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Sound-reflecting shelters inspired ancient rock artists

Acoustic data suggest early European painters preferred echo chambers

By Bruce Bower 8:00am, June 26, 2017



ECHO ART Ancient farmers in southeastern France created rock art in shelters where sounds echoed into the surrounding landscape, researchers say. Among this set of cliff cavities at a site called Baume Brune, only the middle one (with the smallest opening) contains ancient rock art. It also has special acoustic properties that produce loud echoes.

M. Díaz-Andreu

Ancient rock artists were drawn to echo chambers. Members of early farming communities in Europe painted images in rock-shelters where sounds bounced off walls and into the surrounding countryside, researchers say.

Rock-shelters lacking such sound effects were passed up, at least in the central Mediterranean, report archaeologist Margarita Díaz-Andreu of the University of Barcelona and colleagues in the July *Journal of Archaeological Science*. In landscapes with many potential rock art sites, “the few shelters chosen to be painted were those that have special acoustic properties,” Díaz-Andreu says.

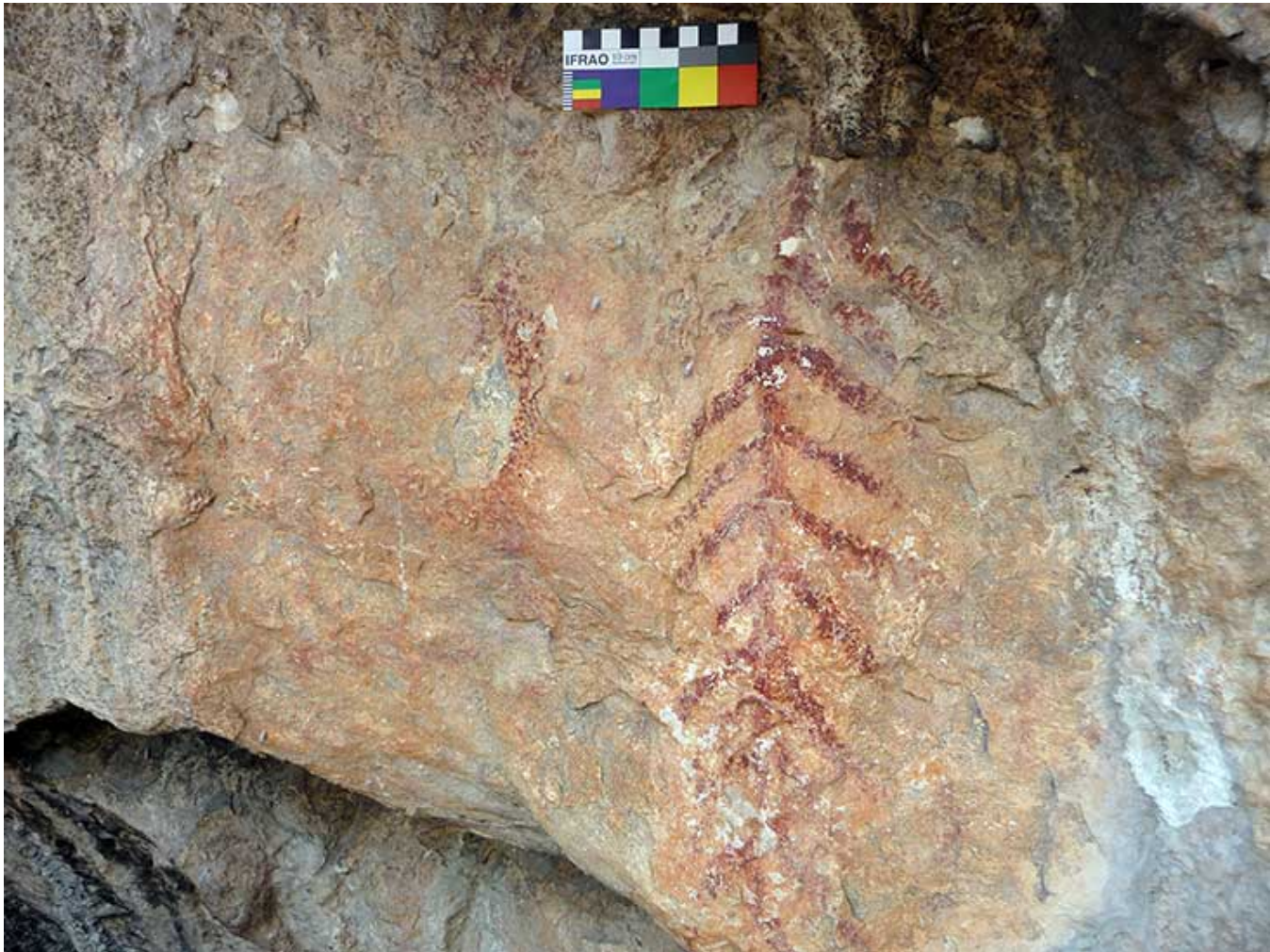
Some hunter-gatherer and farming groups studied over the past couple centuries believed in spirits that dwell in rock and reveal their presence via echoes. But acoustic evidence of special echoing properties at rock art sites is rare.

