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COVER: Peter Fix (foreground) and Jim Bruseth reassemble the hull timbers of La Belle, the ship of the French explorer Robert Cavelier, Sieur de La Salle.

CREDIT: George Ramirez.

Explore more images of our feature articles online at www.archaeologicalconservancy.org
Watching The Ancient Skies

Watching the skies and keeping track of the calendar were important activities for the prehistoric peoples of the Americas, yet the methods they used are just now being understood by archaeologists and their astronomer colleagues. In this issue of American Archaeology we examine the latest research on early American astronomy. (See “Celestial Timekeeping,” page 32.) For the most part, figuring out the methods ancient people used to track the heavens is quite a challenge, as the evidence can be ambiguous and there is no written record of what they were viewing in the skies.

The Maya are an exception. They had elaborate observatories, like the Caracol at Chichén Itzá, in Mexico, and a written language. Only a few Maya books survive, but the Dresden Codex shows how they followed Venus over time. The written record is fragmentary and the observatories are in ruins, but together they show an extensive knowledge of astronomy.

In the United States the evidence is less obvious, but there are some clear indications that ancient Americans went to great lengths to observe the heavens. The best example so far is Woodhenge at Cahokia, near St. Louis. A large circle of standing poles was used to trace the movements of heavenly bodies, and probably tell time. Stains from these poles survived in the soil. At Chaco Canyon in New Mexico, it seems that sophisticated astronomy was imported from Mesoamerica.

Archaeologists are studying how these things worked, and preserving what remains is critical, as every little clue can be very important to figuring it out.

Mark Michel, President

Mark Michel

DOMESTIC

May 17–23
The Neolithic Revolution
The impact of agriculture

June 7–13
Trading Posts of the Southwest
American Indian art and artists

June 14–21
Utah’s Range Creek and San Rafael Swell
Fremont culture of the Green River

June 16–22
Summer Solstice
Archaeoastronomy in the Four Corners

August 7–13
Colorful Northern New Mexico
Archaeology, art, and Pueblo landscapes

September 13–19
Hopi Migrations
Oral tradition and archaeology

September 20–25
The Ancient Pueblo World
A journey through Chaco and Mesa Verde country

September 27–October 2
Chaco Meridian Revisited
A new look at the Chaco world

INTERNATIONAL

March 15–28
Olmec and Maya
Cultural crossroads in southern Mexico

May 29–June 16
Aegean Adventure
Sea kayaking Crete and Santorini

December 5–13
Pueblo-Maya Connections
Modern culture, ancient traditions in the Guatemala Highlands

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I was pleased to read the article “The Story Of Kennewick Man” (Winter 2014-15). As residents of the region where the remains were found, we watched this drama unfold, but until now had not heard the end of the story.

My wife and I attended a lecture by forensic anthropologist Jim Chatters where he talked about the process of rebuilding the facial features of Kennewick Man from a casting of the skull. It was obvious to all in attendance that he had created a bust of Star Trek’s Luc Picard, captain of the Enterprise. The appearance was certainly not that of the local Native Americans. He also said that he knew immediately that the skull was certainly not from of a Caucasian settler.

Chatters’ was recently involved in the study of more than 12,000-year-old Naia skeleton that was found in a flooded cave in Mexico. That study was able to get DNA results that confirmed a genetic lineage to current Native Americans. However, the skull features are not typical of Native Americans. More to come?

David Harris
Richland, Washington
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.

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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.

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You can also follow us on Facebook.
Museum of Natural and Cultural History
University of Oregon, Eugene—From a 19th-century working-class family in Portland to a Chinese mining community in Jacksonville, the new exhibit "Site Seeing: Snapshots of Historical Archaeology in Oregon" tells the fascinating stories of five historical sites recently excavated by museum archaeologists. (541) 346-3024, http://natural-history.uoregon.edu (Long-term exhibit)

Natural History Museum of Los Angeles County

University of Pennsylvania Museum of Archaeology and Anthropology
Philadelphia, Pa.—The new exhibition “Beneath the Surface: Life, Death, and Gold in Ancient Panama” invites visitors to dig deeper in search of a greater understanding of the Sitio Conte people who lived there from about A.D. 700 to 900. The exhibit’s centerpiece is a to-scale recreation of a massive chief’s burial discovered at the site, with many artifacts displayed as they were found. More than 200 objects provide an immersive experience, and video footage from the original excavation with digital interactive stations let visitors hear from a range of experts. (215) 898-4000, www.upenn.museum (Through November 1, 2015)
Brevard Museum of History & Natural Science
Cocoa, Fla.—Discovered in 1984, Windover Pond is a major archaeological site in Brevard County that preserves the remains of a 7,000-year-old burial ground for more than 200 Native Americans. Tools, complexly woven cloth made of plant fiber, and the brains of these ancient people were all found preserved in the pond, presented in the new exhibit “The Windover People: An Exhibition of Archaic Man.” A simulated dig enables visitors to become part of the exciting discovery, while numerous artifacts recovered from the site are on view, including split conch shells for dipping water, bone awls, weaving tools, a wooden mortar and pestle, shark teeth, and mussel shells used for scraping. (321) 632-1830, http://brevardmuseum.com (Long-term exhibit)

Museum of South Texas History
Edinburg, Tex.—The exhibit “Rio Grande Legacy” explores the region’s history through unique artifacts and state-of-the-art multimedia. Visitors encounter prehistoric fossils, ancient tools, Spanish Colonial treasure, battlefield relics, and artifacts from the region’s heydays as a steamboat route, and later as a cattle kingdom. Entering through a replica train station, visitors to River Crossroads learn about the arrival of railroads and irrigated agriculture, town-building, wars of the 20th century, and the booming post-war years. (956) 383-6911, www.mosothistory.org (Long-term exhibit)

❖ CONFERENCES, LECTURES & FESTIVALS

Arizona Archaeology Expo
March 7, Quartermaster Depot State Historic Park, Yuma, Ariz. This year’s expo features archaeology-related, hands-on activities, craft demonstrations, and other fun, educational events. Throughout the month of March, archaeological activities, exhibits, talks, and tours of local rock art and other sites will be offered across the state. Contact Kris Dobschuetz at (602) 542-7141, kd2@azstateparks.gov

Verde Valley Archaeology Center
Camp Verde, Ariz.—The new exhibit “Return of the Camp Verde Meteorite” will present the 135-pound meteorite found wrapped in a turkey feather blanket, buried in a Sinagua ruin near Camp Verde in 1915. On loan from Arizona State University’s Center for Meteorite Studies for six months, this is the first time the meteor will be on public display. (928) 567-0066, www.verdevalleyarchaeology.org (Through August 31, 2015)

Verde Valley Archaeology Fair
March 27-29, Camp Verde Community Center, Verde Valley, Ariz. This annual event offers archaeology exhibits, demonstrations, lectures, and films. The accompanying Invitational Native American Art Show will feature Louis Garcia, a Tiwa/Piro Pueblo weaver, who will give talks and demonstrations. (928) 567-0066, www.verdevalleyarchaeology.org

Southwest Indian Art Fair
March 28-29, Arizona State Museum, University of Arizona, Tucson. Southern Arizona’s premier Indian art show takes place on the museum’s front lawn. Two hundred native artists from around the region display works including pottery, katsina dolls, paintings, jewelry, baskets, rugs, blankets, and much more. The event also features music, dance performances, and traditional foods. (520) 621-6302, www.statemuseum.arizona.edu

Society for California Archaeology Archaeology Annual Meeting
March 12-15, Red Lion Hotel and the Holiday Inn Convention Center, Redding, Calif. The meeting features a variety of presentations, poster sessions, and workshops. There will also be an awards banquet and field trips to local sites. (530) 342-3537, www.scahome.org

Tulane Maya Symposium & Workshop
March 19-22, Middle American Research Institute, Tulane University, New Orleans La. This year’s symposium, titled “Royal Chambers Unsealed: Tombs of the Classic Maya,” explores the significance the Classic Maya placed on the death of their divine rulers and the meaning they invested in their funerary architecture, building decoration, grave goods, burial texts, and mortuary rituals. Some of the more recently discovered royal tombs will be showcased. (504) 865-3101, tms@tulane.edu, http://mari.tulane.edu/TMS

Caddo Conference
March 27-28, Arkadelphia, Ark. This conference brings together Caddo Indians, and people interested in Caddo language, history, and the archaeology of the area that is now Arkansas, Louisiana, Texas, and Oklahoma. Various papers and symposia will address these topics. A special Saturday afternoon session will explore Caddo culture, language studies, and dances. www.caddoconference.org

Society for American Archaeology 80th Annual Meeting
April 15-19, Hilton Union Square, San Francisco, Calif. A wide variety of presentations, symposia, poster sessions, a silent auction, CRM expo, and excursions to local sites will be offered at this year’s meeting. (202) 789-8200, www.saa.org
The recent analysis of a stone vessel found some 50 years ago offers further evidence that the Norse, who are often referred to as Vikings, visited the New World centuries before Columbus. Archaeologist Patricia Sutherland and her colleagues recently published a paper in the journal *Geoarchaeology* detailing the results of their study that confirmed a vessel found at the Nanook site on Baffin Island in northern Canada was used as a crucible for melting bronze.

Moreau Maxwell of Michigan State University recovered the vessel in the 1960s, and identified it as a broken pot that belonged to an artifact assemblage related to the indigenous Dorset culture. Recent analysis of the vessel’s interior determined it to contain bronze remnants and tiny glass spherules that form when rock is heated to very high temperatures.

Research at Nanook and other Dorset sites in the eastern Canadian Arctic is providing new information about the presence of Europeans in the New World sometime around A.D. 1000. Until recently it was assumed that the Norse made only short, occasional trips to the New World from their colonies in Greenland. In the past Norse artifacts have also been found in the remains of Inuit settlements.

“The evidence from this site on Baffin Island, along with that from other locations in the Canadian Arctic, is supporting the view that the Norse travelled the northern coasts of Canada more extensively than previously thought and over a longer period of time,” says Sutherland, an adjunct professor at Memorial University of Newfoundland and Research Fellow at the University of Aberdeen in Scotland. “They may have spent significant amounts of time ashore while engaged in the exploitation of local resources, and this time would have involved various types of interaction with the local indigenous populations of the region.”

Sutherland and her colleagues have been investigating sites on Baffin Island since 2000 as part of the Helluland Archaeological Project, which focuses on the presence of early Europeans in Arctic Canada and their interaction with the indigenous peoples.

The analysis of the crucible “adds an intriguing new element to this emerging chapter in the early history of northern Canada,” Sutherland says, “and it may also represent the earliest evidence of high-temperature non-ferrous metalworking in the New World north of Mesoamerica.” —*Tamara Stewart*
Archaeologists at Valley Forge National Park in Pennsylvania have unearthed details of how George Washington blended his personal life with his military career during the winter of 1777-78, when the Continental Army retreated to a rural location near the Schuylkill River after suffering several defeats at the hands of the British. The findings were presented in January by former National Park Service (NPS) archaeologist Joseph Blondino at the Society for Historical Archaeology Conference in Seattle, Washington.

During excavations conducted between 2009 and 2011, NPS archaeologists and volunteers unearthed two trash pits and evidence of a log cabin dining hall built next to the extant Isaac Potts house, which served as Washington’s headquarters. Previously, the only clue that a cabin had been built was a reference in a letter that Martha Washington wrote to a friend in March, 1778.

Archaeologists also discovered a 25-foot-long and one-foot-wide shallow trench parallel to the Potts house that may be part of the cabin’s foundation. In addition they unearthed a linear stain one foot away from, and parallel to, the trench that may have been created by water dripping from the cabin’s roof.

