Fossil may expose humanity's hybrid roots

Last Nov. 28, archaeologists working in Portugal's Lapedo Valley, 90 miles north of Lisbon, chanced upon a child's burial. At first the researchers, led by Joao Zilhão of the Portuguese Institute of Archaeology in Lisbon, viewed the 24,500-year-old skeleton as an example of modern *Homo sapiens.*

The shallow grave resembled other Late Stone Age human burials in Europe. A seashell lay among the child's bones, which bore the stains of an intentionally applied red pigment.

By the time excavation of the skeleton concluded on Jan. 7, however, the scientists suspected that their find represented something far more interesting—an anatomical hybrid that could only have appeared so late as a result of extensive prior interbreeding between humans and Neandertals. *H. sapiens* and Neandertals both inhabited southwestern Europe for at least several thousand years, until around 30,000 years ago.

The Portuguese team called in an authority on Neandertals, Erik Trinkaus of Washington University in St. Louis, to examine the find. He agreed that they had uncovered a hybrid kid.

Zilhão announced the discovery at a press conference in Lisbon 2 weeks ago. Trinkaus described the skeleton last week in Columbus, Ohio, at the annual meeting of the Paleoanthropology Society. A full description of the new fossil will appear in Proceedings of the National Academy of Sciences.

"This kid surprised us," Trinkaus says. "The mosaic of anatomical features tells us that when Neandertals and modern humans met, they regularly interbred."

Some researchers at the Columbus meeting who saw slides of the new specimen echoed Trinkaus' view. Others argued either that any interbreeding was minimal or that the fossil merely represents a stocky modern human.

Much of the child's skull was crushed, although the scientists recovered braincase pieces and the lower jaw and teeth. The rest of the skeleton was largely intact. Tooth development places the child's age at between 3 1/2 and 5 years, Trinkaus notes. Radiocarbon analyses yielded the burial's estimated age.

Modern human traits observed on the skeleton include a well-formed chin and relatively small lower arms. But the huge "snowplow" jaw, large front teeth, short legs, and broad chest betray a Neandertal heritage, Trinkaus says.

The prehistoric child did not belong to a group of modern humans who may have evolved squat bodies suited to Ice Age conditions, he asserts. Southwestern Europe did not get cold enough to instigate such changes, in his opinion.

Trinkaus suggests that Neandertals and modern humans interbred as closely related members of the same species, as some subspecies of baboons and other animals interbreed today.

Scientists who argue that modern humanity arose simultaneously in two or more parts of the world over at least the past 1 million years support Trinkaus' interpretation. "The Portuguese find indicates that one anatomically variable human species inhabited western Europe," contends Milford H. Wolpoff of the University of Michigan in Ann Arbor. "Human populations have always interbred."

Christopher B. Stringer of the Natural History Museum in London, a proponent of a theory of more recent human origins in Africa, disagrees. The fossil youngster may be an unusually stocky modern human, Stringer holds. Even if further analysis confirms its hybrid status, he suspects that prehistoric interbreeding rarely occurred. Numerous fossils of early modern humans show no signs of Neandertal contacts, Stringer notes.

Another out-of-Africa advocate, Jeffrey H. Schwartz of the University of Pittsburgh, views the fossil child as a modern human who possibly suffered growth abnormalities that created a bulky lower body. "I don't see any evidence of hybridization," Schwartz remarks. —*B. Bower*

Portuguese Institute of Archaeology

Fossil child lies partly excavated at Portuguese site.

Knotting weakens a polymer molecule

The perverse tendency of loosely coiled ropes to acquire knots is a frustratingly familiar phenomenon to many sailors and anglers. Long, flexible molecules, like DNA or those that make up polymers, can also suffer knotting (SN: 11/16/96, p. 310).

In computer simulations of the effect of tying a simple trefoil, or overhand, knot into a polymer strand, researchers have now demonstrated that such a knot significantly weakens the molecule. Like a tightly knotted rope, a knotted polymer molecule is weakest and most likely to break adjacent to the knot.

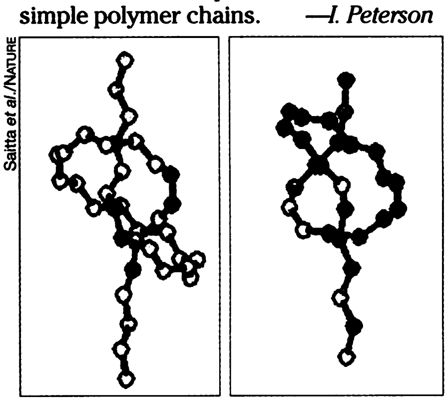
Chemists A. Marco Saitta and Michael L. Klein of the University of Pennsylvania in Philadelphia and their coworkers report the results in the May 6 Nature.

"Finding that molecular knots break like ordinary knots is wonderful news," comments Penn physicist Philip Nelson (SN: 4/26/97, p. 256). "The deep message in this and [other recent research] is that single macromolecules really are ordinary physical objects, obeying the rules of elasticity theory."

Saitta and his colleagues modeled the physical behavior of a knotted hydrocarbon chain, representing a portion of a polyethylene molecule. They discovered that a loose knot produces little noticeable strain along the chain. When the knot is confined to a segment consisting of fewer than 35 carbon atoms, however, the strain is much larger. In a strand only 28 carbon atoms long, the stress becomes highly concentrated in bonds just next to the knot.

Calculations suggest that 23 carbon atoms form the tightest knot that can be sustained in a polyethylene strand without breaking it, the researchers report.

A team of scientists in Japan has recently confirmed experimentally that a knotted filament of a cellular protein known as actin also tends to break at bonds neighboring the knot, just as predicted in the computer simulations of simple polymer chains. —*I. Peterson*



Saitta *et al.*/Nature

Strain energy distribution in knotted polymer strands consisting of 35 carbon atoms (left) and 28 carbon atoms (right). In the tighter knot (right), the strain energy is highest (shown in red) at bonds immediately outside the knot's entrance points.

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