ARCHAEOLOGY

Oldest Mound Complex Found at Louisiana Site

Millennia before the arrival of Europeans, early Native Americans went on a construction binge, dotting the eastern side of the continent with thousands of vast earthen mounds. With shapes ranging from massive cones and quadrangular platforms to gigantic serpents, the mounds were clearly legacies from many different cultures, serving purposes that ranged from ceremonial centers to charnel houses. A new finding in Louisiana has now extended the tradition of mound building back in time by nearly 2000 years—and opened a new perspective on the cultures of ancient North America.

Most archaeologists believed that the first large earthworks were built 3500 years ago at Poverty Point, Louisiana, by a people who had prospered from trading. But on page 1796, a multidisciplinary team headed by archaeologist Joe Saunders of Northeast Louisiana University in Monroe and including colleagues from the fields of soil science, geomorphology, biology, paleontology, and physics reports dating construction of an elaborate earthen enclosure in northeastern Louisiana to a 400-year period beginning 5400 years ago. That makes Watson Brake, as it is now called, the oldest known extant mound complex in the Americas.

The existence of this extensive public architecture, consisting of 11 mounds and connecting ridges that enclose nearly 9 hectares, is hard to reconcile with archaeologists' traditional picture of the small, mobile bands of hunter-gatherers that inhabited the southeastern United States 5400 years ago. Greatly influenced by modern studies of San hunter-gatherers in Africa, researchers often assumed these peoples lived in simple egalitarian societies little prone to social change. To construct an earthen enclosure 280 meters in diameter according to a preconceived plan, however, the builders had to have sophisticated leadership skills. They must also have had a wealth of food to sustain the hard labor of raising mounds as tall as a two-story house.

"It's rare that archaeologists ever find something that so totally changes our picture of what happened in the past, as is true for this case," says archaeologist Vincas Steponaitis of the University of North Carolina, Chapel Hill, who is president of the Society for American Archaeology. Tristram Kidder, a professor of anthropology at Tulane University in New Orleans, agrees: "I think it's a wonderful contribution."

Watson Brake first came to scientific attention in the 1970s, when local resident Reca Jones discerned its outline after a timbering operation clear-cut some of the area. Initially, researchers chalked it up to the Poverty Point people, who flourished in the region from 3700 to 2700 years ago and also constructed conical mounds and long ridges. Saunders, however, was skeptical. In walking the mound area, he did not see any of the telltale stone tools associated with the Poverty Point people or any of the clay cooking balls that they had heated in fires and then placed in water for boiling food. Moreover, he saw no telltale refuse from later cultures.

With colleague Thurman Allen, a soil scientist from the Natural Resources Conservation Service in Monroe, Saunders cored the tallest mound at Watson Brake by auger in 1993. The pair discovered not only an ancient garbage dump below the mound but an important indicator of the earthwork's great antiquity: 1 meter into the mound, they encountered a reddish, clay-enriched layer of soil, a so-called soil "horizon" that could only have been formed over several thousands of years as iron and clay leached out above and concentrated below.

J. SAUNDERS/NORTHEAST LOUISIANA UNIVERSITY

Digging in. Archaeologists auger into Mound A to obtain core samples.

Fascinated, Saunders mounted excavations of the site. The work soon revealed that people had camped at Watson Brake both before and during construction, leaving behind refuse and hearths. Moreover, radiocarbon dates on charcoal and on humates (organic acids from decayed vegetation in the soil) from horizons just underneath the base of the mounds showed that construction began at a startlingly early date: 5400 to 5300 years ago.

The early date fitted well, however, with the artifacts the team found beneath the mounds and scattered across some intermediate layers. None of the distinctive Epps or Motley projectile points of the Poverty Point people or their clay cooking balls turned up, nor did any of the imported stone known as novaculite that these avid traders regularly obtained from Arkansas. Instead, the team found Evans points, fired earthen blocks, and local stone favored by Middle Archaic bands more than 5000 years ago.

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Ancient clues. These artifacts pointed to an early origin for Watson Brake earthworks.

Still, Saunders wanted further evidence of the site's antiquity. He applied a dating method called optically stimulated luminescence to sediment samples gathered from midmound layers where people had once camped. This technique measures the buildup of electrons that occurs in sediments after they are buried and no longer exposed to sunlight. The result indicated that an intermediate stage of mound building had occurred sometime over 4000 years ago. He also dated samples from horizons below the mound with an experimental technique that estimates age from the amount of oxidizable carbon remaining in ancient organic sediments. The technique put the beginning of construction down to about 5180 years ago, in good agreement with the radiocarbon date.

The combination of all these lines of evidence, researchers say, makes the date entirely convincing. "There's just no question about it," says Jon Gibson, an archaeologist at the University of Southwestern Louisiana in Lafayette and an authority on the Poverty Point culture. "Saunders has come at it from too many different angles."

That leaves the puzzle of what spurred the Watson Brake people to build these ancient mounds. Archaeologists once thought mound building was linked to agriculture, which created food surpluses and tended to lead to more permanent settlements and more complex societies. But because there was little evidence of agriculture at places such as Poverty Point, many researchers thought that these mounds arose as a result of extensive trading networks, which fostered societies complex and prosperous enough to build them.

Trade did not seem to be a factor at Watson Brake, however, as the artifacts found were all made of local materials. Neither did agriculture. When Saunders and his colleagues gleaned charred seeds from the sediments and sent them to Kristin Gremillion, a specialist on ancient agriculture at Ohio State University in Columbus, she found no signs of domesticated plants. However, she did identify the wild ancestors of three domesticated plants—*Chenopodium berlandieri*, *Iva annua*, and *Polygonum* spp.—first cultivated in the American Southeast some 4000 years ago. Clearly, Archaic mound builders were already gathering and consuming the wild plants' starchy seeds.

