes and satellites have become so remarkably clear that archaeologists can see things from space that can’t be detected at ground level.

By Julian Smith

ARCHAEOLOGIST TOM SEVER was working as an image processor at NASA in the 1970s when he realized that the digital data coming in from recently launched satellites like Landsat just might revolutionize archaeology. Researchers had used aerial photographs to find sites as far back as World War I, but satellite images covered much larger areas and could be updated in days or weeks instead of years or decades.

“I saw its potential from the beginning,” says Sever, now at the University of Alabama. “In my Ph.D. dissertation, I said remote sensing would be as important to archaeology as Carbon-14 dating.” He eventually convinced his superiors, and institutions like the National Geographic Society and the Smithsonian, that the new technology was worth a look, and archaeology had a new, powerful tool called aerial remote sensing (ARS).

For the first time, researchers could study entire regions before setting foot on the ground, much less digging any holes. Sensors on aircraft (referred to as airborne) and satellites (spaceborne) could record wavelengths invisible to human eyes, mapping traces of human activity through slight changes in ground temperature, moisture, and vegetation. Some of the sensors could penetrate darkness, clouds, and forest canopies around the clock.

In the early 1980s, archaeologists used NASA’s airborne Thermal Infrared Multispectral Scanner (TIMS) to find hundreds of miles of prehistoric roads surrounding Chaco Canyon in New Mexico. The scanner can measure temperature differences of 0.2 degrees Fahrenheit on the ground. With this technology, large-scale patterns in construction and settlement that can’t be detected at ground level can be seen clearly from above.

Central America has been one of Sever’s most successful study areas. Working in the jungles where the Maya and other ancient peoples once lived is difficult. The dense vegetation can hide ruins, and archaeologists also have to contend
An IKONOS satellite image of a section of the Petén rainforest in northern Guatemala, where the ancient Maya once resided. The green areas are lowlands that are partially submerged during the rainy season, the red areas are covered with vegetation, and the yellowish areas are places where the soil has been disturbed by Maya occupation.
with heat, humidity, mosquitoes, and poisonous snakes. In the 1980s, Sever used Landsat images to locate Maya sites along the border between Guatemala and Mexico, leading to the creation of the Maya Biosphere Reserve. Since then, he has been using high-resolution images from the commercial IKONOS and Quickbird satellites, in addition to NASA data, to focus on the San Bartolo site in northern Guatemala. This project is part of a larger NASA effort to unravel how human-caused and natural changes can affect the environment.

The Maya used large amounts of lime to build their cities. Over the centuries the mineral seeped into the soil, altering its chemistry sufficiently to give it a distinct signature that’s clearly discerned in infrared satellite images. (While Landsat couldn’t make out anything less than 100 feet wide, IKONOS and Quickbird have far superior resolutions.) Subsequent excavations of these places with high concentrations of lime has confirmed the existence of hundreds of previously unknown sites, yielding data that helps to determine where, when, and how many people lived there.

Archaeologists think a major drought was a significant factor in the collapse of the Maya around the 9th century A.D. The Maya also deforested large areas for agriculture, firewood, and building materials. Computer simulations run by Sever and others suggested that a complete deforestation of the region would have raised temperatures by three degrees Fahrenheit and decreased rainfall by up to 30 percent.

“We’re finding the Maya were able to have an effect on their local climate,” Sever says, “It wasn’t significant enough to cause the entire collapse, but natural drought coupled with changes they’d made to the climate by deforestation” could have been enough, especially when combined with disease, famine, and warfare.

In the mid-1980s, Sever and archaeologist Payson Sheets of the University of Colorado began investigating an unnamed culture that settled near Costa Rica’s active Arenal Volcano around 2000 B.C. A specially equipped NASA Learjet flying at 1,000 feet provided color photographs as well as infrared images. On some of the images Sever noticed faint lines several feet wide running through open pasture lands. At first the researchers thought the lines might be ancient roadway, but excavations revealed they were narrow, heavily used prehistoric walking trails.

“It never dawned on us that we could ever find footpaths,” says Sheets. Some were visible as shallow trenches on the surface, but others only showed up in the infrared images. Due to erosion, fertile soils were deposited in the abandoned paths and they produced plants that grew more vibrantly than the neighboring vegetation, and this was detected by the infrared images. The paths connected villages and cemeteries, and some of the paths, worn by traffic, were six to nine feet deep. “They were walking a precise processional path, single file, back and forth, for centuries,” Sheets says. This was the first evidence of specific villages being connected to cemeteries.

Sever and Sheets have confirmed two networks of paths that extend close to 20 miles. By examining the artifact scatters and ash layers from known volcanic eruptions, they’ve concluded the networks were traversed by two different cultures, one dating from 500 B.C. to A.D. 600, and the other from A.D. 600 to 1300.

New paths are constantly being discovered, in part because ARS technology is always improving. In the early days of the project, Sheets says, the research aircraft carrying the cameras could sit on the runway in San Jose, Costa Rica and Tom Sever and Payson Sheets stand in the remains of a footpath in northwest Costa Rica. The footpath, which couldn’t be seen at ground level, was detected by airborne and spaceborne imagery.
Rica’s capital, for weeks waiting for a break in the weather. Now satellites record more or less constantly and with much sharper detail.

Color infrared images taken from satellites are Sheets’ favorite. “You can see things like where kids have played hopscotch on the sidewalk,” he says. The technology works best for detecting things on the surface and to a depth of about six feet beneath it. Ground-based remote sensing equipment is more effective at detecting objects deeper than that. Sheets says that ARS has fundamentally changed his work. “I consider myself colossally fortunate to have access to this data,” he says. And he’s happy to share it. “I always give landowners an image of their property after we survey it, as a thank-you.”

The Department of Defense (DOD) funded an archaeological survey of San Clemente Island, one of the eight Channel Islands in the Pacific Ocean 60 miles west of Los Angeles. Human occupation of San Clemente Island dates back at least 10,000 years, and though many of its sites have been recorded, large sections of the island have not been surveyed. The DOD, which owns the island, decided to use Airborne Synthetic Aperture Radar (AirSAR) to survey those areas for cultural resources, as it must do by law, in a quick, accurate, and noninvasive way.

