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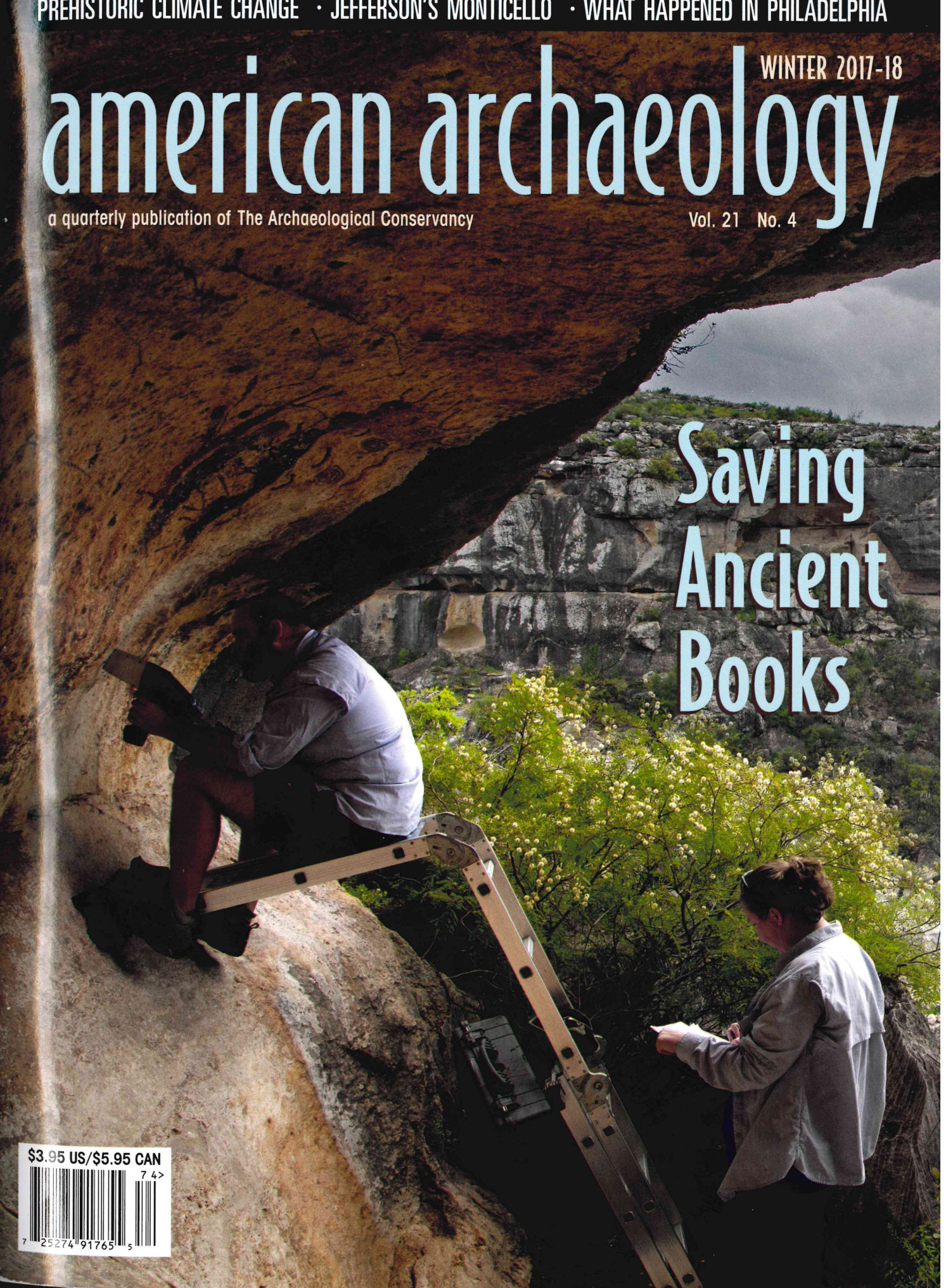
Saving Ancient Books



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Saving An Ancient Library

Archaeologists have undertaken an ambitious project to digitally preserve millennia-old pictographs and the knowledge they contain.