In fact, Saunders says, the rich environment at Watson Brake may deserve much of the credit for making the construction project possible. The site perches on a terrace that, 5400 years ago, overlooked what was then the Arkansas River and an extensive wetland. Animal remains at the site suggest that the mound builders took full advantage of the varied habitats. In addition to hunting deer, turkey, raccoon, and other upland species, Watson Brake's inhabitants collected freshwater mussels and snails and fished both the main channel and the backwaters.

Indeed, the mound builders were adept fishers. Northeast Louisiana University paleontologist Gary Stringer and faunal expert Edwin Jackson of the University of Southern Mississippi in Hattiesburg identified at least nine fish species. The most abundant were freshwater drum, which weigh up to 27 kilograms. Catching these fish, especially during spring and summer when they are spawning and easily captured in nets, is a highly efficient way of obtaining food, notes Stringer.

But even though the team's work provides ample evidence of how the Watson Brake people mustered the food surpluses needed for the construction project, another big mystery remains. Saunders has so far unearthed few clues about what purpose the giant enclosure might have served. Soil sampling inside the earthwork retrieved few artifacts, even though team members screened sediments through fine geological sieves. This suggests that the builders did not conduct ceremonies or other activities within the enclosure.

Stranger still, the excavations to date show little evidence that people occupied the area once the complex was completed. It's as if the builders had nothing to keep them there once the job was done. "I know it sounds awfully Zen-like," Saunders concludes, "but maybe the answer is that building them was the purpose."

–Heather Pringle

Heather Pringle, a science writer in Vancouver, Canada, is the author of In Search of Ancient North America.

CHRONOBIOLOGY

Gene for Mammals' Body Clocks Found

As anyone who has suffered from jet lag knows, the body's 24-hour biological clock delivers a powerful timekeeping signal. In recent years, clock researchers have made significant progress in understanding the biochemical gears and springs that keep this clock running, largely by identifying a handful of genes that appear key to the process in a few animal and plant species. Now, a team at the Baylor College of Medicine in Houston, Texas, has come up with the first evidence that some of these genes may have been conserved over the course of evolution, indicating that universal mechanisms across all species might keep the clock ticking.

U. ALBRECHT

Night and day. 11 a.m.: New gene, *m-rigui*, is expressed in a mouse's brain (*top*, yellow). 11 p.m.: All is quiet.

In today's issue of *Cell*, molecular geneticist Cheng Chi Lee, developmental biologist Gregor Eichele, and their co-workers report isolating a gene in mice and humans similar to the *period* (*per*) gene of the fruit fly *Drosophila melanogaster*. The *per* gene, which is turned on and off in a daily cycle, appears to work with other genes to create an oscillating mechanism that runs the fly's internal clock (*Science*, 3 November 1995, p. 732). "This is an extremely interesting piece of work," says clock researcher Joseph Takahashi at Northwestern University in Evanston, Illinois. "This is really the first molecular link between the *Drosophila* clock gene story and the emerging mouse gene story."

The Baylor group found the new gene during a hunt for DNA sequences that code for regulatory proteins on human chromosome 17. Out of five such sequences they identified, one was found to code for a protein that shares 44% of PER's amino acid sequence and showed greater similarity in a region of the protein, called the PAS domain, which is a common feature in most clock genes identified so far. They dubbed this gene *RIGUI* and in a similar study in mice found the same gene on chromosome 11, which they dubbed *m-rigui*.

This finding is likely to be bolstered by another paper, from Hajime Tei of the University of Tokyo and co-workers in Japan and California—expected to be published shortly in *Nature*—which will also report the identification of putative human and mouse homologs of *Drosophila*'s *per* gene. Takahashi says that this group's results are so similar that he believes "it's the same gene."

In a clue to the function of *RIGUI*, Lee and his colleagues found that expression of the gene rises and falls according to a circadian pattern, like that of *per*. For example, Lee and his colleagues measured the production of *m-rigui* messenger RNA (mRNA)—a necessary intermediate in protein synthesis—in a part of the mouse brain called the suprachiasmatic nucleus, thought to be the master clock regulator in mammals. They found dramatic swings in mRNA levels over a 24-hour period, even when the animals were kept in the dark. Moreover, the timing of *m-rigui* expression could be altered by shifting the timing of the animals' light and dark cycle. Both of these effects are key tests of an internally controlled circadian pattern.

These findings imply, Lee and his colleagues say, that *RIGUI* may play the same role that *per* does in the fruit fly. They caution, however, that the sequences are not close enough for them to be sure. Steven Reppert, a neurobiologist and clock researcher at Massachusetts General Hospital in Boston, echoes this caution, saying that the partial homology with *per* is not conclusive evidence that *RIGUI* has the same function in mammals that *per* does in insects. He adds that the oscillating expression of *RIGUI* in brain tissues does not prove that it is central to the clock's regulation. The only way to prove this, he says, would be to "knock out the [mouse] gene and see what happens to the circadian rhythms." If they are disrupted, Reppert concludes, the Baylor group's results would represent "a profound finding."

The Baylor group is now embarking on just such experiments. And despite their reservations, Reppert and other researchers agree that the new results are likely to open new doors in clock research. "We will now be able to test molecular models of the clock in mammals," says Takahashi. "Once we get a couple of these genes, the next ones will start falling into place."

–Michael Balter