Díaz-Andreu’s team studied two rock art sites in 2015 and 2016. Baume Brune is a kilometer-long cliff in southeastern France. Of 43 naturally formed cavities in the cliff, only eight contain paintings, which include treelike figures and horned animals. Rock art in the Valle d’Ividoro, on Italy’s east coast, appears in an 800-meter-long section of a gorge. Only three of its 11 natural shelters contain painted images. Researchers generally date these French and Italian paintings to between roughly 6,500 and 5,000 years ago, several thousand years after the Stone Age had ended, Díaz-Andreu says.

To investigate the acoustics of the decorated and unadorned shelters, the researchers developed a new technique for determining the direction, intensity and timing of sound waves arriving at a particular point from

every direction. A special microphone connected to a digital recorder measured the acoustic properties of any echoes set off by balloons popped just outside each rock-shelter. This setup was moved to various spots outside the caves to record the acoustic reach of reflected popping sounds. Echo measurements in France were taken at distances ranging from 22 to 36 meters from cliff shelters. Due to rougher terrain in Italy, measurements there were taken at distances ranging from 77 to 300 meters.

Story continues after image



BRANCHING OUT A cliff cavity in southeastern France that contains ancient rock art, including this treelike image, also possesses good acoustics for producing echoes. Sound played a crucial role in determining where early farmers chose to create rock art, scientists suspect.

M. Díaz-Andreu

Then, the acoustic data were transformed into 3-D, slow-motion depictions of echoes, represented by moving circles, indicating where sound reflections originated. At both sites, shelters with rock paintings displayed better echoing properties than undecorated shelters, Díaz-Andreu says. And in each location, the shelter that best reflected echoes had the highest number of paintings.

“This novel technique shows a clear correlation between audible echoes and decorated shelters,” says music archaeologist Riitta Rainio of the University of Helsinki in Finland, who did not participate in the new study.

Echoes that bounce off steep rock cliffs bordering three lakes in northern Finland also attracted ancient artists, Rainio says. She and her colleagues took acoustic measurements at Finland’s painted cliffs from 2013 to 2016. Microphones placed on boats positioned at different spots on nearby lakes measured sound waves generated, in most trials, by a starter’s pistol. These Finnish paintings date to between around 7,200 and 3,000 years ago, Rainio says.

In some cases, echoes reflect directly from cliff paintings. “That, and possible drumming figures painted on the cliffs, suggest that sound played some role in rituals at these sites,” Rainio says. Her team will report its findings in an upcoming *Journal of Archaeological Method and Theory*.

Creators of older Stone Age cave art also appear to have focused on sites where echoes abounded, says archaeologist Paul Pettitt of Durham University in England. For instance, many roughly 14,000- to 12,000-

year-old animal drawings and engravings at France's Niaux Cave cluster in a cathedral-like chamber where sounds echo loudly.

"The new study provides convincing evidence that echoes, which were scientifically inexplicable to prehistoric people, played a determining role in how art was created," Pettitt says.

Citations

T. Mattioli et al. Echoing landscapes: Echolocation and the placement of rock art in the Central Mediterranean. *Journal of Archaeological Science*. Vol. 83, July 2017, p. 12. doi: 10.1016/j.jas.2017.04.008.

Further Reading

B. Bower. Cow carved in stone paints pictures of Europe's early human culture. Science News Online, February 3, 2017.

B. Bower. Stone Age art gets animated. *Science News*. Vol. 181, June 30, 2012, p. 12.

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