In 2002, a DC-8 carrying an AirSAR system operated by NASA’s Jet Propulsion Laboratory crisscrossed the island four times, bouncing radio waves of three different lengths off the ground. The shorter the wavelength, the more detailed the image it produced. The images, which revealed everything from ground textures and vegetation to walls and roads, were incorporated into a GIS database that included information about topography, drainage, vegetation, and soil types.

Using data from 15 of the island’s known sites, the researchers also identified a number of those sites’ characteristics, such as the typical vegetation and the soil’s moisture content. All of this information was used to develop a predictive model that pinpointed places on the island that were likely to be archaeological sites because they matched the various characteristics—what the researchers refer to as “site signatures”—of the known sites.

“You’re trying to find out what’s different about a site in comparison to the surrounding landscape,” says Doug Comer, the president of Cultural Site Research and Management, a contract archaeology firm that collaborated with NASA on the project. Archaeologists can be afraid of predictive models, Comer says. “They think, if we rely on a model that’s flawed, we’ll destroy sites that the model says shouldn’t be there.” But so far their model has proven to be very accurate.

To test its accuracy, they examined hundreds of places that the model pinpointed, and in most cases found archaeological sites there. During three field seasons, the researchers confirmed 833 sites on San Clemente. These sites contained plenty of carbon ash from fires, food, and refuse, which produced rich soils and thick vegetation that were discerned in...
the AirSAR images.

The model predicted a large number of sites on a small portion of the island. This prediction is supported by the fact that less than a quarter of San Clemente contains 90 percent of the confirmed sites. Both the predicted and confirmed sites have similar characteristics: Virtually none of the sites was on a slope steeper than 15 percent or more than 200 yards from water. The inhabitants almost always had a view of the ocean, the source of nearly all their food and materials. This suggests there are probably very few sites on the majority of the island. Comer says the model needs further testing, but “even before we do that the Navy has valuable guidance as to where they should not place new roads or buildings, or conduct maneuvers that involve disturbing the surface of the ground. The chances are that if they carry out these sorts of activities in areas where the model does not show site signatures, they can do so without the complicating factor of encountering archaeological sites.”

The San Clemente project ended in 2007, but work continues on Santa Catalina, another of the Channel Islands. Comer says they are having surprising luck detecting lithic scatters, which are notoriously difficult to find. These sites tend to be on sparsely vegetated hilltops, where people may have sat and chipped out tools as they looked out to sea for marine animals.

Though AirSAR wasn’t the only data source, it made a “crucial and unique contribution” to the Channel Islands project, says NASA’s Ron Blom. “It’s the only way to get a truly regional view of the landscape these people lived in and how they used it.”

Comer adds, “It opens up a whole new way to find archaeological sites because it senses environmental conditions associated with archaeological sites, like surficial roughness and patterns of scattered rock, that are invisible to other remote sensing technologies. It also corroborates vegetative patterns associated with sites that can be sensed by other technologies.”

Choosing ArSAR data can be a tradeoff between cost and quality, says Devin White of Integrity Applications Incorporated, an archaeologist who has worked on digs in southwest Colorado. “The question comes down to how much money you have.” Using commercial satellites can drive the cost of a project into the six figure range. Aircraft cost a lot to fly, so ordering new images is very expensive. Archived aerial images are much cheaper, costing hundreds, instead of thousands, of dollars.

It costs even more to get a satellite up, White says, but “then it just keeps on collecting data, 24 hours a day, seven days a week. That’s what makes spaceborne data so much cheaper in the long run” than airborne data. Archaeologists often have limited budgets, and consequently Comer and
Blom are developing a short course about how to use NASA satellite data for research and site protection. Unlike commercial satellite data, NASA data is very inexpensive, and in some cases free. Detailed aerial photographs are also available from various government agencies like the U.S. Geological Survey, and they can cost less than $25.

One problem, ironically, is that the images can be too recent. “In general, older imagery is more useful to archaeologists, because the land was much less developed, plowed down, or built on decades ago,” says Ken Kvaanme of the University of Arkansas. Photos taken in the U.S. as far back as the 1930s often show archaeological features much more clearly.

For a little over a decade, Kvaamme has used IKONOS and Quickbird data, along with other forms of remote sensing, to create an atlas of archaeological sites along the Middle Missouri River in North and South Dakota. Shallow surface depressions are all that remain of villages of earth lodges, dome-shaped wooden structures covered in soil, built by native tribes about 150 years ago.

Contemporary images are still useful in finding sites, Kvaamme says, and he and his collaborator, Tommy Elle Hailey of the Cultural Resource Office at Northwestern State University in Natchitoches, Louisiana, have taken the unusual step of making their own. They use a two-seat powered parachute, with landing wheels and a large propeller, to fly low over potential sites shooting photos and video. “There’s no floor—you can look straight down,” he says. Top speed is seldom over 20 mph, so motion blurring is minimal. “We usually fly into a headwind, so we almost hover.”

ARS sensor resolution is constantly improving, and researchers are already eagerly awaiting the development of new hyperspectral sensors that provide hundreds of bands of data instead of only a handful. There has been a strong shift from airborne to spaceborne systems, says White. NASA’s airborne program has faded, in part from budget cuts, and new data isn’t being collected on older sensors like TIMS.

Archaeologists are looking at technology like LIDAR (Light Detection and Ranging), which is like radar except it uses pulses of laser light and offers much greater detail and even 3-D images. Unmanned aerial vehicles are the wave of the future, says Sheets; NASA is currently developing some to replace its AirSAR-equipped DC-8, mothballed in 2004.

With spaceborne systems working around the clock, there’s a possibility that images of a specific site already exist. Researchers can order data online without leaving their desks. There is talk of attaching sensors to the International Space Station, and growing interest in using data from GEOSAR geosynchronous satellites, which can penetrate vegetation and also create 3-D images.

Some aerial data sources are available for free to anyone with an Internet connection. NASA’s World Wind combines topographic maps, aerial photos, satellite images, and GIS data into a 3-D virtual model of the Earth’s surface. “Before anyone goes in the field now, they check Google Earth,” says Kvaamme. “You can see changes in vegetation patterns, where ditches or houses are. It’s fantastic. It’s changing the whole discipline.”