Blondino, who is now with Dovetail Cultural Resource Group in Fredericksburg, Virginia, says the trash pits were also unearthed near the headquarters and appear to have been in use only during the six months that Washington and his troops were camped at Valley Forge. Artifacts in the pits included broken redwares, creamware, white salt-glazed stoneware and a nearly complete Chinese porcelain teapot.

“The ceramics were expensive, the kind he would have had in his home, not at a military site,” he says.

“Washington seems to have been trying to live life with some degree of normalcy by having nice things at the encampment.” Blondino speculates that Washington had the china shipped there, or that Martha brought it with her when she joined her husband at Valley Forge in February, 1978.

Faunal remains in the pits indicate that Washington ate a lot of pork, unlike his soldiers who ate mostly beef. The Valley Forge encampment included about 2,000 huts, most of which housed about 12 men.

The relative scarcity of broken tobacco pipes in the pits and around the Potts house suggests that Washington may have instituted a no-smoking zone at his headquarters. Blondino notes that tobacco pipes are usually ubiquitous at late-18th century dig sites. “It’s reasonable to assume that there was no smoking on duty,” he says. —Paula Neely
Archaeologists recently discovered the ruins of a water temple complex in Cara Blanca where pilgrims left offerings to beseech Chaak, the Maya water god, to send rain to the drought-stricken area. It’s one of the few substantial Maya shrines in an isolated area in central Belize that has been identified and studied, according to University of Illinois archaeologist Lisa Lucero, who directed the excavation. The closest city was Yalbac, approximately five miles away.

Based on the archaeological evidence, Lucero says an increasing number of pilgrims visited Cara Blanca between A.D. 800 and 900, a time when the Maya experienced at least eight multi-year droughts. During the past four years, archaeologists identified and excavated the buried ruins of the vaulted temple.

Materials related to water, including rocks and fossils dredged from the pool, were incorporated in the building. Lucero says the three-feet-thick walls were filled with tuff stone, which is created underwater. In a typical Maya structure, the walls are filled with trash. Stone tools and broken pieces of pots and bowls, mostly large water vessels, were discovered on the temple floor and in an adjacent pool. Some of the ceramics were painted with wavy lines and spirals that represent flowing water. One was painted with a jaguar, which is associated with water and caves in Maya mythology. Lucero says it appears that people came to the shrine from several hundred miles away. Their offerings increased over time as the drought worsened. “It was a special, sacred place,” she says. The temple pool is one of 25 bodies of water located at the base of limestone cliffs. The Maya thought openings in the earth, such as caves, pools and crevices were portals to the underworld where they could communicate with ancestors and deities. Water from these portals was considered sacred.

Visitors probably cast their offerings into the pool and collected sacred water for ceremonies. About 200 bone fragments, some of which were burned, suggest that the visitors may have sacrificed birds and mammals at the temple and then feasted on them.

After A.D. 900, the temple was destroyed and the site was burned. Lucero thinks priests may have closed it down after it was no longer viable. The discoveries show how the Maya responded in times of stress. “They spent a lot of energy building the temple and intensified their ritual activity,” she says. She thinks it serves as a lesson for how we deal with climate change today—that relying on traditional means rather than changing our course of action can be detrimental.

—Paula Neely

This aerial picture of the water temple was taken by a camera attached to a drone.
Coral artifacts discovered at indigenous temple sites on Maui have provided new evidence about when the temples were built and corroborate oral histories about the political evolution of the Hawaiian island. The research, which was led by archaeologist Patrick Kirch of the University of California, Berkeley, was recently published in the *Journal of Archaeological Science.*

Uranium-thorium dating of coral that was discovered on altar surfaces and incorporated within the walls of the temples revealed a major period of temple construction from A.D. 1550 to 1700. The research team dated 46 coral samples from 26 temple sites that they investigated in southeastern Maui. Half of the samples came from walls and half were from altars. Both produced nearly identical sets of dates.

Kirch says the new evidence shows a pulse of temple construction that began about the time of King Pi'ilani's reign and continued under his successors, Kiha-a-Pi'ilani and Kamalalawalu. The discoveries demonstrate the importance of monumental construction during the rise of large, complex political kingdoms and validate oral traditions that these rulers consolidated several previously independent chiefdoms on the island under one ruler.

The Hawaiian kings were considered divine rulers, according to Kirch. They built temple systems and used priests to control agricultural production and collect tributes in the name of their gods from each chiefdom to reinforce their authority.

Hawaiian tradition suggests that the use of coral may be associated with Kane, the god of irrigated agriculture, or Lono, the god of dryland agriculture.

The researchers were able to use uranium-thorium dating because they knew the coral discovered at the temples had been gathered while it was alive since the verrucae, the lumpy growth mounds on the branches, were still intact. Uranium-thorium dating is “10 times better than radiocarbon dating,” Kirch says. The technique derives a date by gauging the decay of uranium, which corals absorb from seawater, into thorium. It’s considerably more precise than radiocarbon dating due to its lower error range.

Previous studies of the temples using radiocarbon dating indicated they were constructed earlier and over a longer period of time. The new study provides more precise dates and narrows the time period of temple construction. After missionaries arrived in the 1820s, they convinced the king to destroy the temples. Consequently all that remain are the stone ruins.

— Paula Neely

*Geochronologist Warren Sharp documents coral offerings at a Maui temple site.*
Archaeologists excavating the Old Vero Man site in Vero Beach, Florida, have uncovered evidence proving that humans lived with Ice Age megafauna in this region roughly 14,000 years ago. The evidence corroborates the controversial findings of Florida state geologist Elias Sellards, who investigated the site more than 100 years ago.

The archaeologists, who were led by James Adovasio of the Mercyhurst Archaeological Institute, recovered stone artifacts and human-modified and burned Ice Age animal bones in sediment layers that were radiocarbon dated to as early as 14,000 years ago. More than 170 species of plants and animals have been identified.

Sellards first investigated the site in the early 1900s, and after 1915 he concluded that humans co-existed with Ice Age megafauna. Sellard's conclusion was met with considerable skepticism. And though he recovered the remains of mastodons, saber tooth cats, ground sloths, and mammoths, as well as a human skull and other bones, these items were sent to various institutions and some were eventually lost.

Adovasio and his colleagues returned to the Old Vero Man site at the behest of a local group known as the Old Vero Ice Age Sites Committee (OVIASC). Realizing that the construction of a water treatment plant and other nearby development could threaten the site, OVIASC asked Mercyhurst to investigate it. OVIASC has funded two-thirds of the project, and Mercyhurst has provided the rest of the money. “If it weren’t for them, we wouldn’t be out there,” says Adovasio.

“Because of all the geological concerns raised in the early work undertaken there, nearly all we did last year was to reconstruct the stage on which Paleo people acted out their lives,” he says. “We’re not sure what Paleo-Indian lifestyles along coastal environments were like—back then Vero Beach would’ve been close to the sea. We want to know how they were handling the rapidly changing climate at the end of the Ice Age. The idea of them as focused, big-game hunters is crumbling at Paleo sites across North America. There was a great diversity of lifestyles and technologies brought with pulses of colonization into the New World.”

The project is scheduled to continue into May of this year. The researchers intend to excavate near the concentration of burned animal bones they discovered in 2014. Working with scientists from Florida Atlantic University, they will also conduct genetic analysis of the animal bones.

—Tamara Stewart
In the spring of 1684, a team labored to assemble a ship in the port town of Rochefort in southwest France. They fastened timbers using iron bolts and wooden pegs and raised three masts over the single deck. That summer the vessel, christened La Belle, set sail with Robert Cavelier, Sieur de La Salle, who was on a quest to establish a French colony at the mouth of the Mississippi River.

More than 300 years later, a team is again laboring to assemble La Belle, this time in a museum in Austin, Texas. Archaeologists and conservators are carefully hoisting the vessel’s original timbers, resting them on carbon fiber and fiberglass supports, and securing them with fiberglass bolts. Not only are the materials different; this time the team has an audience. A class from Highland Park Elementary School in Austin peers at the ship and the timbers arranged on the floor.

“How do you know how these pieces go together?” asks one boy. “I spent 18 years looking at them,” says Peter Fix, La Belle conservator and head of reconstruction. “So I can tell you where each piece goes by looking at it.” “I’ve never seen anything this old,” says another boy with awe in his voice.

La Belle spent only a few years afloat after it launched from In 1995 archaeologists recovered part of La Salle’s ship La Belle off Texas’ Gulf Coast. So began a remarkable project to preserve, reconstruct, and display the 17th-century vessel.

By Elizabeth Lunday

La Belle emerges from a concrete vat containing polyethylene glycol, a liquid used to preserve the hull timbers.
Rochefort. The story of its journey to America and subsequent sinking is an example of what could go wrong in the New World. The story of its discovery, conservation, and reconstruction is an account of what can go right when archaeologists find creative solutions to perplexing conservation challenges. La Salle first arrived in New France—part of today’s Canada—in 1666. His triumph as an explorer came in 1682 when he sailed the length of the Mississippi from the Great Lakes to the Gulf of Mexico and claimed all of the land adjacent to the river and its subsidiaries for France. He returned home to convince King Louis XIV to sponsor a colony on the Gulf that could control trade heading north and south on the river as well as serve as a base for a proposed French invasion of Spanish-controlled Mexico.

La Salle’s fleet sailed from France on July 24, 1684, and the expedition was plagued with problems, including Spanish privateers, bad weather, and La Salle’s notorious bad temper. But the biggest of those problems was that, even though he had sailed it two years earlier, he didn’t know the location of the Mississippi. La Salle knew the latitude of the mouth of the river, but accurate longitude measurements were impossible to calculate until the late 1700s; consequently he was...
uncertain how far west he needed to travel. Furthermore, his map of the region mistakenly showed the Mississippi flowing into the Gulf near the mouth of another great river, the Rio Grande. So, not surprisingly, La Salle overshot the Mississippi by some 400 miles.

In January 1685, the explorer decided to land the colonists at what he assumed was the mouth of a wide river—actually Matagorda Bay, an estuary about halfway between today’s Galveston and Corpus Christi. One of his three ships returned to France as planned; another, l’Aimable, ran aground entering the bay and was lost. Only La Belle remained. La Salle established a settlement named Fort St. Louis and began hunting for the Mississippi on foot.

In February 1686, La Belle was caught in a storm and ran aground. La Salle realized the colony, its numbers depleted by disease and attacks by natives, wouldn’t survive without help from New France—more than 1,700 miles away. He and 16 men began walking northeast in January 1687, but near today’s Navasota, Texas, the men snapped under the pressures of hunger and La Salle’s temper. They shot him and left his body for the wolves. Two years later, the remaining colonists at Fort St. Louis were killed or captured by members of the local Karankawa tribe. In Matagorda Bay, the hull of La Belle settled deep into mud while the deck and the degraded masts were torn away by wind and waves. By 1689 nothing remained to mark the location of the ship.

For many years, archaeologists had only a vague idea of the locations of La Salle’s colony and ship, but by examining artifacts and studying historic maps they established the general whereabouts of Fort St. Louis and La Belle by the 1970s. The Texas Historical Commission (THC) launched an expedition to find the ship in 1995. After a detailed magnetometer survey of Matagorda Bay, divers probed the seafloor where anomalies were found.

Although that section of the bay was only 12-feet deep, the churning, silty waters made diving incredibly challenging. “It was zero visibility,” says Jim Bruseth, guest curator at the Bullock Museum of Texas History and the director of La Belle’s excavation for the THC. “But the first diver that went down was going along the bottom by feel, and he felt the shape of a cannon.” When lifted to the surface some days later, the cannon’s French inscription proved that the team had discovered La Belle.