By Richard A. Marini

These anthropomorphic figures are part of a Pecos River-style mural known as Rattlesnake Canyon. This represents only about one-tenth of the enormous mural, which is more than 100-feet long and ten-feet high.

PHOTO BY JEAN CLOTTE / COURTESY SHUMLA ARCHAEOLOGICAL RESEARCH & EDUCATION CENTER

Having scrambled about the shallow, open-air rock shelter known as the Wiley site in southwest Texas, six archaeologists took inventory of the many iconographic figures painted on the shelter wall. They prepared to take high-resolution photographs that will document, and possibly reveal new details, about these ancient, often indecipherable images. The archaeologists work for the Shumla Archaeology Research & Education Center, a nonprofit organization based in the dusty town of Comstock.

Shumla has recently begun the Alexandria Project, an ambitious effort to catalog and digitize more than 350 rock art sites scattered throughout Val Verde County, a three-hour drive west of San Antonio, hard by the U.S.-Mexico border. The project's name is a nod to the ancient Egyptian library that was destroyed in antiquity. The archaeologists are racing against time to build a library of high-resolution images of the murals, some of which are 4,000 years old and are painted in what's known as the Pecos River style. They have a busy schedule that calls for them to visit and record an average of ten sites per month.

Carolyn Boyd uses a digital microscope to determine the order in which paint was applied to the wall at the White Shaman site.

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The hope is that future researchers will be able to study these digitized images should the originals—facing threats both natural and man-made—ever be lost. Together, the paintings tell the story of the aboriginal peoples who inhabited this dry, windswept land thousands of years ago. "This is one of the most important regions in the world for archaeologists who study hunter-gatherer rock art," said Karen Steelman, an archaeological chemist who directs Shumla's research. Steelman is one of only a few people in the world with the expertise to extract organic compounds from paint samples in order to radiocarbon date the ancient paintings.

Getting to some of the rock art sites is a challenge. To reach the Wiley site's rock shelter, which is located on a remote corner of a private ranch, the researchers drove twenty miles off the main highway on a bumpy dirt-and-caliche road, then another fifteen minutes through scrubby plains in a trio of all-terrain vehicles, followed by a twenty minute hike mostly uphill. The team included Steelman, executive director Jessica L. Lee, project archaeologist Charles Koenig, assistant project manager Amanda Castañeda and staff archaeologists Vicky and Jerod Roberts. Castañeda and Koenig are married, as are the Robertses.

Although the paintings have survived for four millennia, they are increasingly endangered. The construction of the Amistad Dam and Reservoir in 1969 has made the area more humid, which in turn promotes spalling as well as the growth of microbes that encrust the paintings. And no one knows how many were flooded as the reservoir waters rose behind the dam. Global warming is also triggering stronger storms, leading to more flooding that scours the walls and leaves behind damaging silt. And drug smugglers who use the area as a through-route may vandalize the art. "If you look at photos from the 1950s, it's obvious many of the paintings are less vibrant today," Steelman said.

Upon arriving at the Wiley site, which is named for the ranch owner's granddaughter, the researchers took an inventory of the painted figures, categorizing them as anthropomorphic, zoomorphic, geometric and, for those they were uncertain about, enigmatic. Castañeda visited the site back in 2011, so the team already had fairly extensive notes about it. That's not always the case. Some caves haven't been visited by researchers since the 1950s, and descriptions are often limited to a single word: "pictographs."

As more landowners hear about the project, the

An examination of microscopic photos of this anthropomorph wearing an antlered headdress at the White Shaman site revealed the ancient artists' precise application of colors.