Sever has seen his predictions about ARS come true, and then some. “It is exceeding even my wildest vision in my early years of how the technology could be used. I never envisioned the computer capability, satellite technology, and bandwidth increasing at the rate and the rapidity they are.” Still, says White, ARS should supplement careful research, modeling, and groundwork, not supplant them. “Like any technology, you can over-rely on it. It’s just a tool, like a trowel, or a bucket, or a map.”

Julian Smith’s book Chasing the Leopard will be published this summer. His article “Proof of a Pre-Clovis People” appeared in the Winter 2009-10 article of American Archaeology.
Excavating Hazardous Sites

A huge environmental cleanup is taking place at the Hanford Department of Energy site in southeastern Washington State. This sign marks an open excavation area where archeologists sort through material from a landfill associated with one of Hanford’s World War II worker camps.
Struggling to handle a small trowel while wearing bulky protective gloves, a hazmat suit, and a full-mask respirator, Suzanne Cherau, senior archaeologist and safety manager with the Public Archaeology Laboratory (PAL) based in Rhode Island, excavated an 1800s’ carriage works site in New Haven, Connecticut. The surroundings were barren, industrial, and contaminated with high levels of arsenic and lead.

“PAL has worked on over a dozen projects over the past 15 years that have involved hazardous chemical contaminants in the soil,” said Cherau. “Projects mainly involve historic industrial sites such as 19th-century lead works, copper mines and factories, carriage works, glassworks, lighthouse sites, and pre-contact Native American sites found in coastal locations containing high concentrations of chemical contaminants.”

“Early industry was water-driven, so many early industrial sites were carved out of these areas, and water also attracted prehistoric and historic settlement,” said John Vetter, the Environmental Protection Agency’s (EPA) national expert in archaeology and historic preservation. This combination of industry built atop ancient cultural resources has created some of the world’s most hazardous archaeological sites.

Physical hazards found at archaeological sites generally fall into two main groups: environmental contaminants such as lead, arsenic, cadmium, mercury, asbestos, and PCBs; and biological agents such as smallpox, parasites, viruses, fungi, lyme disease, and rabies. Early industrial sites dating from the 19th and early 20th centuries are typically located along the East Coast, while sites related to the extractive industry such as mining tend to be located in the Western U.S. “Now we’re dealing with lots of abandoned mines out West that need to be cleaned up,” said Vetter. “The size and scope of these projects is tremendous in terms of acreage, where, for example, waste tailings piles cover huge areas. These sites were just walked away from in the past.”

In response to the 1978 Love Canal disaster near Niagara Falls and the Valley of the Drums toxic waste dump site in Kentucky, Congress established the EPA’s Superfund program, also known as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), in 1980 to locate, investigate, and clean up hazardous waste sites throughout the U.S. The Superfund law established a tax on potential polluters, procedures for cleanup and containment of the most toxic sites, and a way to recover costs from responsible parties.

Once a site is determined to be highly contaminated and a danger to the public, it is placed on the National Priorities List, the list of EPA Superfund sites. The EPA has identified about 47,000 hazardous waste sites in the U.S., and, since 1980, 1,600 sites have been put on the National Priorities List and about 60 more are proposed for listing. More than 300 of these sites have been cleaned up or contained to the point that they’ve been removed from the list. Many states also have their own hazardous clean-up divisions.

With the establishment of CERCLA, archaeologists have been increasingly called upon to investigate contaminated sites. Federal and state-sponsored investigations of former industrial sites require that environmental site characterization studies be conducted, generally well in advance of archaeological work. Following the characterization study, the archaeologists work with specialists to develop a health and safety plan tailored to the nature of the site, the excavations, and the hazards faced. All archaeologists who work in hazardous environments must take a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course in the use of protective equipment and the decontamination of people and equipment, as well as an annual, eight-hour refresher course.
The nature and concentration of the site’s hazards determines the level of protective gear that must be worn. The gear levels range from A to D, with A, the highest, requiring a full chemical protective suit, chemical-resistant boots and gloves, and self-contained air. Level D requires only coveralls and safety shoes. Each crew member must also undergo a baseline medical examination that includes blood work for the specific chemical compounds known to be present at the site and a pulmonary fitness test for respirators, should they be needed.

“Getting trained archaeologists out in the field was a breakthrough 20 years ago,” said Vetter. “We saw other field professionals such as geologists and biologists going out and gathering environmental data at Superfund sites, but no archaeologists going out, and none trained” to do so. Over time, Vetter began to see more and more archaeologists getting the necessary training, with some of the contract archaeological firms creating departments dedicated to hazmat investigations. “There is a lot of industrial archaeological work, so more folks are getting the hazardous training,” said Vetter.

The Marathon Battery site is on the Hudson River across from West Point Academy in southeastern New York. It’s a highly contaminated nickel cadmium battery plant, which operated from the 1950s through the 1970s and was built over the ruins of a Civil War cannon factory known as the West Point Foundry. It was also one of the first Superfund cleanup projects. “We had to develop new approaches that met the challenges” of toxic sites, said Joel Grossman, who along with his multidisciplinary team was hired to investigate the site in 1989.

“After the Love Canal business, West Point Foundry was the first big clean-up project, the test case to see whether it was feasible and practical” to implement federal requirements, said Grossman, who is internationally recognized for his pioneering work at the site. “Dangerous cancer-causing cadmium deposits from a post-WWII battery factory built over the historic weapons foundry needed to be removed, both on land and from the marshes bordering the river. Clean-up could not begin until the ill-defined historic site had been documented.”

The five-year investigation posed critical health and safety threats that he had to contend with. His goal was to keep his crew safe, dry, and warm. (To keep the project on schedule, much of the excavating was done in the winter.) Toward that end, his crew worked all day and every day under portable, custom-built, blast-resistant shelters covered with inflated, plastic skins, which he described as “reinforced greenhouses.” The shelters were equipped with heaters and pumps that ran around-the-clock to lower the water table so the archaeologists could excavate five feet below the surface, where the Civil War artifacts were located. An on-site laboratory was used to inventory, decontaminate, and conserve the 150,000 artifacts that were recovered. “If you take contaminated artifacts off-site, you create another Superfund site,” he explained.

“Crew members carried walkie-talkies to guarantee quick rescue and support, and bayonets taped to their hazmat suits, to quickly cut them off in case of a break in
the sealed protective outer shell” of their suits, explained Grossman. This did occur once during the project, and rescue personnel with heavy scrub brushes and high-pressure hoses quickly decontaminated the exposed worker, who was then medically evaluated. In addition to the constant threat of heat exhaustion while wearing the protective suits, the crew had to deal with the difficulties of manipulating small instruments through the thick layers of protective gloves. “What is difficult under normal conditions can become nearly impossible in field situations of extreme physical stress,” Grossman said.