The question became how to excavate in such poor visibility. Underwater excavation in so-called “black water” is possible, but it’s slow and difficult. Archaeologists hit on an alternative known from bridge and oil-platform construction that’s been used sparingly in shipwreck archaeology: a cofferdam. A cofferdam is a temporary enclosure in a body of water that allows work to proceed in a dry environment.
This bronze cannon with French inscription proved the team had found La Belle.

The benefits were obvious—archaeologists could excavate using the same techniques as on land. The challenges were equally obvious—a cofferdam would be very expensive, and, though the technique had been used a few times in the United States and Europe, none of those projects had been as complex as *La Belle*.

But the $2 million, 178-foot long and 131-foot wide cofferdam turned out to be a huge success, allowing archaeologists to recover even the smallest, most fragile artifacts. Excavators found the contents of *La Belle* had been remarkably well preserved. Mud and sand had settled deep around the vessel. In this oxygen-free environment, the ship and its cargo were safe from the shipworms and bacteria that typically destroy organic materials. Scientists found *La Belle*’s boxes and casks with their contents intact just as they had been packed by La Salle three centuries before.

More than one-third of the hull also remained intact. Archaeologists dismantled the ship timber by timber, labeling each piece of wood with bright orange cattle ear tags, chosen because they were durable and easy to read. Timbers were placed in plastic-lined wooden vats filled with seawater, and then shipped to Texas A&M’s Conservation Research Laboratory. When they came out of the water, the appearance of *La Belle*’s wooden timbers had hardly changed in 300 years, but their long submersion had altered their chemical and cellular structures. “The problem with waterlogged wood is that...
the structure of the cells is being held together by water,” Bruseth says. “Evaporate the water and it will start collapsing.”

Conservation requires replacing the water with another substance that is stable in open air. Polyethylene glycol (PEG) has long been the chemical of choice. The waxy substance, which is made from oil, is often used in cosmetic or pharmaceutical ointments, and it’s also the base for most laxatives. For archaeological conservation, PEG is reliable and widely available, and in the early 2000s it was cheap.

An enormous concrete vat, 60-feet long, 20-feet wide, and 12-feet deep, was constructed, and in 2003 conservators began soaking the hull in PEG. The process took time; after several years in a bath of low-molecular-weight PEG, conservators planned to switch to a high-molecular-weight PEG to remove the last of the water and increase the strength of the timbers. However, when oil prices began to soar around 2008, PEG was no longer cheap. “We had budgeted 50 cents a pound,” says Fix, “and we received quotes from $1.85 to $2.10 a pound. We were looking at spending almost $1.5 million on polyethylene glycol.”

They turned to a solution usually associated with instant coffee. They would freeze-dry the wood. The process involves quickly freezing artifacts, then surrounding them with a vacuum. The water in the wood sublimates—that is, it turns straight from ice into vapor without going through a liquid stage that could damage the wood’s structure. Freeze-drying removed the remaining water from La Belle’s timbers, and the equipment cost about a third less than the PEG.

The timbers are now stable, but they remain so light and fragile they can’t support their own weight, let alone the weight of other parts of the ship. Fix and the archaeological team sought a solution for displaying La Belle that would protect the timbers and give visitors the best possible view of the vessel. One option would have been to construct a steel support cage, but then the underside of the ship would have been “a forest of steel,” he says.

Instead, Fix designed what he calls an endoskeleton—an internal structure of thin but strong supports. For example, the frames of the ship, timbers that curve up and outward from the keel, sit upon fiberglass and carbon fiber platforms, each molded to fit every curve of the timber it supports. When the outer hull planking is attached, museum visitors won’t be able to tell that the endoskeleton is there.

The endoskeleton is one of several innovations, including the cofferdam and the freeze-drying process, employed in the conservation of La Belle. While some of these methods
had been tried before, they were used on an unprecedented scale on this project. That’s allowed the team to “add to the corpus of knowledge” of conservation techniques, Fix says.

At the same time, the discovery of *La Belle* brought new attention to the role of France in the history of the Southwestern United States. La Salle’s expedition failed, but this failure changed history. “The presence of the ship, the presence of La Salle, woke up Spain,” says Bruseth. “They realized if they were going to hold on to this part of the New World, they had to get people up there. La Salle’s presence started the settlement of Texas by Spain, and that ultimately resulted in the Spanish heritage we have today.”

*La Belle*’s new home, the Bullock State History Museum in Austin, owes its creation in part to the discovery of the ship. “Our lieutenant governor at the time, Bob Bullock, said we need a grand Texas history museum to house *La Belle* and tell the story of Texas,” says Bruseth. The museum opened in 2001.

A large exhibition now showcases the reconstruction of *La Belle*. Bruseth believes it’s one of the few times anywhere in the world that a ship has been reassembled as part of a live exhibit. A steady stream of visitors walks by, and Fix and Bruseth often pause to discuss their progress and answer questions. Inquiries range from, “Why did they have such funny looking forks?” to “Why does it smell so bad?” (It’s the PEG.)

Reconstruction of *La Belle*’s hull will conclude on May 17 of this year. On August 8, an exhibit of the hull and select artifacts will open in a different part of the museum. At that time the rest of the ship will be reconstructed—though not with original parts—a project that’s expected to be completed some time in 2016.

That moment will mark a milestone not only in the history of *La Belle* but also in the lives of Bruseth and Fix. Bruseth has been working on the ship for 20 years; Fix for 18. Neither could have anticipated in the mid-1990s that *La Belle* would so dominate their lives. “I had no idea it was going to take me on this incredible odyssey,” says Bruseth.

The many years devoted to conserving *La Belle* don’t seem to bother Fix—they were what the ship needed. “A conservator is primarily an advocate for the artifact, and the artifact dictates the amount of time,” he says.

As Fix and Bruseth returned to securing timbers, a busload of elementary school students ate sack lunches in the courtyard outside the Bullock Museum. According to their teachers, they loved seeing *La Belle* under construction. “We’ve already had our explorer unit at school, so they’re familiar with La Salle,” says Natasha Morgan, a fourth grade teacher at Harmony School of Innovation in Austin. “It was cool to bring that history to life.”
FROM ATLATLS TO ARROWS

By Mike Toner

Ancient Americans once used a spear-thrower known as an atlatl for hunting and combat. But then a more effective weapon, the bow and arrow, was introduced, and its acceptance had tremendous consequences.
For thousands of years, North America’s ancient people relied on an ingenious spear-throwing device called the atlatl to hunt game and wage war. Then they discovered, and eventually embraced, a new technology: the bow and arrow. “The introduction of the bow had profound implications for population aggregation and density, subsistence and settlement strategies, as well as an impact on trade and warfare,” says University of Missouri archaeologist Todd Vanpool.

The timing of the bow and arrow’s introduction and its replacement of the atlatl varied from region to region. Although some experts believe that early versions of the bow, which is often called the self bow, were used in the Arctic as much as 12,000 years ago, the preponderance of archaeological evidence suggests that this technology didn’t reach much of North America until roughly 1,600 years ago.

Bows were made of wood and sinew. The strings were animal gut or plant fibers. Arrow shafts were wood and feathers. The atlatl was wooden too—from its spear shaft, or dart, to the socketed stick used to hurl the spear. As a result, except for a few sites with exceptional preservation—dry caves, bogs, and ice patches where organic materials are well preserved—evidence of the transition from atlatls to bows and arrows is largely writ in the stone and bone points that have survived.

“In the absence of organic bow or arrow remains, adoption of the bow can only be tracked by the reduction in point size that we see in the archaeological record,” says University of Alabama archaeologist John Blitz. Atlatls were heavier weapons and generally had bigger, heavier stone or bone points. Because arrows weighed less than atlatl darts, they had to have smaller, lighter points to assure accuracy.

According to Blitz, most points are counted as arrowheads if they are less than one-fifth of an inch thick and have a base that is less than four-fifths of an inch in width. But both systems were constantly being refined by their users. As a result, the distinction between smaller atlatl points from later periods and the larger arrowheads that marked early bow and arrow technology is not always clear. Arrows and atlatl dart points were both roughly triangular in shape, and both were bi-faced and hafted. Deciding whether a stone point was used on an atlatl shaft or an arrow often hinges on subtle variations in design and measurements. These ambiguities account for the differing opinions among archaeologists as to when the transition occurred.

The earliest recorded use of the bow and arrow was in southwest Alaska, where archaeologist Robert Ackerman of Washington State University found small bone points with slots for lithic blades that were radiocarbon dated to around 10,000 B.C. Other researchers have found small bone points and micro-blades—which served as the barbs on arrows—that suggest bows and arrows were used in Alaska no later than 7,000 B.C. (Some...
archaeologists disagree with the interpretation of this evidence, arguing that the bow and arrow didn’t appear in this region until roughly 2500 B.C.

Idaho State University archaeologist Herbert Maschner says large temporal gaps in the archaeological record of arrow-like points suggest that the popularity of the bow came and went in four distinct waves in northern North America. The first wave started around 12,000 years ago and ended about 4,000 years later, perhaps because early forms of the bow proved ineffective in hunting the larger land mammals like the bison and moose that had spread into this area. “Early on it really wasn’t that great a technology,” says Maschner.

During the second wave, which began about 4,500 years ago, the bow appears to have been used alongside the atlatl, but the latter seemed to be more useful in hunting sea mammals, which at that time became the dominant form of prey. In fact, there’s no evidence that the bow and arrow was used in Alaska between 3,600 and 2,400 years ago.

The third wave, which began around 400 B.C., was marked by long, thin, narrow points that appear on the Alaska Peninsula and seem to have been designed for combat rather than hunting. Then, roughly 1,100 years ago, the recurved bow was introduced, and so began the fourth wave. The recurved bow was wrapped in sinew for additional strength, with tips that curved away from the user. The result was a smaller, more versatile weapon that could shoot arrows faster and farther than its predecessor, the self bow.

But even then, the atlatl did not entirely disappear from the region. In coastal areas, where the hunting of sea mammals favored weapons that could be launched from a kayak with one arm, hunters relied on the spear thrower well into historic times. Russian fur traders reported hunters using atlatls in the Aleutian Islands in the A.D. 1700s.

Most experts believe that the bow and arrow didn’t appear in other areas of North America until considerably later, though how much later is a subject of debate. Portland State University archaeologist Kenneth Ames thinks the self bow was in use by 5000 B.C. on the Columbia Plateau, the Great Basin, and the Lower Snake River region of the Western United States. He says the stone points that support his contention are often “lumpy and oddly shaped, not at all like the elegant well-made points that came along later.” Although he believes that such artifacts are too small to have been used on atlatl darts, he concedes that his view “differs markedly from the generally accepted picture.”

Early arrows, if in fact they were tipped with such crude
points, may have been too ineffective to replace the atlatl. But that gradually changed. “After 1000 A.D. the bow and arrow almost completely replaced the atlatl,” says Ames.

Blitz, based on his analysis of the projectile points from 33 archaeological sites in Alabama and Mississippi, believes that the self bow was in use there by about A.D. 400. Other evidence suggests this was the time when it was introduced into most of what is now the United States, he says. If small obsidian and chert points found at the Maya site of Aguateca in Guatemala are arrow points, the bow was in use in Mesoamerica as early as A.D. 800.

But Mesoamerica’s acceptance of the bow didn’t result in its abandonment of the atlatl. When Cortez arrived in Mexico in 1519, where the atlatl was a traditional symbol of status and power, he initially received gifts of the weapon decorated with turquoise and carved icons. Later, the conquistadores were on the receiving end of barbed atlatl darts thrown by hostile Aztec warriors.