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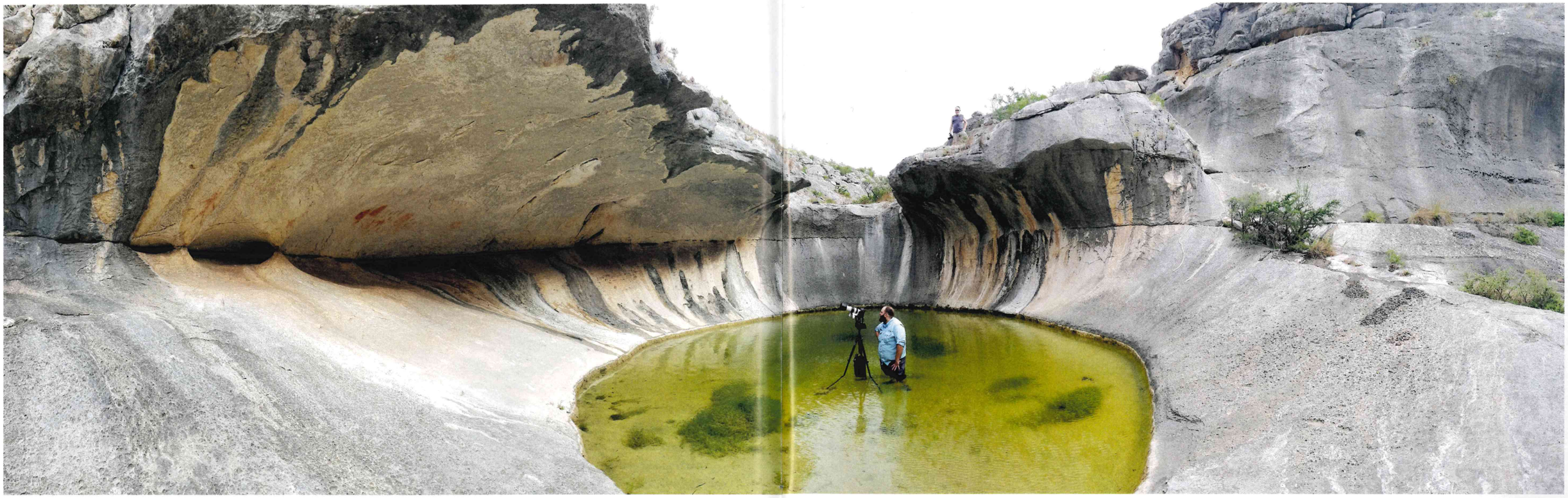
archaeologists have gotten calls asking them to examine previously unknown sites. People who lease their land to hunters "like being able to say there's ancient artwork on the site," said Lee. "Other times they just want to know more about what's on their property."

In addition to digitizing the paintings, the archaeologists also hope to answer a number of questions. For example, did the small bands of hunter-gatherers who roamed the area live in the rock shelters where the paintings were made, or did the rock shelters merely serve specific purposes such as religious ceremonies or trading with other groups?

The archaeologists also are looking to see if they can discern patterns as to where the rock art is located. Were sites chosen because they were near water? Are there prominent landscape features visible from multiple sites? Do they contain common natural features, such as water seeps or niches? Were they a way for the roving bands to communicate with each other, or did the paintings somehow fit into the people's belief system? The answers to these questions will tell them how the sites were used. "It's like when you're studying ancient cities," Steelman said. "You look at where the churches are located, where the houses are, the government buildings. That tells you how the society was organized. We're trying to do the same thing, but from a hunter-gatherer perspective."

Another question the project hopes to answer is whether multiple cave sites tell similar stories and express common motifs, such as a creation story, an otherworld journey story, or descriptions of the religion of peyotism. This is important because while the hunter-gatherers didn't have a written language, they would have recognized the paintings' iconography the same way people in the Renaissance would have understood the conventions of that era's religious paintings. "If they saw a lamb, they knew it represented Christ," Lee explained. "If there was a man and a woman with an apple, they knew it was the story of Adam and Eve."