The crew used a computer transit, which at that time was a new technology, to pinpoint the locations and dimensions of the various coordinates of artifacts and features. This minimized the exposure of the crew, who would otherwise measured the toxic items by hand. Grossman used GIS software to scale, overlay, and then subtract modern features and industrial debris from the 3-D color plot of magnetic anomalies detected across the site by a magnetometer. A backhoe was used to remove the modern fill and expose the 19th-century surface. Excavation of the anomalies pinpointed the location of an 1863 cannon platform and beside it the cannon hoist-tower under three to five feet of industrial fill. The cannon platform, which was made of iron and wood, was recorded with single-camera photogrammetry. The iron was conserved and the decayed wooden platform reconstructed, and they are now on exhibit at nearby Hannah State Park.

According to historical accounts, most of the foundry’s workers were poor Irish immigrants. But the excavation of the workers’ housing uncovered artifacts that were incongruent with that profile, such as officers’ medallions, laboratory instruments, and a variety of German and Austrian coins. “The origins and high-status nature of the mid-19th-century collection indicated that the worker population was more complex, sophisticated, and ethnically diverse than had been suggested by secondary historical accounts,” said Grossman. This discovery prompted intensive investigations at the National Archives, leading to the revelation that key elements of the cannon were actually re-engineered, to increase its accuracy, in accordance with confidential European prototypes and secretly acquired by Lincoln’s Executive Branch agents. “At West Point Foundry, the cadmium-laced archaeological evidence revealed a little-known Civil War research and development program in heavy, rifled super guns. It also revealed previously unrecognized intelligence operations and capabilities in Lincoln’s administration,” Grossman wrote in the book Look to the Earth: Historical Archaeology and the American Civil War.

“The work at West Point Foundry underscores the importance of being able to do justice to our cultural resources even in dangerous and contaminated environments,” he said. “And the fact that some of the biggest discoveries can occur in the most unlikely places, and only because they were mandated by Federal historic preservation laws.”

By 1994, PAL had successfully completed several federal hazmat projects, primarily in former industrialized urban core areas of southern New England. PAL’s clients range from private developers who are mostly involved with the reclamation of former industrial sites (known as “Brownfields”), to state and federal agencies. At the 19th-century Cruttenden Carriage Works site in the heart of New Haven’s historic Wooster Square carriage district, PAL conducted excavations in advance of the state’s rehabilitation of the Interstate 95 Quinnipiac Bridge.

PAL’s initial assessment of the site identified the presence
of various contaminants, consequently the crew wore dust masks, safety shoes and glasses, and disposable Tyvek coveralls and latex gloves. Artifacts were decontaminated on site by washing them with Alconox, a strong soap, before they were sent to PAL’s Rhode Island laboratory for a second washing and analysis. Other precautions were also taken, including barricading the work area and suppressing dust with water pump sprayers. Archaeologists wore monitoring devices that provided air quality readings to the environmental engineer monitoring the project.

“But even in the best of circumstances, things can and do go wrong,” said Cherau. About a month into the fieldwork, a team of archaeologists began hand-excavating one of the site’s multiple cisterns. By mid-day, the crew had exposed about three feet of interior surface and collected numerous objects associated with the site’s historic occupants. While the archaeologists’ monitoring devices did not go off, concurrent testing of excavated soils showed elevated arsenic levels. “We were immediately advised by the state to temporarily shut down so additional measures could be taken,” recalled Cherau. The four archaeologists working the site that day were tested for arsenic. The worker that had been excavating the cistern had high levels in his system, though three subsequent months of monitoring showed no long-lasting effects.

The excavators upgraded their protective equipment and the project resumed. “Work slowed down considerably due to the demands of working in moonsuits and added substantial cost to the project,” Cherau said. “Historic industrial sites are inherently dangerous places for archaeologists, and the rapidly changing work environments created by our excavations can cause hazardous situations even in the most well-planned scenarios.”

In Libby, Montana, clean up of a highly virulent form of asbestos-contaminated vermiculite formerly mined and processed at the W.R. Grace plant, which is on the Rainy Creek archaeological site, necessitated emergency excavations there. “Although we had no prior experience in working at hazardous sites, my company (Aaberg Cultural Resource Consulting Service) was contacted in 2000 by one of the EPA’s contractors,” said Stephen Aaberg, the company’s owner and senior archaeologist. The crew underwent the required HAZWOPER training and wore complete Tyvek suits, steel-toed boots, and full-face respirators.

“Because we would be working within and very close to asbestos-contaminated soil, we were required to wear a higher level of protection than even the heavy equipment operators,” Aaberg said. Crew members also had to wear personal air-monitoring units that would trap air-borne asbestos so the EPA could track exposure levels. A single exposure to tremolite, a particularly dangerous type of asbestos found in the Libby area, could result in a serious respiratory problem.

“I can’t tell you how difficult and uncomfortable it was working in the suits with a full-face respirator,” Aaberg recalled. “We were working in late August and September. Mornings in northwestern Montana started very cool, but by noon heated up into the 80s. We went from freezing cold to unbearable heat during the day; and we could not remove or even unzip our Tyvek suits or take off the respirators while in the containment area.” To further complicate matters, the asbestos-contaminated soil was being removed when Aaberg began his excavation. “We had to move at a quick pace to stay ahead of earth-moving heavy equipment—the archaeological mitigation was really more of a salvage effort than a true comprehensive data recovery effort.”

Despite these challenges, Aaberg and his crew discovered multiple stratified cultural components dating from...
at least 3,700 years ago through the historic period, and they recovered a variety of stone tools and processed animal bones. "Although I briefly thought about specializing in archaeological investigations in hazardous environments, I ultimately decided against it because conditions are so trying for crew members and because—at least in our experience with the asbestos project—there are so many limitations on good data recovery," said Aaberg.

This past fall, the first phase of a six-year Superfund project to dredge the Upper Hudson River of PCB-contaminated soil released by the General Electric Company was concluded in a six-mile stretch of the river near Fort Edward, in east-central New York. The British built a fort, from which the village derives its name, in the 1750s during the French and Indian War, and it housed more than 15,000 troops. The fort was used again during the American Revolution, then it fell into ruins, and the village gradually grew over it.