Rarely is the evidence so unambiguous as it is in the southern Yukon, where perennial ice patches, now shrinking because of changes in the climate, are yielding a bonanza of artifacts including pieces of atlatl darts and whole arrow shafts that are notched, feathered, and wrapped with sinew. These items, which can be directly dated, have been preserved in the ice since they were left there by prehistoric hunters more than 1,200 years ago.
“It’s an almost perfect situation for dating the introduction of the bow and arrow” in the Yukon, says archaeologist Gregory Hare, of Yukon’s Department of Tourism and Culture. Hare leads a team of archaeologists and First Nations representatives who have surveyed more than two dozen ice patch sites. “Throwing dart technology persisted until about 750 a.d., when it was abruptly replaced by the bow and arrow. We don’t see bows and arrows before then. We don’t see atlatls after that. The transition was very quick.”

Regardless of when the bow and arrow appeared, once it did, its effects were undeniable. “With the bow and arrow an individual no longer needed to work with another hunter or a hunting team and settle for a small part of the kill,” says archaeologist Bill Angelbeck, of Douglas College in British Columbia. In an analysis of faunal remains from more than 40 prehistoric sites around the Salish Sea, the maze of coastal waterways in southwestern British Colombia and northwestern Washington, Angelbeck found a shift away from communally hunted game such as sea lions and fish to deer, elk, and smaller game, all of which could be hunted by individuals equipped with bows and arrows. This data suggests that small bands of people sustained themselves without relying on the large hunting expeditions organized by ruling elites.

But Angelbeck says for coastal Salish cultures, the new technology came with a Faustian bargain. The rise of small independent groups and the decline of social elites brought conflict. Effective in hunting, the bow and arrow also proved to be lethal in warfare. “We can see a change in their settlement patterns,” says Angelbeck. “After the introduction of the bow and arrow, people occupied headlands that were more defensible, and we see trenched and fortified sites—refuges that were occupied for short periods.”

The net result, he says, was that as hunters became more independent economically, they were also forced to rely on larger groups for defense. “All technological change is a Faustian bargain,” he says. “For every advantage a new technology offers, there is always a corresponding disadvantage.”

“The bow more than doubled, likely tripled, the success of individuals bent on killing animal or human targets,”

Archaeologists determined when the bow and arrow was introduced in the Eastern U.S. by examining the sizes of projectile points. The two largest and oldest of these projectile points are thought to be atlatl darts. The middle point, an arrow, dates to about a.d. 400 and marks the introduction of the bow to this area. It was later replaced by the smaller arrow points to its right.
says University of California, Davis, archaeologist Robert Bettinger. Comparing it to Samuel Colt’s revolver, he calls it a “great equalizer” that changed how people hunted and fought. The bow brought about individuality and independence for people in California and the Great Basin. Its use coincided with, and probably triggered, the dispersal of people into family-level groups. “Large scale communal hunting predictably declined. Hunting by individuals intensified,” he says. To supplement hunting, smaller groups increased their gathering and harvesting of plant foods, but the competition between these groups often resulted in violence.

When the bow and arrow came to the Ohio Valley sometime around A.D. 400, “the local Hopewell culture, in which far-flung communities met periodically at ceremonial centers, collapsed because the increased efficiency of the bow meant that large-scale game drives were no longer required,” Blitz says. “With one of the major reasons for gathering lost, the culture disappeared.”

But as households dispersed, they occupied more and more land. Food production increased, as did population, competition, and warfare. And that, Blitz believes, drove the small bands of people left in the wake of the Hopewell’s demise to cluster together in order to defend themselves against threats from other groups, a characteristic that eventually evolved into the highly fortified palisaded communities that were a hallmark of later Mississippian cultures.

The recurved bow was a huge improvement that greatly increased the weapon’s lethality and, consequently, its appeal. If the self bow was a Colt revolver, the recurved bow, according to Maschner, was no less than an AK 47 assault rifle. “No (prehistoric) technology that we are aware of has ever spread so fast. It generally spread from north to south, but in a fairly short period of time it basically took over all of North America,” he says. “By 700 years ago, this new technology resulted in the rise and success of the bison-hunting peoples of the Plains, and had fully transformed every society in North America.”

The recurved bow was just one component of what Maschner refers to as the Asian War Complex. (The bow and arrow was used in Asia before it was brought to North America.) Evidence of this complex, which also included armor, wrist guards,
and shields, first appeared in Alaska some 1,100 years ago. These are weapons of war, and as a result “all over the Northwest Coast people start building palisaded fortifications,” Maschner says. “By 1,000-200 years ago, there is extensive evidence of conflict from the Bering Sea to arctic Alaska and across Canada to Greenland,” he and coauthor Owen K. Mason wrote in the journal *Evolutionary Anthropology* in 2013.

The recurved bow is thought to have spread into the Southwest by roughly a.d. 1200, perhaps earlier. The self bow was but one of a variety of weapons, such as clubs, axes, and even rocks, that were used in Southwestern warfare. “After 1250 a.d. the northern Southwest became enmeshed in brutal, sustained warfare that often led to the destruction of entire villages,” says Vanpool. “During this time, the recurved bow likely became the dominant weapon system. The intensely lethal warfare made possible at least in part by the bow and arrow eventually led to large population migrations. And a pattern remained and intensified through the historic period.”

By the 1200s, Anasazi populations moved from their exposed villages on high mesas to the highly defensible cliff houses at Mesa Verde. The peaceable Hohokam people built walled village compounds. Their neighbors erected a 25-mile-long line of defensive lookout communities, presumably to keep an eye on the Hohokam. By 1400, Casas Grandes (also called Paquimé), the fortified city in northwest Mexico where some of the Anasazi were thought to have migrated, had been violently overrun, burned, and abandoned. Arrow points embedded in skeletal remains from across the region attest that the bow played at least some role in all of these changes.

“There was clearly an increase in warfare after the introduction of the bow and arrow,” says Ames. “To say that the recurved bow and arrow caused it would be like saying the machine gun caused World War I. It didn’t. But it clearly made the conflict worse.”
Searching For The Origins Of Pueblo Culture

Archaeologists Steve Copeland and Caitlin Sommer document features on the floor of the great kiva.
An investigation of the Dillard site in southwest Colorado is revealing evidence of early characteristics that came to define Pueblo society.

By Tamara Stewart

DIRT FLIES as archaeologists Caitlin Sommer and Steve Copeland, along with many volunteers, search for the hearth in the Dillard site’s great kiva. Since 2011, researchers with Crow Canyon Archaeological Center have been investigating Dillard and other associated pit structures that formed part of an ancient community near Cortez, in southwest Colorado. The investigation is part of Crow Canyon’s Basketmaker Communities Project, which focuses on early Pueblo society in the Mesa Verde region. Preliminary evidence suggested that Dillard could be among the earliest complex sites in the central Mesa Verde region. It dates to what is known as the Basketmaker III period (ca. A.D. 500 to 750), a time when people first began making pottery and transitioning to a dryland agricultural lifestyle.
Crow Canyon archaeologists are trying to understand the origins of Pueblo culture. “Very few Basketmaker III settlements have been studied on the community scale, which is one reason we initiated the Basketmaker Communities Project,” says archaeologist Shanna Diederichs, who is supervising the excavation. “The Dillard site inhabitants are part of a diaspora of Basketmaker III people into open farming territories across the Colorado Plateau in the seventh century a.d. Where people are migrating from is one of Crow Canyon’s primary research questions.”

Pueblo culture appears to have taken shape around the time of the area’s Neolithic Revolution, which marked the shift from hunting and gathering to agriculture, bringing about major changes in subsistence and social organization. This transition occurred over a 2,000-year period and it featured such technological advances as the creation and use of pottery for cooking and storing foods, and the adoption of the bow and arrow for hunting and defense.

In the early centuries A.D., there is evidence for the interaction of immigrant Western Basketmaker farming groups from the south, who were drawn to the region’s fertile soils, with local Colorado Plateau foragers known as Eastern Basketmakers. Around A.D. 600 this growing, multi-ethnic population began expanding into upland areas suitable for dryland farming. It was right around this time that the community, with its great kiva and associated pit structures—the archaeologists have found roughly 100 of them—was first established.
“The Dillard site provides an unadulterated glimpse of an early Pueblo homesteading population held together by new social institutions associated with agriculture,” Diederichs says. “Throughout history, wherever people decided to become farmers, they had to deal with the consequences—some good, like being able to grow surplus food, others more challenging, like having to cope with increasing population. The Dillard site helps us understand the commitments and compromises our cultures made when they became dependent on farming.”

NAMED AFTER landowner and long-time Crow Canyon volunteer Jane Dillard, the site is located within Indian Camp Ranch, a private, residential community with a high density of archaeological sites that have been protected by individual landowners. Woods Canyon Archaeological Consultants first recorded the Dillard site in 1991 during a survey of the area prior to development. Three years later they dug a test trench that revealed a Basketmaker III-period great kiva, a large social-ceremonial space that was used by the area’s surrounding residents for periodic gatherings. The kiva is the earliest known in the central Mesa Verde region.

“Understanding the Dillard site has been very challenging—every structure there is different, and since the site had been partially disturbed in modern times, most pithouse depressions are no longer visible on the surface,” explains Susan Ryan, director of archaeology at Crow Canyon. “*Time Team America* came and worked with us for three days in 2012, providing geophysical imaging technology that really helped us understand the site.”

*Time Team America* is an American adaptation of the British television series *Time Team* that airs on PBS, in which a group of archaeologists and other experts are given 72 hours to excavate an archaeological site, usually bringing resources—in this case sophisticated remote-sensing technologies—with them. The show’s researchers were enlisted to help Crow Canyon’s archaeologists determine Dillard’s size, learn how it was organized, and how it fit into the broader landscape.

*Time Team America’s* researchers conducted a geophysical survey of the site using various types of remote sensing. They identified a variety of anomalies that they ground-truthed by augering and excavation, revealing eight pit structures north of the great kiva, a number that mirrored the density of structures to the south.

The geophysical survey gave Crow Canyon’s archaeologists a clearer picture of the ancient community’s size and layout, showing that, in addition to the residential pit structures, the great kiva was surrounded by storage and work areas, trash middens, and other features. There was also a fence or stockade encircling some of the pit structures. Radiocarbon and archaeomagnetic dating indicate the site was occupied in the a.d. 600s.
CROW CANYON archaeologists subsequently excavated slightly less than half of the great kiva, and they also did limited excavations at a number of the associated pithouses. They found that most of the pithouses have antechambers and a sipapu feature (a ritual feature connecting this world to the underworld) in the floor, but others have only one chamber and no floor feature other than a central fire pit. The round, shallow, single-chambered structures are less substantial and have been less intensively used than the other pithouses. Researchers estimate five to seven people lived in a typical pithouse, and they attribute differences in pithouse construction and configurations to residents from different backgrounds building homes according to their own specifications.

"Some of the details of pithouse construction such as roofing techniques, internal features, size, shape, entryway, orientation, etc. at the Dillard site mirror pithouses found near Bluff, Utah, to the west," explains Diederichs. "But that settlement was also a new community, part of the Basketmaker III diaspora, and more likely both populations migrated from the south, from the Chuska Mountains region of northwest New Mexico, where we have documented high populations, double-chambered pithouses, and great kivas in the century before the Dillard site was occupied." To examine the possible connection between Dillard and Meloy Village, the site near Bluff, the researchers will see if there are other similarities—such as the kind of pottery that was made and the types of corn that were grown—between the two sites.

Dillard’s circular, semi-subterranean great kiva represents the first use of public architecture in the central Mesa Verde region. It’s about 33 feet in diameter and five-feet deep, and has an adobe-plastered floor. Great kivas became more common in the area hundreds of years later, although 2,000-year-old kivas have been found in the Mogollon culture region in southeast Arizona. Dillard’s great kiva could have served to assimilate disparate groups of immigrants into the settlement, whose native population was also growing as a result of the practice of agriculture, the development of pottery for cooking and storage, and other factors. "The great kiva is a very important feature, indicative of a new concept of community that was developing along with other traits at this early date," says Ryan, who has a particular interest in kiva architecture.