So far, evidence from sites such as the White Shaman Preserve seems to suggest they were not chosen randomly. One of the best and most deeply studied examples of Lower Pecos River-style pictographs in the world, the White Shaman rockshelter, which is owned by the Witte Museum in San Antonio, is located near the confluence of the Pecos



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Jerod Roberts uses the GigaPan photographic system to create a panoramic photograph of the mural at the Tinaja site.

River and the Rio Grande, close enough to the U.S. Highway 90 bridge to hear the passing traffic.

Steelman noted one of the most prominent images in the mural, a headless, white, human-like figure identified as the moon goddess. As the sun sets each winter solstice, it casts a shadow on the mural that stops precisely at the neck of the moon goddess while the rest of the mural is bathed in the red glow of sunset. On the opposite end of the mural is a red and yellow crenulated arch representing the sacred mountain from which the sun emerged at the dawn of time. Just before sunset on the fall and spring equinox, the sun slowly climbs the crenulations, step by step. The remainder of the mural stays in shadow until after the sun has fully illuminated the sacred mountain in an arch of light. "That seems too unlikely to be a coincidence," she said.

No one knows why the indigenous people who lived in the area left about 1,000 years ago. But many of their belief systems survive to some extent among modern-day American Indians. Back in the 2000s, for example, a Huichol shaman brought to the White Shaman Preserve identified many of the figures on the mural by name. "They're my ancestors," he said, meaning that he shared what Alfredo López Austin, an authority of Mesoamerican mythology, called "a hard nucleus" of core beliefs with those who created the mural.

The White Shaman mural is believed to tell a creation story similar to that of Mesoamerican groups who live hundreds of miles to the south, suggesting there was a connection between the two peoples. It's even possible that the people who left this area migrated south, eventually becoming the Aztec. The mural depicts five torch-bearing pilgrims, each associated with an ancestral deity, traveling from their homes to where the peyote grows.

While the Alexandria Project is just ramping up (it began last August, and Wiley was the sixteenth site the team visited), Shumla archaeologists have been studying the Lower Pecos rock art since the organization's inception in 1998. Shumla's founder, Carolyn Boyd, was a young muralist with an interest in rock art when she first visited the area in 1989 to see the work of her long-ago predecessors. Back then, many archaeologists thought the paintings were a random collection of images made by a number of artists over hundreds, or even thousands of years.

"But looking at them as an artist, I realized that they were compositions, that they required scaffolding and group effort and were produced in some cases over perhaps weeks," said Boyd, now the Shumla Endowed Research Professor at Texas State University in San Marcos. She is also author of *The White Shaman Mural: An Enduring Creation Narrative in the Rock Art of the Lower Pecos*, which won the 2017 Scholarly Book Award from the Society for American Archaeology.

She wanted to discuss her theory with professional archaeologists, but knew she'd never be taken seriously because she didn't have archaeological training. So she returned to school and earned a Ph.D. in archaeology from Texas A&M University in 1998. In the years since, she has shown that the Lower Pecos paintings constitute not merely an art gallery, but a library. "These murals contain information on philosophy, on astronomy, on botany, mythology, history, evidence of a calendar system," she said. "When you look at these paintings, you're looking at the oldest known books in North America."

While examining photos of the White Shaman and four other rock art sites taken through a digital microscope, she discovered that the paint colors were laid down one color at a time instead of in a random order. For example, she studied a painting of an anthropomorph with red antlers covered in black dots. But the dots, the photos showed, were painted before the antlers.