GE is conducting the $780 million cleanup, having released as many as 1.3 million pounds of PCBs, now known to be human carcinogens, into the river between 1947 and 1977 from its capacitor manufacturing plants at the Hudson Falls and Fort Edwards facilities. The EPA determined that 14 archaeological sites lie within 150 feet of areas targeted for dredging, with five extending to the river’s edge and into the water. GE has contracted with URS Corporation to conduct an archaeological survey and testing along the riverbanks, and in 2003 the EPA brought on nautical archaeologists with the Lake Champlain Maritime Museum in Vergennes, Vermont to do underwater archaeological work as well as review the underwater work done by URS.

"The key safeguard in these types of environments is that the diver never gets wet," says Adam Kane, the museum’s nautical archaeology project manager. "We do this with dry data suits, dry gloves, latex hoods, and full-face masks with communications. The divers are decontaminated when they exit the water."

Just before dredging concluded for the season this past fall, workers accidentally pulled up several hand-hewn timbers associated with the original fort. Work was stopped and the museum’s archaeologists were called in to complete underwater testing and excavations.

The EPA plans to perform an archaeological survey around the area where the beams were accidentally removed. "We hope to get the setting and context of the timbers prior to their removal, do a little reconstruction of that, and use this opportunity to add to our overall understanding of the occupation of the fort," Vetter said. PCBs are one of the hardest contaminants to remove from artifacts, but tests conducted on the timbers, one of which is 21 feet long, showed they were not heavily contaminated.

"The unfortunate reality is that lots of these submerged archaeological sites are in contaminated environments, and as these get cleaned up, archaeological sites are invariably impacted," said Kane. As awareness of the dangers faced at toxic archaeological sites increases, more archaeological firms are working to formulate health and safety plans and getting their workers HAZWOPER trained. Despite the dangers, numerous projects have shown that it is possible to achieve a balance between safety and successful data recovery. "I’ve been doing this a long time and have never had any major injuries," said Grossman. "I’m not a lucky guy, I’m a diligent guy."

TAMARA STEWART is the assistant editor of American Archaeology and the Conservancy’s Southwest region projects coordinator.
In April of 1824, the U.S. Army built a log stockade on the Neosho River in east-central Oklahoma. The stockade, known as Fort Gibson, was the first army outpost in Indian Territory. In the following decades it was a terminus for the Cherokee, Creek and Seminole who were removed from their homelands in the Southeast. By 1845 the deteriorating log buildings were replaced by stone structures that were built nearby.

During the Civil War the fort was occupied first by Confederate, and later, Union troops. After the war, during Reconstruction, U.S. Army troops were stationed there to prevent Euro-Americans from settling in Indian Territory. The army abandoned the fort in 1890, at which time it was acquired by the Cherokee Nation. By then nothing remained of the original log fort and a park was built on the site.

In 1903, the Midland Valley Railroad Company was formed. The company built a 277 mile-long line to transport coal from mines in western Arkansas through northeast Oklahoma to Arkansas City, Kansas. The line followed the banks of the Arkansas River, crossing the Neosho, a tributary of the Arkansas, just north of Fort Gibson. The railroad was built on an old roadbed that connected Fort Gibson to the adjacent town of the same name, inadvertently bisecting the area once occupied by the log stockade.

In 1934, the National Park Service conducted a Historic American Building Survey of Fort Gibson’s stone structures. The local residents proposed building a replica of the original log stockade, but their efforts were unsuccessful. In 1952, the Oklahoma Anthropological Society volunteers excavate the stockade foundations in the shadow of an adjacent reconstructed stockade. In 1960, the park was established, and a replica of the original log stockade was built. The park today is known as Fort Gibson State Park.

Oklahoma Anthropological Society volunteers excavate the stockade foundations in the shadow of an adjacent reconstructed stockade.
fort to attract tourists, and in 1935, under the auspices of the Works Progress Administration, a replica was built about 200 feet from the railroad tracks. The site was designated a National Historic Landmark in 1960. The replica and the stone structures constitute the Fort Gibson Historical Site, which is managed by the Oklahoma Historical Society.

Historians and the site’s staff have wanted to find the location of the original stockade for decades, but the 1934 building survey produced no information about it and the archaeological work done in the area was inconclusive. In 2003, Oklahoma Historical Society (OHS) researchers conducted test excavations inside the replica, finding no evidence of the original fort.

Lee Bement of the Oklahoma Archaeological Survey took 30 core samples from within the replica and beyond it in 2006. The samples contained cultural materials that dated to the time of the original fort. The locations where the samples were taken, as well as an 1835 map of the stockade, were superimposed on a modern aerial photograph.

Guided by that photograph, Steve DeVore of the National Park Service’s Midwest Regional Archeology Center directed a remote sensing survey later that year. The survey revealed anomalies that could represent buried remains.

In 2007, the anomalies were excavated by Bement and a team from the OHS, who discovered portions of the original fort’s foundation adjacent to the replica. During another excavation later that year, Bement, assisted by the OHS and the Oklahoma Anthropological Society, found other intact sections of the foundation on two vacant residential lots owned by longtime Fort Gibson residents Adam and Angela Mason. The OHS approached the Conservancy about acquiring the lots to preserve the foundation remnants, and the Conservancy in turn approached the Masons, who generously agreed to donate their land. Fort Gibson is the Conservancy’s fourth preserve in Oklahoma.—Michael Bawaya
The bluffs above the Mississippi River in southwest Mississippi are known for their historic sites. The town of Natchez, which is known for its Civil War history and antebellum homes, was named for the Indian tribe that French explorers observed in the 1700s building mounds for their leaders and for use in elaborate ceremonies.

Native Americans in the Lower Mississippi Valley were building mounds thousands of years before the Natchez existed, however, and the Conservancy’s latest acquisition in Mississippi, Bates Mound Number 2, may or may not be one of those very ancient mounds.

Bates Number 2, which is located just north of Natchez, was recorded by archaeologists in 1971. The archaeologists didn’t excavate the mound, nor did they find enough surface artifacts associated with it to determine its age or cultural affiliation. It was speculated that, because of its conical shape and six-foot height, Bates Number 2 could be a Middle Woodland burial mound, but there’s no evidence to confirm this.