The Procession Panel, a Basketmaker III-period petroglyph panel in southeast Utah, shows what appear to be groups of people from dispersed regions converging on a large, central, circular structure. Some of the participants wear headdresses and carry staffs that could reflect their statuses. The archaeologists think a similar scenario probably occurred at the Dillard site. A pit structure, with storage bins containing corn residue and pollen derived from many of the region’s plants, has been identified adjacent to Dillard’s great kiva, suggesting people brought food from surrounding areas for communal feasting. The remains of large, decorated pottery bowls indicate well-attended celebrations.
took place there. A burned pit structure found near the great kiva yielded ritual items such as a groundstone mortar used for grinding medicines, pigments, or other materials, hinting at some of the activities that could have taken place there.

Shallow trash middens indicate the site served as a periodic, rather than permanent, gathering place, with housing near the great kiva to accommodate visitors. Diederichs and her colleagues think this “episodic community organization,” as they call it, was likely modeled after patterns inherited from their late Archaic foraging ancestors, including periodic gatherings at dance circles in geographically-central locations. Though various community members may have assumed leadership roles during these periodic community events, a lack of evidence for ritual authority or highly ranked households near the great kiva suggests they would have had little influence otherwise.

Ritual features on the great kiva floor appear to have been continuously remodeled throughout its use, as was its roof. The great kiva was ritually closed at the end of its use, with inhabitants bringing alluvial sand to fill the floor vault, sipapu, and other features. Archaeomagnetic dates between A.D. 670 and 740 were obtained from a final burning event related to the closing.

“Working back from this date, we have evidence for at least three different remodeling events of the great kiva, so we suspect that it was in use for several generations,” says Diederichs. It’s thought that construction began in the early 600s. A dendrochronology sample awaits analysis at the University of Arizona’s Laboratory of Tree-Ring Research, and several charcoal samples will undergo accelerated mass spectrometry carbon-14 dating, helping to narrow the age range for the site.

There are also thousands of artifacts and faunal and macrobotanical remains to analyze. Some of these materials—pottery storage jars, plant grinding and processing tools, plain gray cooking vessels, corn, and beans—appear to reflect the inhabitants’ agricultural lifestyle. The archaeologists have also recovered pollen from squash, amaranth, rose, lily, sunflower, pine, geranium, tobacco, and cholla.

A few sherds of redware, a trade ware from what is now Utah, were found scattered among the locally-made grayware pottery that characterizes the site. A large piece of shaped turquoise found just north of the great kiva, as well as olivella shell, jet beads, and obsidian traced to several sources in Arizona and New Mexico, suggest ancient trade networks.

Over the next two years Crow Canyon researchers will use their own geophysical survey equipment to investigate some of the smaller Basketmaker III households surrounding the Dillard site to try to better understand their relationship to the community core, and the long-term impacts of early farming practices on the environment during this critical time of transformation.

“The Basketmaker III period was a time of incredible innovation and technological change,” exclaims Ryan. “It was a time when the characteristic traits of the Pueblo culture pretty much started, setting the stage for the next seven centuries.”

TAMARA STEWART is the assistant editor of American Archaeology and the Conservancy’s Southwest region projects coordinator.
Celestial Timekeeping

By David Malakoff

A group of people watches the sunrise during the fall equinox at Cahokia's woodhenge feature in 2013.
The sun was setting, and the visitors gathered on the Great Serpent Mound in southern Ohio could barely contain their excitement. On a warm June afternoon a few years ago, they had come to the ancient structure—a twisting, three-foot-high ridge which creates a quarter-mile-long snake slithering across the landscape—to witness something that occurs just once a year. “The snake is going to swallow the sun!” a little girl exclaimed.

Or so it seemed. The crowd had gathered near the huge head of the snake effigy, which archaeologists believe was built at least 900 years ago by Native Americans. The reptile’s jaws are aimed at just the spot where the sun drops below the horizon on the summer solstice, the year’s longest day. So it’s not hard to imagine that the serpent is bent on engulfing the fiery star.

As the sky turned crimson, the crowd grew rapt. “People are profoundly affected by what they see at that sunset,” says archaeoastronomer William Romain, who has studied the Great Serpent Mound for decades and witnessed a number of solstice sunsets at the site. “Some are moved to tears. Some dance in place.”

Many scholars believe that is just the kind of powerful reaction intended by the ancient Americans who built the Serpent Mound and numerous other prehistoric structures whose alignments appear to emphasize important celestial events. In recent decades, researchers have identified numerous sites in Central and North America where buildings, mounds, ceremonial spaces, and pathways line up with solstice and equinox sunrises, as well as other key movements of the moon, planets, and stars. The sites, some of which are 5,000 years old, are giving scholars a clearer picture of just how extensively prehistoric Americans may have used celestially-oriented art and architecture to gauge the movement of time.

“We know these people were keen observers of the sun, moon, and stars, and how they could be used to track time,” says Colgate University’s Anthony Aveni, a pioneer in the field of archaeoastronomy. “They understood what they were seeing, and used it to bring some order to the chaotic world around them—order that can be reflected in the places they built.”

Romain surmises that one of the reasons for aligning earthworks with celestial events was to establish the best time for ritual events and ceremonies. “Thus, for example, people might agree to meet at a particular earthwork for a world renewal ritual on the night of the first full moon after the winter solstice,” he says. These celestial events provided people with a temporal precision they otherwise lacked. “In setting these kinds of agreed-upon times, there is not much room for error.”

People in the past used various methods to measure time through the movement of celestial bodies.
Comprehending an archaeological site's cosmologically-inspired order can be a challenge, however, requiring careful astronomical measurements and, in some cases, creative analyses. As a result, claims of intentional celestial alignments or time-keeping functions have sparked feisty disagreements over methods and interpretation. Sometimes, skeptics say, alignments are just a coincidence born of selective measurement. "There is a lot of poppycock out there, so you have to be careful," says P. Clay Sherrod, an astronomer with Arkansas Sky Observatories who has helped analyze celestial alignments at dozens of prehistoric mound sites in the Mississippi River Valley. "It's too easy for people to first come up with a conclusion"—that a site reflects an extinct culture's reverence for solar alignments, for example—"and then go out and cherry pick the data needed to support it."

Still, since modern archeoastronomers began their work in earnest some 40 years ago, such problems have become rarer, researchers say. Archeoastronomical studies "may have started out on the fringe," says Romain, "but these days they are pretty accepted in mainstream archaeology."

It took scholars more than a century to document the Great Serpent Mound's cosmological connotations. They first described the effigy in the 1840s, but it wasn’t until the late 1980s that they recognized astronomical alignments. Not only does the head point to the summer solstice sunset, but Romain and others have noted that lines drawn through peaks of the effigy’s seven major curves could mark key moon-rise and moon-set points. Some researchers have even argued that the effigy maps out the constellation known as Draco; others see the Little Dipper, with Polaris, the North Star, centered in its coiled tail.

At least some of these alignments must be more than just coincidence, serpent scholars argue. But how they were understood and used by the people who built the effigy remains the subject of debate, as does the snake’s age. In the 1990s, dating of charcoal samples found within the mound suggested the effigy was constructed some 900 years ago, about 1070. But in October 2014, a team led by Romain pushed the construction date back to about 2,300 years ago,
by analyzing a new set of charcoal samples. The younger
dates, the researchers argued in the *Journal of Archaeologi-
cal Science*, probably represent an effort to repair the erod-
ing effigy centuries after it was originally built.

If correct, the older date suggests the serpent was built
during the Early Woodland period by the Adena people,
who were known for the substantial earthworks they built
throughout the Ohio River Valley. How they used the effigy,
however, is unclear, and archaeologists have found few
artifacts that suggest its purpose. Some see a ceremonial
center designed to help steer the spirits of the dead to the
afterlife (there are graves nearby). Others see more practi-
cal purposes, such as serving as a calendar that marked the
hunting and planting seasons. “We can’t bring the people
back to refute any of the theories,” says Sherrod. “We can
only speculate.”

Interpretation of some other sites, particularly Maya
ruins in Mexico and Central America, is less speculative.
There, studies have revealed an array of solar, lunar, and
planetary alignments, and a relative abundance of artifacts
and written records offer insight into the cultural uses of
cosmological knowledge. Stone carvings, paintings, bark-
paper books, and descriptions written by early Spanish
invaders have all provided important insights, says Aveni. In
contrast, “the problem at most North American sites is that
you don’t have much evidence, you only have alignments.”

Studies at one prominent Maya site, the city of Uxmal

*During the summer solstice a single dagger of light strikes*
*the center of a spiral petroglyph carved into a cliff*
*at Fajada Butte in Chaco Canyon.*

*The upper façade of the Governor’s Palace is embellished with glyphs representing Venus.*
on Mexico’s Yucatan Peninsula, highlight the value of having both cultural and astronomical data. A major building known as the Governor’s Palace is aligned with a pyramid in a way that marks the spot on the horizon where the planet Venus rises once every eight years. According to astronomer E. C. Krupp, the director of the Griffith Observatory in Los Angeles, some researchers conclude the central doorway of the Governor’s Palace framed a spectacular view of the most southern rising of Venus on a line that included a small platform in front of the Governor’s Palace, a cylindrical stela in front of the platform, and the pyramid of Cehtzuc on the horizon. From Cehtzuc, looking in the opposite direction, the same line coincided with the most northern setting of Venus over the central door of the Governor’s Palace.

That might be a coincidence, except that the palace is covered with glyphs known to represent Venus. And other records, including the Dresden Codex, a famous book of Maya astronomy believed to date to the 1200s or 1300s, suggest that the planet played an important role in Maya cosmology and timekeeping. Several pages of the codex allow users to predict Venus’s movement across the sky, and link the planet to important Maya deities, omens, and ceremonies. Scholars have also suggested that the planet’s movements served a practical purpose, marking the beginnings of the region’s dry and rainy seasons.

Venus, however, is just one cosmic player in the Maya’s exquisitely complex calendars. “The Maya were obsessed with time,” notes Pomona College astrophysicist Bryan Penprase, in his book The Power of the Stars: How Celestial Observations Have Shaped Civilization. They developed interlocking calendars based on cycles of 260 and 360 days, as well as a system for tracking much longer periods by bundling days into groups of 20 and 13. “The largest cycles were thought to be recurrent cycles of creation and destruction,” Penprase wrote, and each of the 20 named days “contained a destiny which was relived in each of the many eras of a cyclic universe.”

Given that spiritual importance, scholars say it is no surprise that days, dates, and other time-keeping symbols are a routine feature of Maya art and architecture; or that Maya leaders went so far as to use the layouts of their cities to show off their timekeeping prowess, perhaps as a way of unifying a far-flung population. “There is little doubt that a state calendar… played a role in certain stages of site planning,” Aveni concluded in an article in the Journal of Archaeological Research in 2003. “Thus the abstract knowledge of the elite given, say, in the Dresden Codex, could be shared with the commoner though rudimentary calendars expressed via the orientation of, and decoration on, monumental architecture.”