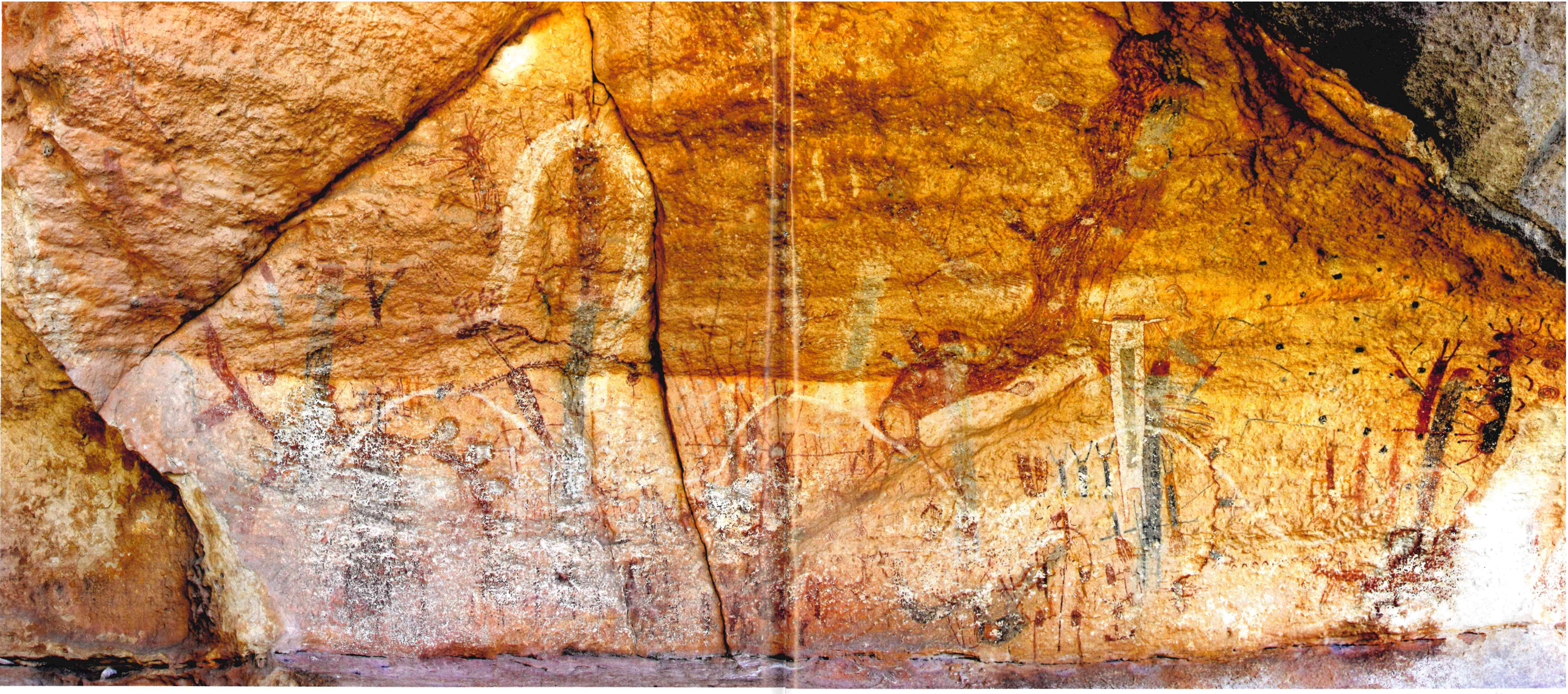
"As an artist, I'd paint the antlers first, then the dots," she said. "I think most people would." But these ancient artists did the complete opposite. Further examination of the microscopic images revealed that the paint colors were laid down in the exact same order: first black, then red, then yellow and, finally, white. "I got goose bumps when I realized we had clear scientific evidence showing the degree of sophistication needed to plan and execute something of this size," Boyd said.

Having done this thorough analysis at only five sites, she can't be certain that this method was used for all Lower Pecos paintings, but Boyd noted "what we have found so far is intriguing and suggestive of a rule that governed the order in which the paint was applied.