It’s one of two mounds located about a half a mile apart that belonged to the Bates family of Church Hill, Mississippi. The edge of the mound was slightly damaged years ago by road construction, but for the most part it remains intact. Gene and Suzy Bates recently donated the mound to the Conservancy. The other mound, known as Bates Number 1, was donated to the Conservancy last year by other family members. Core samples taken from that mound indicated it dates to at least 500 B.C., and it’s possible that Bates Number 2 is of equal antiquity. The area around the latter mound is dense with archaeological sites, some of which also have mounds that date from Archaic through Historic times.

Bates Number 2 could be thousands, or hundreds, of years old. With so little known about the mound, it has great research potential and it’s almost certain to make a significant contribution to our understanding of the archaeology of this area rich in history.

—Jessica Crawford
The Conservancy Preserves An Ancient Pennsylvania Site

Ebbert Spring has been a source of water for thousands of years.

Ebbert Spring is one of several springs in the area that emanate from limestone outcrops. When Europeans first arrived in this section of the Great Valley, they referred to it as “the Barrens” because of the many limestone outcrops that dot the valley, and the large swaths of open grassland found here. These springs provided a vital source of water to both prehistoric people and European settlers, and the latter often constructed their farmhouses in close proximity to, and sometimes on top of, these springs. An 18th-century brick house with a limestone foundation currently sits atop Ebbert Spring. It’s one of the larger of the springs in the area, producing approximately 700 gallons of water per minute and maintaining a year round temperature of 52 degrees. To this day, the spring serves as a source of potable water for people in the region.

The Ebbert Spring site was first recorded in 1994. However, it wasn’t until 2003, when a developer purchased much of the land surrounding the spring, that the local chapter of the Society for Pennsylvania Archaeology began test excavations there. The researchers were looking for evidence of a French and Indian War fortification that was thought to have been built near the spring, but instead they discovered an array of prehistoric artifacts and features, including a major Late Woodland occupation featuring a palisaded village.

For the next several years the society conducted extensive excavations on private land adjacent to the Conservancy’s property. The researchers recovered tens of thousands of lithic, ceramic, and bone artifacts as well as intact postmolds, hearths, and refuse pits from the Late Woodland period. This data shows that Ebbert Spring was used by people from Paleo-Indian times until today.

Atapco Properties, Inc., which now owns much of the land surrounding Ebbert Spring, has agreed to donate over three acres of the site to the Conservancy for permanent preservation. While this portion of the site has not been excavated, a preliminary survey of the property has produced an extensive prehistoric artifact assemblage, as well as evidence of a French and Indian War-period occupation. The information recovered from Ebbert Spring has added to our knowledge of how springs were used over time and their importance to the people in the Great Valley. —Andy Stout
A Glimpse of Ancient Life on the Northwest Coast

An unusual wet site in Washington State could yield valuable information.

The Conservancy is pleased to announce the launch of the POINT-4 Program, a $2 million emergency acquisition project designed to ensure that virtually no nationally significant archaeological site is destroyed by development, looting, or the effects of the environment.

The program will focus primarily on sites in five geographic regions representing particular cultures that are in great danger of destruction, and on one national culture. Those regions and cultures are the Algonquians and Iroquois villages of the Northeast; the monumental sites of the Mississippi Delta; the mound builders of the Ohio Valley; the Anasazi of the Four Corners; and the prehistoric and historic sites in California’s Central Valley. It will also focus on the Paleo-Indian culture that spanned the country.

This year marks the 30th anniversary of The Archaeological Conservancy. In honor of this event, the Board of Directors and staff of the Conservancy have pledged the first $1 million for POINT-4, to be matched dollar for dollar by new contributions.

The Conservancy has acquired the Deqwaled site on the Snoqualmie River north of Seattle, preserving information about the activities of the people living on the Northwest Coast about 2,500 years ago. The Washington Archaeological Society excavated Deqwaled in the late 1950s and early 1960s. These were the first waterlogged investigations, also known as "wet site" excavations, conducted in the Pacific Northwest. In addition to examining waterlogged areas, the researchers also exposed a portion of the dry riverbank.

Archaeologist David Rice participated in one of the digs while he was attending high school. "The initial finds suggested that the site was a prehistoric seasonal fishing site that was periodically flooded by annual runoff of the Snoqualmie River," he said. The dry phase of the excavation revealed an archaeological midden deposit. The artifact assemblage contained fire-modified rock, and a wide range of chipped stone tools, including projectile points, knives, scrapers, gravers, adze blades, microblades and cores, and many flakes.

The researchers had to develop different excavation strategies to cope with the problems posed by the waterlogged environment. Water inhibits the oxidation and decomposition of organic artifacts; but once they are removed from the water, they quickly decompose. Consequently, wet site
excavations require specialized collection and preservation techniques.

In 1979, archaeologists Astrida R. Blukis Onat returned to the site with students from Seattle Central Community College to do more excavations. “We uncovered what appeared to be a burned house post, with adjacent side posts,” Blukis Onat said. “This structural feature is much like those described in ethnographic literature for house construction. Removable wall planks were tied with cedar rope between the main post and the side posts. These planks formed both outer and inner walls for the structure.” Deqwaled is a Lushootseed word—Lushootseed is the language spoken by Native Americans in this area—meaning “house post. “There is no known place name in the Lushootseed language for this location,” she added.

In 1985, Blukis Onat learned that the land containing the site was going to be sold, so she purchased it to preserve the site. “There are very few sites of this period—2,000 to 3,000 years old—known in the greater Puget Sound area,” she said. “And there are very few sites that contain both dry land and wet site deposits that appear related.”

In the fall of 2008, Blukis Onat donated more than 3,000 artifacts and other data from the site to the University of Washington’s Burke Museum. The artifact collection includes hundreds of basketry fragments, net sinkers wrapped in cherry bark, and fishing gear. “The fragments of cedar baskets and woven mats, coupled with fishhooks, net weights, and stone tools, offer valuable insights into the collecting and storing of fish, shellfish, and berries,” said Laura Phillips, the archaeology collections manager at the Burke Museum. “They tell stories about life, technology, trade, and artistic invention.”