One recent discovery is giving researchers new insights into the early history of the Maya calendar. Much of what scholars know about the subject comes from codices that date to the Maya’s Late Post Classic period (about A.D. 1300 to 1521). But earlier evidence was sparse until 2010, when archaeology student Maxwell Chamberlain followed a looter’s trench to a small room with painted walls within the extensive ruins of Xultun, in northeastern Guatemala. A team led by William Saturno of Boston University soon realized that the murals, including a picture of a feather-decorated king, included small red and black numerical glyphs recording the cycles of the moon, Venus, and other planets. The room appears to date to the early A.D. 800s, and similar images...
don’t show up again in the archaeological record until the Dresden Codex. “One goal of the Maya calendar keepers… was to seek harmony between sky events and sacred rituals,” Saturno and his team, which included Aveni, wrote in Science in 2012. “The Xultun paintings may represent an expression of the same ambition several centuries earlier.”

Further north, in what is now Mexico, scholars have been piecing together how the Aztec culture incorporated calendars and cosmological signposts into their material culture. Like the Maya, the Aztecs adopted interlocking calendars based on 360- and 260-day cycles, with ceremonial days linked to the movements of the sun, moon, and stars. And many scholars believe the architectural alignment of Aztec cities, including their capital Tenochtitlan, highlight the seasonal movements of the sun and stars. Such arrangements “sealed the workings of the cosmos into the architectural fabric and sacred space of the city,” notes Aveni.

Outside of Mexico and Central America, researchers have less to go on. At North America’s oldest documented mound site, Watson Brake, in northern Louisiana, researchers believe people began constructing a series of 11 mounds in an oval arrangement about 5,400 years ago. The long axis of the oval is clearly aligned to the winter and summer solstices, Romain and others have concluded, but artifacts found at the site, including projectile points and earthenware, don’t clearly point to specific ceremonial or time-keeping functions.

At younger mound sites, scholars have long been intrigued by evidence of great circles of wooden posts known as woodhenges. In Ohio, diggers have found woodhenges at about a half-dozen sites linked to the Hopewell culture, which flourished roughly 2,200 to 1,700 years ago. (See “A Hopewell Woodhenge” in the Winter 2014-15 issue of American Archaeology.) The most famous North American woodhenge is at Cahokia, the Mississippian mound site in western Illinois. Once covering about six square miles and including some 120 mounds, Cahokia was North America’s largest city in the 12th century, believed to house up to 20,000 people. In the early 1960s, archaeologist Warren Wittry discovered post pits arranged in a series of overlapping circles some 400 feet in diameter. Ultimately, researchers uncovered evidence of five great woodhenges that appear to have been built successively between A.D. 1100 and 1200.

“The function appears to be a solar calendar,” says Bill Isenminger, the assistant site manager at Cahokia Mounds State Historic Site. “If you stand near the center, certain posts line up with the sunrises on the summer and winter solstices, and the equinox.” Some scholars envision high priests standing on a platform at the center of the woodhenge on holy days, greeting the sun—perhaps with lines of signal fires directing the gaze of onlookers and enhancing the drama.
Other elements of Cahokia’s layout may also reflect the sky. Among the site’s most spectacular sunrises, for example, are those that occur on the equinoxes, when the sun appears to emerge from a major feature, the massive Monks Mound, where the community’s leader is believed to have lived. The placement may not be an accident: Cahokia’s leader may have sought greater political legitimacy and status by having his mound symbolically give birth to the sun.

In western North America, scholars have been pondering the function of another kind of circle: “medicine wheels” made of rocks that appear to be associated with the solstices and the stars. Overall, researchers have identified more than 100 possible medicine wheels, mostly in Alberta and Saskatchewan in Canada, and in Montana and Wyoming in the United States. Size varies greatly — ranging from circles just a few feet to more than 300 feet in diameter — and the wheels are often placed atop a hill with good views. One of the largest and oldest is the Majorville Medicine Wheel in southern Alberta. Archeologists have found spear points and stone tools indicating people occupied the site at least 4,500 years ago. Although badly damaged, researchers have detected 28 spokes radiating from a large central cairn; some appear to point to the summer solstice sunrise and the rising points of the bright stars Sirius, Aldebaran, Fomalhaut, and Rigel. A similar, but much younger feature, the Big Horn Medicine Wheel in Wyoming, was built sometime between the 1200s and 1700s. It and some other wheels appear to point to the same stars, although some researchers argue that is a statistical fluke.

How the wheels were used remains a subject of debate, but whatever the interpretation, experts agree that many wheels were used only in summer, because in winter they are typically covered by ice and snow. Some modern tribes say they served a ceremonial purpose for burials, but human remains have been found in the central cairns of just a few. Others see the structures as a kind of ceremonial star map; for instance, modern Native American groups are known to assign families or clans to a particular star or constellation. When ancient people camped there in summer, the wheel could have shown them where to set up their lodgings so as to be aligned with their assigned celestial bodies.

A few researchers reject any astronomical associations, seeing the circles as simply a geometric expression of a symbolic “world” with spoke-like rivers flowing from a spiritual center. But many scholars argue for some kind of celestial time-keeping function: At the Big Horn wheel, for instance, researchers note that three of the target stars rise at one-month intervals after the summer solstice, so the rise of the last star would warn of the imminent arrival of colder weather.

In the Southwestern United States, archaeoastronomers have been fascinated by another timekeeping puzzle: how ancient cultures used the play of light and shadow as a calendar. On the summer solstice a so-called sun dagger pierces the center of a spiral petroglyph carved into a cliff (the dagger is created by the sun shining through a crack in rock slabs) at Fajada Butte in northwest New Mexico’s Chaco Canyon. In contrast, two daggers bracket the carving on the winter solstice. Similar rock art has been found in dozens of locations, including inside caves where the sun’s rays can only reach the petroglyphs on certain days of the year.

It likely took years for prehistoric Americans to discover and learn how to use such natural calendars. Still, few doubt that they were far more aware than us of how to use celestial events for timekeeping. “We’ve largely lost contact with the sky, and what it can tell us, because of modern technology,” says Aveni. “I blame it on Thomas Edison; when he threw that switch, electric lights dimmed the night sky for us. It became less important.” But by seeking to understand how ancient people once relied on the cosmos, he says, we can maintain at least “some of the legacy that the sky once bequeathed to us.”

The Search For Moho

In 1541 in what is now New Mexico, the Spanish explorer Coronado and his men attacked a Native American pueblo they called Moho. This resulted in one of the first significant battles between Europeans and Natives in the region. Historical accounts of Moho’s location are vague, so the exact place of the battle is uncertain. Several researchers, all of whom are focused on different sites, think they have found it.

By Charles C. Poling

On a chilly autumn day above the Río Grande, archaeologists Mike Marshall and Clay Mathers are reconstructing the details of a 473-year-old assault at the ruins of Santiago Pueblo north of Albuquerque, New Mexico. “To the Tiguex Pueblo people who lived here it was a crime scene,” Marshall says. “It was an unprovoked attempt to take everything they had, and it threatened their very existence. Our archaeological investigation is a long-delayed forensic examination of a complex series of siege and resistance events.”

Approximately 200 Tiguex people died in 1541 when Francisco Vázquez de Coronado led a patchwork force, consisting primarily of Spanish and other European adventurers and native Mexicans, in an armed siege of a fortified pueblo they called Moho. A desperate and determined Native force had retreated to Moho to stage a last stand in the climactic two-month battle of the Tiguex War, one of the first major armed conflicts between Europeans and Native Americans in what is now the Southwestern United States.

“The consequences of the Tiguex War were real,” Mathers says. “Almost certainly that’s why the Spanish put the capital in Santa Fe and not here—there was such an intense loss of life here and they lost their stored food
supplies.” Marshall adds, “This one pueblo affected the course of history” in the region.

Nobody knows exactly where this siege of Moho took place. Coronado and his chroniclers used one set of names for the area’s pueblos, and the connection between many of those names—including Moho—and the actual locations they describe, has been lost. Other, smaller battles took place in Coronado’s time, too, which complicates the search. Are the ruins now called Santiago the actual location of Moho, as Mathers and Marshall contend? Or was it roughly 11 miles south at another ruin, Piedras Marcadas, as archaeologist Matt Schmader speculates? Or are the historians Richard Flint and Shirley Cushing Flint right when they argue Moho was some 15 miles upriver from Santiago at what is now Basalt Point Pueblo, which sits atop Santa Ana Mesa, or some other site on that mesa? And where was Coofor (sometimes referred to as Coofer, as well as Alcanfor), the site of a major Coronado encampment and a geographic key to the puzzle?

“There wouldn’t be any Moho to look for if you didn’t have documents,” Richard says. “On the other hand, there was no map with an X on it. We can be pretty sure that it’s somewhere in the” greater Albuquerque area.

The documents also say the Coronado contingent camped nearby and provide the approximate distance from Moho to the related pueblo of Coofor. For years, these documents alone told the tale of Coronado. Only recently has archaeology revealed the Native American perspective.
The Coronado entrada, which lasted from 1540-42 and extended as far north as Kansas, proved to be a futile search for a wealthy civilization to conquer. No Spaniard or Mexican would return for 40 years. Tantalizing nuggets in the historical documents, which are riddled with holes and laced with ambiguities, inform the current archaeological investigations in New Mexico.

Coronado left Mexico with 375 European men at arms and some 2,000 indigenous Mexican soldiers. Few wore armor and among their weaponry they carried roughly a dozen swords, 20 crossbows, and 26 arquebuses (an early firearm shooting lead balls). Many of the Mexican soldiers wielded devastating, obsidian-bladed, mace-like macanas. The expedition brought horses, mules, and other livestock. Miscellaneous civilians tagged along.

By the winter of 1540-41, after a fight with the residents of Hawikku Pueblo in western New Mexico, the Coronado expedition was cold, hungry, and essentially freeloaders on the Tiguex, who lived in the area around present-day Albuquerque and were thought to number up to 20,000. Here the Spanish found a number of multi-storied, mostly adobe pueblos featuring enclosed plazas, palisades fortifying the entrances, ceremonial kivas, and farms in the floodplain.

When Coronado and his men settled in, the trouble started. After taking over Coofor, they demanded supplies, warm clothing, and blankets from the area pueblos. The Tiguex balked, complied, resisted, and eventually revolted. Skirmishes flared into battles. The Spanish exacted brutal retribution and even burned Tiguex men at the stake.

A group of desperate Natives found refuge at Moho. Coronado’s forces attacked, and were repulsed. They then hunkered down for a long winter’s siege. The Natives
subsisted on stored provisions and, because Moho lacked a permanent water source, drank rainwater or snowmelt until those sources ran dry. Here the details get sketchy. The Spanish documents report the Tiguex began digging a well, the walls of which collapsed on 30 people, killing them. After about two months, the remaining refugees fled at night only to be cut down by Coronado’s men or perish as they tried to cross the icy Río Grande. So ended the Battle of Moho.

Archaeologists excavated the Santiago site in 1934-35 in search of artifacts and features associated with Coronado. They found a number of metal artifacts but, according to Mathers, they lacked the expertise to connect them to the Spanish explorer. In 1986, a highway crew inadvertently exposed a Coronado encampment a few hundred yards west of Santiago. Bradley Vierra, who excavated the encampment, and Stanley Hordes, the historian who worked on the project, suggested that Santiago might be either Coofor or Moho.

Then in 1998 archaeologists working near Tallahassee, Florida, uncovered an encampment from the Hernando de Soto expedition that was contemporary with the Coronado site. The encampment, known as the Governor Martin site, yielded wrought iron, caret-headed nails that were similar to nails found at Santiago. The Flints, having examined items from the Coronado and de Soto encampments, as well as early 16th-century Caribbean sites, suggested that caret-headed nails were indicative of Spanish occupation prior to 1560.

The Flints’ suggestion was corroborated by Mathers and Charles Haecker’s archaeological research, which showed the nails were a telltale find identifying Coronado and other Spanish sites of this time period. The same goes for crossbow bolts, which are the copper tips of Spanish arrows fired from crossbows. Forty years later, when the next Spanish/Mexican expedition reached New Mexico, the arquebus had effectively replaced the crossbow and the Spanish were not using caret-headed nails.

