

Find Suggests Weaving Preceded Settled Life

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MINNEAPOLIS— SOME 27,000 years ago, an innovative group of hunters and gatherers were in the habit of setting up their summer base camps near a river along the Pavlov Hills in what is now the southeastern Czech Republic. They mixed the fine soil with water and molded it into human and animal figurines and fired them, creating the oldest known fired ceramics. They took the two-and-a-half-million-year-old technology of flaking stone tools a step further by grinding them into smoothly polished pendants and rings, the earliest known examples of ground stone technology in Europe.

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And now, at a meeting here last week of the Society for American Archeology, scientists announced that this same group, contemporaries of the earliest cave painters of France and northern Spain, has left the oldest evidence of weaving in the world. The site has yielded clay fragments bearing impressions of textiles or basketry, which according to Dr. James M. Adovasio of Mercyhurst College in Erie, Pa., and Dr. Olga Soffer of the University of Illinois at Urbana, push back the known origin of these technologies at least 7,000 years, to 27,000 years ago.

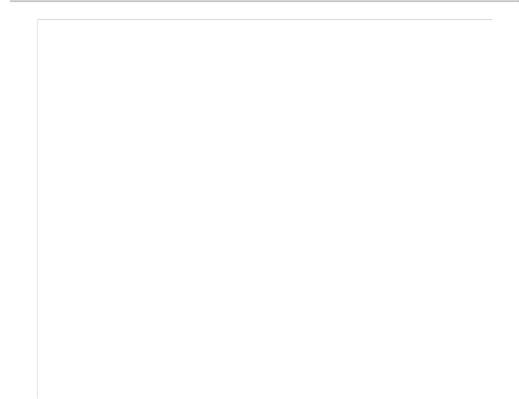
It also validates a suggestion long offered by some archeologists that the origin of textile technology by far predates the Neolithic period of plant and animal domestication to which it had traditionally been assigned. Archeologists tended to believe that people did not weave until they abandoned the migratory hunting and gathering way of life and settled into permanent agricultural villages with domesticated plants and animals, a process that was getting under way in many parts of the world by around 8000 B.C. and is known as the Neolithic. Once they were sedentary, the story went, they could develop such technologies as ceramics and weaving.

"I think this will really blow the socks off the Neolithic people because they always think they've got the first of everything," Dr. Soffer said in an interview. "We have this association of fabric and ceramics and ground stone technology with the Neolithic although we've known about ceramics from these people at Pavlov for a while, but it was written in Czech or German and it didn't make an impact."

Some scholars of the Upper Paleolithic, which in that part of the world stretches from about 40,000 to 12,000 years ago, had predicted that textiles might have been around at that time. "It's not very unexpected but it's very important," said Dr. Anthony Marks, an archeologist at Southern Methodist University in Dallas.

Textile specialists, especially, were encouraged by the discovery.

"It indicates how important textile structures are," said Dr. John Peter Wild, an archeologist at the University of Manchester in England. "You're way ahead of metals. The only technologies you have to compare it with in sheer brilliance of execution are stone implements. This is the organic technology that matches it."



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Previously, the earliest known basketry dated to no earlier than around 13,000 years ago and the oldest piece of woven cloth was a 9,000-year-old specimen from Cayonu in southern Turkey. The oldest known twisted fibers, which could have been woven into basketry or textiles, were found in Israel and date to about 19,300 years ago.

Because baskets and textiles are made of organic materials, they perish rapidly once deposited, Dr. Adovasio said in an interview. Not surprisingly, the absence of hard evidence for textiles in the Paleolithic molded the theories on the origins and development of weaving technology.

The evidence presented last week consists of four small fragments of fired clay bearing negative impressions of a textile or finely twined basket, Dr. Soffer said. Along with hundreds of thousands of other artifacts at the rich site, they were excavated in 1954 by Dr. Bohuslav Klima, a Moravian archeologist. In the summer of 1990, Dr. Soffer, sorting through about 3,000 clay fragments in an effort to categorize them stylistically, noticed four pieces, about the size of a quarter, with markings on their concave sides.

She photographed them, with the notation "plant fibers?" and the next year showed them to her colleague, Dr. Adovasio, who, she said, went "absolutely ballistic."

Three radiocarbon dates of ashes at the site ranged from 24,870 to 26,980 years ago, and Dr. Soffer said the fragments could date from anytime between. She said she was entirely confident of the dating because there was no evidence at the site of any human occupation at all after 24,870 years ago, so the pieces could not have come from any other layers deposited later.

Analyzing magnified, high resolution photographs of the fragments, Dr. Adovasio determined that two fragments bore two different weaves and two bore indistinct parallel impressions that might be from warps, the vertical threads of a weave. He could see the alignment of the plant fibrils in the photographs so he knew the fibers were made of plant material, or bast, and not sinew, which can also be woven. Among the plants that could have provided bast were the yew and alder trees or the milkweed and nettle, the researchers said.