Blukis Onat thought that the site would be an ideal candidate for preservation, so she contacted the Conservancy, and we acquired Deqwaled in January. “The site is unique because it contains both a high riverbank portion with features and lithic artifacts, and a lower overbank deposit—in the delta of an adjacent small stream—with perishables, including mats, baskets, and a portion of a fish trap,” she said. Deqwaled is the Conservancy’s first wet site. Researchers will now have the opportunity to study this unusual and extremely valuable archaeological resource. —Julie Clark

ancient fishermen used net sinkers wrapped in cherry bark.
Gillota-Johnson Preserve Management Team Meets

SOUTHWEST—The management team for the Gillota-Johnson Preserve in southwestern Colorado met last November to develop the 100-year management plan for this recently acquired site. Gillota-Johnson features a well preserved group of eight architectural units, a great kiva, and a bedrock reservoir. It was occupied between A.D. 880 and 980, and it’s the largest site of its kind in the region.

The meeting began with a site tour followed by a discussion of management issues such as site security and protection, stabilization, professional research policies, educational programs, and public access.

The management plan is an important tool used by the Conservancy to ensure that decisions concerning the preservation of a site are made in a way that not only preserves and protects the resource but also includes input from all of the interested parties. The Gillota-Johnson management team includes the previous owners of the property, professional archaeologists from southwestern Colorado, Colorado Historical Society representatives, Native Americans, the volunteer site stewards, and Conservancy staff.

Old Mobile Expanded

SOUTHEAST—The Conservancy’s Old Mobile preserve, in southwest Alabama, has recently been expanded. In 1996, the DuPont Company donated an easement to the Conservancy on the portion of the site they owned. At that time, the remaining two thirds of the site belonged to other companies and was unprotected. In recent years, Mobile County acquired a third of the site that once belonged to Courtaulds Fibers, at
which point Mobile County Commissioner Merceria Ludgood spearheaded an effort to follow DuPont’s lead and donate a preservation easement to the Conservancy. Due to the Mobile County Commission’s foresight and the efforts of several other people, over half of this site, which is eligible for National Historic Landmark status, is permanently protected.

The town of Old Mobile was founded by Pierre Le Moyne d’Iberville in 1702 and it became the first capital of French colonial Louisiane. Its inhabitants had a friendly relationship with the Indians of the surrounding area. However, disease, hunger, and flooding were constant problems, and in 1711 the settlement and Fort Louis de la Louisiane were moved down river to the present location of the City of Mobile.

Under the direction of Gregory Waselkov, the University of South Alabama’s Center for Archaeological Studies has been conducting research at the site for 21 years. The archaeologists have located the remains of over 50 structures, eight of which have been excavated, yielding thousands of artifacts.

American Archaeology Article Wins National Prize

The article “Embracing Archaeology,” which appeared in the Fall 2009 issue of American Archaeology, won the Society For American Archaeology’s Gene S. Stuart Award.

The award, which is in memory of the late Gene S. Stuart, a writer and managing editor of National Geographic Society books, honors outstanding efforts to enhance public understanding of archaeology. The award is given to the most interesting and responsible original story or series about any archaeological topic published in a newspaper or magazine.

“Embracing Archaeology” told of how the Eastern Band of the Cherokee, who were once suspicious of archaeology, are now using it to learn about their history. The award carries a $2,000 prize, which was given to the article’s author, Andrea Cooper, a freelance journalist.
The Search for Mabila
Edited by Vernon James Knight, Jr.
(University of Alabama Press, 2009; 277 pgs., illus, $57 cloth, $38 paper; www.uapress.edu)

From his 1539 landing in modern day Florida until his death somewhere along the Mississippi River almost three years later, the Spanish explorer Hernando de Soto wreaked havoc on every Native American province through which he passed. However, the exact route he followed and the locations of the battles between his army and the native towns is a subject that has preoccupied historians and archaeologists, as well as the public, since the early 1800s. In southern Alabama, a battle took place in a fortified town called Mabila between de Soto’s army and a chieftain named Tascalusa. The conflict took a large number of casualties on both sides, and the Spanish also lost trunks of clothing, blankets, tents, weapons, tools, medicine, and spoils taken from other Indian towns.

The Search for Mabila, edited by Vernon James Knight, Jr., does not claim to do this. Instead, the volume proposes a “broader approach” to locating Mabila and details the efforts of a multidisciplinary group of experts that convened for a three-day workshop in 2006. As Knight points out, researchers have more resources than ever at their disposal, and therefore the authors incorporate information from the fields of history, geology, folklore, geography and archaeology to develop a new approach to locating Mabila.

“The Search for Mabila is a fascinating volume that provides readers all the existing information about where Mabila could be found as well as a synopsis of a new method for finding it. Knight notes that the search continues, and he stresses in his introduction, “It really does not matter to us in the slightest way which modern town or city can lay claim to having Mabila in its backyard. Our desire is simply to learn more about a fascinating but keenly intractable period of early American history.”

—Jessica Crawford
One of the most important and contentious issues of American anthropology is the impact of the European encounter on Native American populations. In this important study of the Indians of the Yosemite Valley of California, Kathleen Hull makes a very important contribution. Drawing on the archaeological data, as well as Native oral traditions and historical accounts, she is able to reconstruct the impacts of European diseases and other factors on the Native population.

In this case, as with many others in the Americas, epidemic diseases preceded face-to-face contact, and these diseases did in fact have a catastrophic impact on the Native population. Yet, the evidence suggests that the depopulation that resulted from these diseases was not sufficient to destroy the cultures of the Native groups. Hull finds that had there been only a single wave of fatal disease, many Native people would have recovered and maintained their traditional long-term stability.

It was the second wave of assaults by disease and exploitation of Native labor and resources that were even more destructive and that brought about irreversible culture change. Gold Rush miners followed the Spanish, resulting in a fatal depopulation and destruction of indigenous life ways.

The second part of Pestilence and Persistence is a comparison of the Yosemite Indians with Native groups in 10 other regions of North America, including the Iroquois of upstate New York, the complex chiefdoms of the Southeast, and the Pueblo people of the Southwest. While Hull finds many similar experiences, she also finds a great many differences. This book is much more than a case study of a small California tribe. It is a major contribution to our understanding of European contact with Native America and all its consequences.