After Vierra excavated the camp by the
highway, little happened with the Albuquerque-area Coronado sites until Schmader, along with Mathers, Haacke, and Chris Adams, made a breakthrough find in 2007, tying Piedras Marcadas Pueblo to Coronado. Piedras Marcadas sits a quarter mile from the Rio Grande on a low, brushy rise. Schmader and Marshall both worked the site in the 1980s, using pottery sherds to date its occupation from A.D. 1200 through Coronado’s time. Though none of its architecture still stands, it had about 1,000 ground-floor rooms and a plaza that sprawled over eight acres.

Out of respect for contemporary Pueblo communities who consider the site an ancestral village, Schmader has restricted research to surface surveys, mapping, remote sensing, and test excavations, which includes a pit he dug that disappears into darkness 12-feet down. In 2007, while using remote sensing to discern the pueblo’s layout, a member of Schmader’s team found a rusty caret-headed nail. He showed it to the Flints, who confirmed the Coronado connection. “We’d always suspected it,” Schmader says, but prior to the discovery of the nail “we didn’t have the evidence.”

After that, Schmader and his colleagues used metal detectors to find dozens of 16th-century artifacts a few inches below the surface. Schmader has continued his investigation over the past seven years, finding over 1,000 artifacts from that period, such as nails, lead musket balls (some flattened by impact), copper crossbow bolts, chain mail links, a broken dagger tip, clothing fasteners, horse gear, and awls.

Schmader correlated the artifact distribution patterns with an architectural map created from the remote-sensing...
This decorative sherd was found on the surface at Piedras Marcadas.

data. This evidence spoke of a pitched battle. For instance, densely clustered military artifacts by an entrance suggest intense fighting at the palisade, which is mentioned in the texts. Schmader believes the high number of broken, bent, and flattened military objects and lost personal items indicate multiple skirmishes at Piedras Marcadas—a siege.

There is also a deep crater that contains most of a kiva as well as Spanish metal artifacts that could be Moho’s caved-in well. Perhaps the Tiguex attempted to dig the well inside an existing kiva. This crater hasn’t been excavated, and therefore it remains a mystery. Finally, if one accepts Santiago as Coofor, as Schmader suggests, Piedras Marcadas is the same distance from Santiago, according to the historical documents, as Moho was from Coofor.

Marshall says Santiago’s archaeological evidence tells the story of Coronado’s assault and the Pueblo Indians’ resistance. (The site is on land owned in part by The Archaeological Conservancy.) Since 2013, Marshall and Mathers have been working at the ruins in cooperation with Sandia Pueblo and the site’s other owners to complete a systematic and highly comprehensive survey. Part of this investigation, and the on-going consultation with the nearby contemporary pueblos of Sandia and Isleta, shed light on the Native American side of the Coronado entrada that, according to Marshall, has been seriously neglected by most scholars.

Using a metal detector, Mathers has found more than 500 objects, including chain mail fragments, flattened lead balls, crossbow bolts, a complete knife, horse gear, buckles, and caret-headed nails. The collection looks much like the Piedras Marcadas material, but with fewer personal items, Mathers says. Other findings include Native weapons such as stone battle hammers, axes, projectile points, etc.
and sling stones, plus burnt adobe and 16th-century Pueblo glaze-ware pottery.

Santiago’s evidence, like that of Piedras Marcadas, indicates furious fighting at the two main entrances. The architecture suggests the Tiguex built the pueblo to defend against attacks. The archaeologists who excavated Santiago in the 1930s didn’t find a well, but they didn’t excavate the plaza, where it could be. Mathers says they also failed to document a deep depression that’s now obscured by development.

The Flints believe the siege of Moho happened at Basalt Point Pueblo, or possibly a neighboring site on Santa Ana Mesa, 200 feet above a daunting cliff overlooking the Río Grande on present-day San Felipe Pueblo, about 30 miles northwest of Albuquerque. The Flints argue this location best matches the “on a height” description of Moho from Spanish documents written in 1545. The Spanish also described Moho as being “strong,” according to Richard, and they “equated strength of a fortification with being on a high, steep hill. There are hundreds of 16th-century and older examples of such fortresses in Spain.” He adds that the word moho means lichen, of which there is a heavy growth on the Santa Ana Mesa cliff. Neither Santiago nor Piedras Marcadas are perched on a hill or covered with lichen.

For their parts, Marshall, Mathers, and Schmader note that “height” could refer to a tall pueblo, and that the almost impenetrable basalt geology of the mesa seems to rule out digging a well. They also consider Basalt Point to lie outside the area the Spanish defined as the Tiguex province, in which Moho was located. “We believe eventually that archaeological and other data will demonstrate conclusively that Santiago is the best candidate for Moho,” Mathers says. He and Marshall intend to submit their evidence for publication in a peer-reviewed journal. Shirley Flint also thinks the location of Moho will be confirmed at some point by a combination of unequivocal historical and archaeological evidence. Schmader, on the other hand, thinks that the ambiguity in the archaeological and historical records is such that proving its location beyond a reasonable doubt could be impossible.

But he is sanguine about the outcome. “I’ve really gotten to where it doesn’t matter,” he says. He’s more intrigued by the similarity of artifacts at Piedras Marcadas and Santiago, since the documentation does not describe a big battle at Coofor. “Now it’s more of a mystery as to why the assemblages at Santiago and Piedras Marcadas are relatively similar if the sites had reasonably different activity on them,” he says. But then he concludes philosophically: “Advances lead to other questions.” And that’s what keeps the archaeologists digging.

CHARLES POLING is New Mexico-based writer who reports on archaeology, history, the arts, and other topics.
Conservancy To Acquire Its Largest Preserve In The East
Queen Esther’s Town and several other sites will be saved.

The Queen Esther’s Town Preserve is located in Milan in northeast Pennsylvania. The site, which is more than 92 acres, sits along an expansive floodplain near the confluence of the Susquehanna and Chemung Rivers. After working for over a decade to acquire the property, the Conservancy finally signed an option to purchase the site, which has staggering research potential for future scholars.

Queen Esther is thought to have been of French and Native American ancestry. She married a Delaware Indian chief and had an influential position in the tribe. In the mid to late 1700s she was the leader of the eponymous Queen Esther’s Town, which consisted of about 70 houses. Her own dwelling was referred to in historical accounts as her “castle.” In addition to these structures, the community had a large herd of cattle that they grazed on Queen Esther’s Flats.

The village of Teaoga was also located on a point where the two rivers connect and just to the northeast of Queen Esther’s Town. The Continental Army destroyed both towns on September 27, 1778, in retaliation for the destruction of the settlement at Wyoming (near present day Wilkes-Barre) by a force of Tories and their Iroquois allies. The military’s action was part of General John Sullivan’s campaign against the Iroquois Confederacy.

In the book Early Times on the Susquehanna, This historical marker in Wyoming, Pennsylvania, notes the place where, according to historical accounts, Queen Esther killed a number of soldiers with a maul.
Queen Esther is described as a “large, heavily built woman, of commanding appearance… having influence with the Indians, and prior to the Wyoming massacre… treated the whites with uniform kindness and courtesy. She was a prominent figure in the Susquehanna Valley until the time of the Sullivan expedition.”

While Queen Esther’s site alone makes this worth acquiring, the preserve contains the remains of five recorded archaeological sites, and there are probably many more. “Queen Esther was a relative newcomer to the site,” says Mark Shaffer, an archaeologist with the Pennsylvania Historical and Museum Commission. “Extensive occupations of Owasco cultures occurred here between about A.D. 900-1300 based on the presence of ceramic sherds similar to those found at radiocarbon-dated sites in nearby upstate New York. Even earlier Native American occupations are indicated at this site by temporally diagnostic projectile points dating to the Transitional (1200-1800 B.C.) and Archaic (1800-8000 B.C.) periods of Eastern Woodlands prehistory.”

The property has never had a comprehensive archaeological survey. The five-recorded sites were found by amateur archaeologists, who discovered a variety of artifacts.
as well as features and burials, in the 1940s and ’60s. “Much remains to be learned from the site of Queen Esther’s Town,” says Shaffer. “Given its location adjacent to the confluence of the Chemung and Susquehanna Rivers, there is a strong possibility that much older archaeological deposits and living surfaces lie deeply buried below the current ground surface.”

The preserve’s archaeological resources have been threatened by residential and commercial development, mining, and fracking that are taking place on the areas surrounding the property. “The Archaeological Conservancy’s acquisition of this property is a tremendous victory for archaeology, history, and historic preservation,” Shaffer says.

The Queen Esther’s Town preserve is being established in honor and loving memory of Robert Easton Macafee, by his wife Joan and son Brian. Robert worked this land, which was part of the family’s farm. The Conservancy is only able to acquire important sites like this because of conservation-minded people like the Macafee family. The Alfrieda Frank Foundation provided a grant that helped fund the acquisition.

—Andy Stout

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Bird Hammock Preserve Expanded

SOUTHEAST—The Conservancy recently acquired the second of the three tracts that make up the Bird Hammock site near Tallahassee, Florida. The site was occupied during the Swift Creek (ca. A.D. 1–700) and Weeden Island (ca. A.D. 700–1200) periods, two cultures that occupied parts of Florida, Georgia, and Alabama. The site consists of one mound that dates to the Swift Creek period, and another mound that dates to the Weeden Island period. Both mounds are surrounded by middens filled primarily with shells.

The recent addition is a small tract that contains half of the Weeden Island mound and some of the associated shell midden. The site is located in Wakulla County, which has restrictions on subdividing property into tracts smaller than five acres. This meant that, in order to preserve half of the mound and midden, the Conservancy would have had to purchase a significant amount of land, most of which contained no cultural resources.

However, since the Conservancy would be saving an important archaeological site, the county waived its restriction, allowing the landowner to subdivide the tract into a quarter of an acre that included the half mound and midden, which the Conservancy then purchased. Archaeologists with the National Park Service’s Southeast Archaeological Center assisted a surveyor in mapping the boundaries of the archaeologically significant portions.

This acquisition means that approximately one-quarter of the Bird Hammock Site is preserved, and hopefully the third tract, which is owned by a different party, will be acquired soon, thus ensuring the entire site’s preservation.

Twenty-five Acres Added to Wells Petroglyph Preserve

SOUTHWEST—The Conservancy recently acquired a 25-acre tract adjacent to the Wells Petroglyph Preserve in Northern New Mexico utilizing POINT funds. The Wells Petroglyph preserve was established in 2000 when artist Katherine Wells donated 148 acres of her property, situated on the escarpment of Mesa Prieta, a 12-mile-long basalt formation located just north of Española between the Chama and Rio Grande rivers. The slopes of the mesa contain basalt boulders covered with tens of thousands of petroglyphs. The glyphs have been stylistically dated to the Archaic, Pueblo, and Historic periods. The Conservancy’s preserve contains over 9,000 recorded images.

One of Wells’ many petroglyphs.

This screen, which a looter used to sift small artifacts from displaced dirt, was found at the site.
The 25-acre addition has been partially surveyed and it appears to have myriad images.

Beginning about 7,500 years ago, Archaic people began carving images on Mesa Prieta’s basalt surfaces. These Archaic images tend to be abstract geometric glyphs with occasional human or animal footprints. The majority of the images on the escarpment are linked stylistically to the Puebloan period, reflecting the migration of a large number of Puebloan people who came to this area from the Mesa Verde region around A.D. 1300.