The archeologists did not know whether the impressions were made intentionally or accidentally. Many of the fragments were found in ash deposits. Analysis of all four showed that they had been fired at 600 to 800 degrees Fahrenheit, which is consistent with a simple kiln or a bonfire, or even a dwelling burning down, Dr. Soffer said. One possibility is that the woven item was unintentionally pressed into wet clay near a hearth -- perhaps by walking on it -- and subsequently fired.

Because the fragments are so small and no selvage, or defined edge, is apparent on them, Dr. Adovasio could not determine what they came from. He said the mesh would have been similar to that in a potato sack and might have come from a bag, mat, clothing or a basket. While it would have been possible to make the pieces without some sort of loom, it would have been far easier using one, he said, even if that meant only tying one end of the warp around a tree and the other around one's waist.

"This demonstrates an amazing investment of energy," he said.

Dr. Elizabeth J. W. Barber, a prehistoric textile scholar at Occidental College in Los Angeles, noted that plain, or true weave, involved passing a weft, or horizontal, thread over one warp thread, under the next warp thread, over the next and so on. If a nonflexible stick is woven through the warp like this, then the process can be mechanized halfway. Raising the stick lifts up every other thread of the warp (or whichever warp threads are required for the desired weave) and the weft thread can be speedily pulled through. For the following pass, the position of the separated warp threads must be reversed and that is where a heddle, which individually holds the warp threads of the second group and attaches them to a bar, comes in.

The type of weave in the Pavlov clay fragments is "twining"; though it too can produce a cloth, it cannot be mechanized because the parallel weft threads cross each other. Dr. Barber said twining produced a more stable weave because the weft threads twisted around each other and prevented sliding.

"When you see them switching from twining over to the true weave or plain weave by around 7000 B.C., then they've figured out mechanization," she said. "They've given up stability of weave for speed of production."

Dr. Adovasio noted that twining itself was already a relatively advanced form of weaving technology. He suggested twining might even be as much as 40,000 years old.

"If they're making this, then they're making cordage," said David Hyland, an archeologist at Gannon University in Erie, Pa. Cordage, essentially plant fibers twisted together, includes string and rope.

"And if they can make this, they can make anything in the way of a net, trap or snare," said Dr. Adovasio, who believes that because of the scarcity of evidence, prehistorians had underestimated the importance of woven materials in early peoples' lives. Conversely, he said, because of their relative abundance, stone tools have been overemphasized in archeologists' interpretations of prehistoric economies.

"I don't buy a lot of the gender studies stuff," began Dr. Adovasio. "But mostly men have done the analysis of Paleolithic sites and they have in their minds the macho hunter of extinct megafauna. Guys who hunt woolly mammoths are not supposed to be making these."

The model of the Paleolithic men going off with spears to hunt while the women stayed home and gathered plants around the camp may be too simple, he said.

"Maybe they killed one mammoth every 10 years and never stopped talking about it," Dr. Soffer said.

At the Pavlov and nearby Dolni Vestonice sites, for example, Dr. Klima unearthed far more bones of smaller animals than of mammoths. While the former may have been hunted with spears, it is more likely that nets were used to capture small animals like rabbits, the archeologists said.

"This tool," noted Dr. Hyland, of cloth, "represents a much greater level of success where used for hunting than lithic tools."

Dr. Adovasio, who has been working with textiles for more than 25 years, said he hoped the discovery would inspire archeologists to learn more about how textiles and basketry decayed and to pay more attention to the possibility that textiles or their impressions are preserved on sites.

One mystery is what became of the apparently advanced technologies of these Central European hunters and gatherers after 22,000 years ago, when, as the weather gradually turned colder, the archeological record of their presence in the Pavlov Hills suddenly ceased.

"You've got the huge Scandinavian ice sheet coming down from the north and glaciers coming from the Alps and you get this no-man's land and people get out of there," Dr. Soffer said.

She suspects that some went east and some southeast. But except for a few random fired ceramics and bits of net or cord in eastern Europe, the technologies themselves remain silent for the next 7,000 to 10,000 years. When they resurface, the skills the Pavlov people employed so fancifully have been converted to practical purpose. The technique of stone grinding, instead of being used in decorative items alone, is now applied to making hoes and axes. Fired clay turns up not in figurines but in cooking and storage vessels.

"It had never dawned on these people that they could make a pot," Dr. Soffer noted.

Textiles and basketry, too, anchor themselves firmly into the technological landscape.

"It's like who invented the first flying machine? Leonardo da Vinci," Dr. Soffer said. "But Boeing didn't start making them until this century. There has to be a social and economic context for new technology. If you don't have the context, then it won't really go anywhere."

Photo: Traces of ancient weaving embedded in fired clay. (Size scale is in centimeters, about four-tenths of an inch each.) (Dr. J.M. Adovasio/Mercyhurst College, Erie, Pa.) (pg. C1) Drawing (pg. C10)

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