—Mark Michel

Mammoths and Mastodons: Titans of the Ice Age
By Cheryl Bardoe
(Abrams, 2010; 43 pgs., illus., $19 cloth; www.abramsbooks.com)

This book was produced for young readers (age eight and up) by the Field Museum in Chicago to accompany a major new exhibit on these Ice Age giants. It tells the story of Lyuba, a baby wooly mammoth found in Siberia by two boys in 2007 that has revealed much new information on these extinct cousins of elephants. The true story of Lyuba leads to a thorough discussion of mammoths and mastodons, their habits and habitats. It also explains the various theories surrounding their extinction and provides a behind the scenes look at what paleontologists and archaeologists do and what they are discovering. Of special interest is the discussion of the human role in mammoth and mastodon extinction.

While written for children, Mammoths and Mastodons is a highly intelligent account of an important scientific mystery that parents will also enjoy. The book is superbly illustrated with drawings and photographs, and a glossary of terms is particularly helpful. It would be a wonderful addition to the library of any curious youngster.

—Mark Michel
Peoples of the Mississippi Valley

**When:** April 17–24, 2010  
**Where:** Tennessee, Arkansas, Mississippi, and Louisiana  
**How Much:** $1,595 per person ($285 single supplement)

Beginning in Memphis and following the Mississippi River south to Natchez, our week-long journey covers more than 5,000 years of history, taking you from ancient earthen mounds to Civil War battlefields. The trip offers an exciting opportunity to learn more about the rich and complex mound-builder cultures that flourished along the Mississippi River valley until the arrival of the Europeans.

While taking in the charms of the Old South, we’ll visit important sites, including Emerald Mound, the third largest Mississippian mound in the United States.

Yampa River Trip

**When:** May 23–30, 2010  
**Where:** Colorado and Utah  
**How Much:** $1,895 per person ($150 single supplement)

Join us for a down-river adventure through the spectacular scenery of Dinosaur National Monument, including Whirlpool Canyon, which was first described by the explorer John Wesley Powell. In addition to the beautiful scenery, this 70-mile journey down the Yampa and Green rivers offers an opportunity to visit remote archaeological sites, including Fremont culture rock art panels and prehistoric rock shelters.

Peru

**When:** July 9–23, 2010  
**Where:** Peru  
**How Much:** $4,995 per person ($1,188 single supplement)

From the golden tombs of the Moche on Peru’s coastal plain to the splendor of Cuzco and the magic of Machu Picchu high in the Andes, our tour promises to be an unforgettable adventure. John Henderson, an expert in the region’s archaeology, will join us.
Iroquoia: People of the Longhouse

**When:** September 10–16, 2010  
**Where:** New York  
**How Much:** $1,495 per person ($275 single supplement)

Join us as we travel across New York and explore the rich history and archaeology of the Iroquois. Accompanied by noted Iroquoian archaeologist William Engelbrecht, we’ll visit such fascinating places as the New York State Museum, the Iroquois Indian Museum, the Rochester Museum and Science Center, the Kateri Shrine, Fort Stanwix, Fort Niagara, Johnson Hall, Lamoka Lake, and Ganondagan. We’ll also spend a night at Niagara Falls and tour one of the Finger Lake region’s noted wineries.

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**Effigy Mounds of the Upper Midwest**

**When:** September 25–29, 2010  
**Where:** Wisconsin and Iowa  
**How Much:** $899 per person ($200 single supplement)

In what is now Wisconsin, prehistoric Native Americans constructed about 20,000 earthen mounds, a number unmatched by any other area of comparable size. We’ll visit the best surviving examples of these amazing constructions with an emphasis on the sites of the Effigy Mound Culture. Among the sites we’ll see are Lizard Mounds Park, Effigy Mounds National Monument, and Aztalan State Park.

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**Best of the Southwest**

**When:** September 18–28, 2010  
**Where:** New Mexico, Arizona, and Colorado  
**How Much:** $2,495 per person ($480 single supplement)

The Southwest is home to some of the best-preserved evidence of prehistoric civilizations in the New World. The magnificent ruins of Chaco Canyon and Mesa Verde are but two vivid reminders of the complex cultures that dominated the region between the 10th and 14th centuries. Our tour includes these two settlements as well as other prehistoric sites and modern pueblos.

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**Oaxaca**

**When:** October 29–November 8, 2010  
**Where:** Mexico  
**How Much:** $2,495 per person ($350 single supplement)

Join us in Oaxaca during one of the most unusual festivals anywhere—the Day of the Dead. On this day, people prepare home altars and cemeteries to welcome the dead, who are believed to return to enjoy the food and drink they indulged in while alive. The Day of the Dead is a time of celebration. You’ll have the opportunities to explore Oaxaca’s museums and markets. Our tour also explores the Mixtec and Zapotec archaeological sites in the region, including Mitla, Monte Albán, San José Mogote, and Dainzú.
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MAKE YOUR MARK IN TIME.
Some Conservancy members think the only way to help save archaeological sites is through membership dues. While dues are a constant lifeline, there are many ways you can support the Conservancy's work, both today and well into the future. And by supporting the Conservancy, you not only safeguard our past for your children and grandchildren, you also may save some money.

PLACE STOCK IN THE CONSERVANCY.
Evaluate your investments. Some members choose to make a difference by donating stock. Such gifts offer a charitable deduction for the full value instead of paying capital gains tax.

GIVE A CHARITABLE GIFT ANNUITY.
Depending on your circumstances, you may be able to make a gift of cash and securities today that lets you receive extensive tax benefits as well as an income for as long as you live.

LEAVE A LASTING LEGACY.
Many people consider protecting our cultural heritage by remembering the Conservancy in their will. While providing us with a dependable source of income, bequests may qualify you for an estate tax deduction.

Whatever kind of gift you give, you can be sure we'll use it to preserve places like Atkeson Pueblo and our other 390 sites across the United States.

Yes, I'm interested in making a planned-giving donation to The Archaeological Conservancy and saving money on my taxes. Please send more information on:

☐ Gifts of stock ☐ Bequests ☐ Charitable gift annuities

Name: __________________________________________
Street Address: __________________________________
City: __________________________ State: _____ Zip: __________
Phone: (______) ___________

The Archaeological Conservancy
Attn: Planned Giving
5301 Central Avenue NE
Suite 902
Albuquerque, NM 87108-1517
Or call:
(505) 266-1540