In A.D. 1598 New Mexico’s first capital, San Gabriel del Yunque, was established by the Spanish near the confluence of the Chama and Rio Grande rivers. Their presence inspired historic-period petroglyphs on the escarpment including Christian crosses, horses, churches, and heraldic lions believed to emulate lions depicted on Spanish Coats of Arms. (The capital was moved to Santa Fe in 1610.)

The Wells Petroglyph Preserve is listed in the National Register of Historic Places as well as the New Mexico State Register of Cultural Properties. In 2014, the Cultural Landscapes Foundation recognized Mesa Prieta as one of the nation’s 11 most threatened and at-risk landscapes.

The Conservancy Obtains the Remainder of Mound Spring

WEST—The Pahrump Valley, in Southern Nevada, was known for a series of spring mounds that were formed by the buildup of mineral deposits from centuries of seepage from underground springs. The water from these springs drew prehistoric people to this area, and their refuse also became fill for the mounds. Although most of these mounds have been destroyed by development in the Pahrump Valley, a few remain.

The Mound Spring site consists of one of these surviving mounds. The artesian spring that created the mound has since dried up, but it once provided water for the native Southern Paiute. No formal research has been conducted at the site, but a surface survey revealed lithics, ceramics, and faunal remains. Because of that evidence, as well as investigations at a similar site in the Pahrump Valley, it is thought that prehistoric populations seasonally inhabited the Mound Spring Preserve for several thousand years.

In the late 1880s through the early 1900s stagecoaches, freight wagons, and travelers that passed through the valley stopped at the spring for water. There is evidence of an historic adobe structure that dates to a slightly later period.

In 2002, the Conservancy purchased a 2.1-acre parcel containing the northern half of the mound. In January of 2015, the Conservancy acquired the remaining portion of the mound to complete the 5.4-acre preserve, which has great research potential.
Reviews

The Invisible History of the Human Race: How DNA and History Shape Our Identities and Our Futures
By Christine Kenneally
(Viking Press, 2014; 368 pgs., $28 cloth; www.penguin.com)

Award-winning Australian journalist Christine Kenneally has produced an excellent layperson’s guide to the 21st-century’s most promising new science concerning DNA and the human genome. Every day we are peppered with references to those double helixes that shape the human experience, but few of us easily understand the complex science and its implications for human history.

For archaeologists, the unraveling of ancient human DNA information promises to answer many of the most perplexing questions. Who came before? Where did they come from?

How did humans develop? With whom did they breed? These and many more questions are now being tested with DNA samples. More often than not, the first answers are confusing to lay people. This book will help us understand this challenging new science that promises to tell much about the human race and its history.

Lives in Ruins: Archaeologists and the Seductive Lure of Human Rubble
By Marilyn Johnson
(Harper Collins, 2014; 288 pgs., illus., $26 cloth, $10 ebook; www.harpercollins.com)

Author Marilyn Johnson assumes that everyone in the sandbox wanted to grow up to be an archaeologist. In writing this delightful travelogue, she takes on the task of seeing the earth through the eyes of real archaeologists doing research at archaeological sites. From the effigy mounds of Wisconsin to the plantations of the Caribbean, from the waters off Rhode Island to Egyptian tombs, Johnson tracks archaeologists at work around the globe.

She turns herself into a kind of archaeological Walter Mitty who actually participates in the work, fun, and hardships of archaeology, and not just in the glamor spots of Egypt and Machu Picchu, but also in obscure sites in South Dakota and upstate New York. Unlike her hero Indiana Jones, she learns some of the tricks of the trade, like digging with a trowel and brush. She also shares the bologna sandwiches and warm beer that were served at a real field school under the hot sun. Johnson revels in learning about the rather obscure things modern archaeologists deal with, like the fat content of mammoth bones.

Her adventure takes her to a primitive field school on the tiny Caribbean island of St. Eustatius, where she learns the basics of excavation and historical archaeology, as well as the horrors of archaeological looting and trafficking. At an ancient Greek site on Cyprus, the beauty and wonders of the classical world bring science and art together. In New York she takes a class in human origins and learns about the latest controversial research on human evolution and migration. She also takes a course in stone tool knapping, which required her to stock up on Band-Aids. Beer and archaeologists have a special attraction, and Johnson attends conferences where she learns the archaeology of beer as well as its attraction. On a more serious note, she examines the dismal job market for archaeologists and the scarcity of funds for training and research.

Johnson weaves a serious tale of learning about archaeologists and their craft with humor and insight. The wild cast of characters is the stuff of Hollywood. Adventure blends with scholarship to tell a fascinating story. This book is a delight for all of us amateurs who someday want to become serious archaeologists.
The Archaeology of Smoking and Tobacco
By Georgia L. Fox
(University Press of Florida, 2015; 192 pgs., illus., $70 cloth; www.upf.com)

Nothing in the material culture of the Americas is more ubiquitous than tobacco. From the times of earliest Native Americans to the present, tobacco has played an important role in the culture of the Americas. In this absorbing study, California State University-Chico, archaeologist Georgia Fox uses the discipline of historical archaeology to examine the material culture and the social aspects of tobacco use in North America in the post-Columbus era.

While prehistoric Native Americans primarily used tobacco in religious and spiritual settings, European Americans developed a culture around the social and recreational consumption of it. Historical archaeology is informed by the examination of historical documents and the study of archaeological items. Fox skillfully uses both to paint an expansive picture of tobacco use in North America. Tobacco was the first major export from the New World and it has played an important economic role ever since. Its discovery, production, consumption, and trade are important parts of the American experience.

Until the 20th century, tobacco was usually smoked in clay or stone pipes. These pipes, which are found in abundance on nearly every historical site in North America, are critical parts of the American historical record. At Jamestown, for instance, archaeologists have already recovered more than 50,000 pieces of clay smoking pipes dating from 1620 to 1690. Pocahontas’ husband, John Rolfe, introduced varieties of tobacco from South America to appeal to European tastes, and it was soon the colony’s most important product.

Using the historical record and DNA analysis of pipes, archaeologists are learning a lot about smoking among women. African American slaves had their own smoking rituals and paraphernalia. In Western boomtowns like Virginia City, tobacco, along with drinking and gambling, were the most common forms of entertainment. Evidence of tobacco chewing is also found in spittoons. Pipes and other tobacco related artifacts can be sourced and dated, making them important tools for archaeologists exploring historical sites.

Fox tells us that tobacco played an important role in every major shift in American life, such as the change from rural farming communities to raw industrial cities, for example. She finds that tobacco made those traumatic transitions easier. “It was a binder of human experience regardless of gender, class or ethnicity,” she writes. The Archaeology of Smoking and Tobacco is an engaging study of Americans’ perceptions of themselves. —Mark Michel

Kukulcan’s Realm: Urban Life at Ancient Mayapán
By Marilyn A. Masson and Carlos Peraza Lope
(University Press of Colorado, 2014; 624 pgs., illus., $85 cloth, $68 ebook; www.upcolorado.com)

Located in the northern part of Mexico’s Yucatán Peninsula, Mayapán was the last great city of the Maya, flourishing from about A.D. 1200 to 1450. The densely settled city is surrounded by a 5.6 mile-long Great Wall, and the authors estimate the peak population at 15,000 to 17,000. According to legend, Mayapán, like Tula and Chichén Itzá, was founded by Kukulcan, a great priest and statesman. Despite its size, monumental architecture, and significance, Mayapán is seldom visited by tourists.

This expansive volume details many years of research by the authors at this great site, focusing largely on the domestic aspects of the city. They consider top-down strategies illustrated in the monumental buildings as well as bottom-up strategies revealed by their household archaeology. But differentiating royal and working classes is more difficult and complex than it might first appear.

Kukulcan’s Realm is an in-depth study of a great city that prospered at the very end of the Maya era. The authors have used the latest archaeological techniques to coax plentiful new information from the ruins. This volume is a highly enlightening report on that research.
Chaco Canyon in Depth

**When:** September 12-20, 2015  
**Where:** New Mexico and Colorado  
**How Much:** $2,195 per person ($230 single supplement)

Explore the vast cultural system of Chaco Canyon and the extensive network of outlying communities that developed in northwestern New Mexico and southwestern Colorado from A.D. 800 to 1140. We’ll visit Pueblo Bonito and other spectacular great houses in Chaco Canyon, as well as the great kiva at Casa Rinconada. We’ll also hike to some of the most spectacular and remote sites in the canyon.

This tour also offers the opportunity to visit many of the most important outlying communities that are integral parts of the entire Chacoan complex that’s still being uncovered by researchers. Scholars are struggling to understand how this vast system developed and operated, and why it suddenly collapsed around A.D. 1140. We’ll spend two memorable nights camping in Chaco Canyon and, to complete the experience, we’ll tour the modern day Pueblo of Acoma. Some of the leading Chaco experts will join us.
Cliff Dwellers

**When:** September 17-27, 2015  
**Where:** Arizona and Colorado  
**How Much:** $2,495 per person ($480 single supplement)

This fall the Conservancy brings back one of its most popular Southwestern tours: an exciting look at the region’s spectacular prehistoric cliff dwellings. Ancient Southwestern groups experimented with building their houses in cliff faces and rockshelters. These structures not only offered protection from the weather, but many of them also served as natural solar collectors during the winter.

From Phoenix you’ll travel north through the Verde Valley, Sedona, Oak Creek Canyon, and Flagstaff to Monument Valley and Mesa Verde. You’ll see the cliff dwellings of Montezuma Castle, Cliff Palace, and White House Ruin, just to name a few. The trip also includes a visit to Lorenzo Hubbell’s historic trading post, a stop at Second Mesa at Hopi, a jeep tour of Canyon de Chelly, and walking tours of some of the Conservancy’s most significant preserves, including Yellowjacket and Atkeson Pueblo at Oak Creek.

Oaxaca

**When:** October 24-November 3, 2015  
**Where:** Mexico  
**How Much:** $2,695 per person ($275 single supplement)

Join us in Oaxaca, Mexico 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 during life. Rather than being a morbid occasion, this is a celebratory event.

Our tour explores the Mixtecan and Zapotecan archaeological sites in the region, including Mitla, Monte Albán, San José Mogote, and Dainzú. You’ll have the opportunity to explore Oaxaca’s museums and markets as well as several crafts villages featuring weaving, pottery, carved animals, and other local art.
The Archaeological Conservancy would like to thank the following individuals, foundations, and corporations for their generous support during the period of November 2014 through January 2015. Their generosity, along with the generosity of the Conservancy’s other members, makes our work possible.

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Making a Lasting Legacy

Established in 2002, the Living Spirit Circle has become an essential component of the Conservancy’s continued success in identifying and preserving America’s most endangered archaeological resources. Formed to recognize those members who have provided for the Conservancy in their estate plans or through charitable gift annuities, the Living Spirit Circle is made up of a dedicated and generous group of individuals.

Nancy Volkman, a long-time Conservancy supporter and member of the Living Spirit Circle, left her estate to the Conservancy in 2013. Her wish was to acquire archaeological sites in memory of her parents, Franklin and Bernice Volkman. Nancy’s generosity will allow the Conservancy to purchase Foxwood Farms in South Carolina and Mound Springs in Nevada.

In the years ahead, the forces that destroy archaeological sites will only multiply. Development, sprawl, and looting increase with each passing year. Nancy Volkman’s commitment to preservation and her foresight will help ensure that America’s precious archaeological resources have a future. By joining the Conservancy’s Living Spirit Circle today, you can support our nation’s cultural heritage for years to come.
Heritage Club

Make your gifts to the Conservancy go even further by joining the Heritage Club, our monthly giving program. You will not only provide continuous support of our preservation efforts, but also reduce our fundraising expenses by eliminating the need to send paper renewals.

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Wells Petroglyphs,
New Mexico

Began as a Conservancy Preserve in 2000

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