Why would they do this? "Because everything in these paintings has meaning," she said. "It's not just the symbols and not just the color. Even the order of the colors carries meaning." This can be seen at the White Shaman site, where, according to ethnographic accounts, the color black represents primordial time, water, and femininity. Adding red, which represents masculinity and fire, on top of black—the union of two opposites—led to the birth of the sun and brought forth creation. Yellow is associated with the light of the sun, and then comes white, which indicates transcendence, or the next phase of life.

"So if you think of it in human terms, the black is the beginning, then you have birth, you grow and die, and start over again," Boyd said. "We see the same core concept that color carries meaning throughout Mesoamerica and beyond. The belief that color carries meaning is pretty widespread." The paintings were also sacred and potent, explained Boyd. "Where we see painted figures, they saw living deities and mythological characters who were active in their lives. The paintings were the deities, the mythological characters."

"The Pecos River pictographs are some of the most elaborate and beautiful in the world," said David Whitley, a noted rock art expert with ASM Affiliates, a cultural resource



The complex mural at the White Shaman site is twenty-six-feet long and thirteen-feet high. Carolyn Boyd and her collaborator Kim Cox have concluded that the mural tells a story of the birth of the sun and the beginning of time.

PHOTO BY CHESTER LEEDS / COURTESY SHUMLA ARCHAEOLOGICAL RESEARCH & EDUCATION CENTER

management firm in Tehachapi, California. "Carolyn Boyd has demonstrated convincingly that the sites were painted as planned and composed murals. This reflects a kind of complexity among hunting-and-gathering peoples not known elsewhere in the world."

Back at the Wiley site, while the rest of the team was reconnoitering, Jerod Roberts set up a photographic system called a GigaPan. It consists of a high-resolution camera mounted on a computer-controlled gimbal that is programmed to take photos of the entire cave, moving systematically from top to bottom and left to right. Roberts took 588 images of the rockshelter, each fifty to eighty megabytes in size. The process took a little more than an hour. Later, back at Shumla's Comstock office, powerful computers stitched the GigaPan photos into one huge, high-resolution image that the archaeologists can examine.

Once Jerod was finished with the GigaPan, he surrendered the camera to his wife, Vicky, who made a similar series of photos of the entire cave. But instead of taking the photos from a fixed spot, as with the GigaPan, she moved across the length of the cave, taking one step to the right as she completed each series of top-to-bottom photos.

Using a photogrammetry process known as structure from motion, the 1,043 photos she took were later processed by the computers back in Comstock to create a high-resolution, three-dimensional digital image of the cave. In much the same way that images can be manipulated in Google Street View, researchers can use a computer mouse to tilt, pan, and zoom in on the image to study it from innumerable angles.

But the GigaPan and structure-from-motion photos only tell so much. The team also uses a technology called decorrelation stretching that boosts color contrast in the photos to accentuate details and highlight faint images in the rock. It's a process similar to what NASA does to enhance images of planets, stars, and galaxies gathered by telescopes and space probes. "Something that's really faint, that you'd barely glance at in the field, can really pop once you run it through the program," said Steelman. "Decorrelation stretching has really revolutionized rock art research. We can now see details and figures that we might have ignored or missed before." The process is also much quicker than using desktop software such as Adobe Photoshop, which can take hours. Instead it takes only a click of a button to manipulate colors and enhance the reds, yellows, blacks, and whites commonly used in rock art.

At some point Shumla plans to open its files to other researchers. But because the data files being created are so large, where they will live permanently is still undecided. For the time being, some files are being stored on a 3-D model sharing website at Sketchfab.com while others are being uploaded to the GigaPan website site. Shumla officials are also in talks with the Center for Archaeological Studies at Texas State University about housing the data, but no decision has been made yet.

Meanwhile, work on the Alexandria Project continues. By bridging art and science, the researchers are not only preserving priceless artifacts for future generations, they are also revealing the sophistication of the hunter-gatherers who lived in this area.

RICHARD A. MARINI *is a reporter with the* San Antonio Express-News. *His article "Rediscovering The Alamo" appeared in the Winter 2016-17 issue of* American Archaeology.