Hip bones imply early humans lived large

As indelicate as it sounds, a rare pair of nearly complete pelvic bones has thrust anthropologists up against the impressively large bodies of human ancestors. More than 200,000 years old, those pelvic fossils—one newly unearthed in Spain and the other extensively analyzed for the first time although it was discovered in China in 1984—belonged to individuals whose reconstructed physical build makes most people living today look puny.

No other substantial pelvic remains from members of the human evolutionary family come from the same period as the new find. An African *Homo ergaster* pelvis dates to around 1.5 million years ago, and an Israeli Neandertal pelvis dates to about 60,000 years ago.

Separate investigations of the Spanish and Chinese fossils now suggest that modern humans have shrunk from the ample anatomical norm of their fossil ancestors, which included a long, broad, and thick pelvis for both sexes.

"A narrow pelvis could be a unique modern human condition," contends the Spanish team, led by Juan-Luis Arsuaga of Complutense University of Madrid. That argument receives support from the recent examination of the Chinese fossil pelvis, according to Karen R. Rosenberg of the University of Delaware in Newark.

The Spanish fossil, attributed to a male, makes its debut in the May 20 NATURE. Rosenberg presented her team's analysis of the Chinese specimen, which the researchers suspect was a female, last month at the annual meeting of the American Association of Physical Anthropologists in Columbus, Ohio.

A cave in northern Spain's Atapuerca Mountains yielded the fossil pelvis described by Arsuaga and his coworkers. They found it in sediment from which they had already extracted fossil individuals classified as Neandertal ancestors from more than 200,000 years ago (SN: 4/10/93, p. 228).

The thick bones of the ancient male pelvis, which flare out at the top, form a triangular opening through which a modern human newborn could easily pass, the scientists say. Females in this ancient population would have had even wider pelvic canals, the team argues, to allow for the delivery of babies larger than those of modern humans.

The individual represented by the fossil stood about 5 feet, 8 inches tall and weighed at least 210 pounds, according to Arsuaga's group. Other evidence indicates that the average body mass of ancient *Homo* species markedly exceeded that of modern humans (SN: 5/24/97, p. 322).

Rosenberg and her colleagues also found evidence of heft. No other fossil female in the human evolutionary family approaches their Chinese specimen's size. She stood an estimated 5 feet, 6 inches and weighed about 172 pounds.

The group, led by Rosenberg examined a partial skeleton known as the Jinniushan specimen. Chinese investigators had excavated it from a collapsed limestone cave in northeastern China. According to analyses of radioactive elements in animal teeth found in the same cave, the skeleton dates to about 280,000 years ago.

Rosenberg classifies the Jinniushan specimen as an archaic, or early, *Homo sapiens*. Although originally thought to be a male, the specimen has a cranium that looks more like those of females from that period, she says.

The ancient woman's large braincase is proportional to her substantial body size, Rosenberg contends. Overall, in her view, the Chinese specimen fits into the known progression of increasing brain size relative to body size that occurred in *Homo* between 600,000 and 150,000 years ago.

From even more ancient fossil ancestors up to archaic *H. sapiens*, human ancestors share a relatively thick, elongated frontal pelvis, Rosenberg says. The Spanish researchers suspect that that trait plus others exhibited by their specimen commonly occurred before the emergence of modern humans. Arsuaga and his team point out that a 3.2-million-year-old *Australopithecus afarensis* pelvis—part of the partial skeleton dubbed Lucy—looks much like their new fossil and is comparably broad relative to overall body size.

"The wide body of the Jinniushan specimen relative to its stature also appears to be adapted to living in a cold environment," Rosenberg says. She adds that the large size of both the Chinese pelvis and other bones relative to the ancient individual's height also suggests that biological adaptation to a cold climate occurred.

Arsuaga's group doubts that evolutionary responses to frigid conditions contributed to the anatomical features of the pelvis they uncovered. —*B. Bower*

Fusion fuel zips to core through back door

A few years ago, a new obstacle appeared in the path to the long-sought goal of generating more energy from magnetic fusion than is consumed. Scientists could no longer get enough hydrogen fuel into the reactor core. For the previous two decades, they were able to fire frozen fuel pellets through ports in the outside walls of the doughnut-shaped machines. However, as researchers pushed core temperatures of reactors to about 100 million°C, the plasma of ionized hydrogen in the machines became impenetrable to the BB-size pellets.

Now, scientists find that a fraction of the hydrogen in pellets that pass through the walls can once again reach the core, but they must be injected through the inside or top walls of the reactors' ring. By upping plasma density in the hottest zones of the reactor, the new method of launching fuel pellets should boost fusion energy output, says Mike Gouge of Oak Ridge (Tenn.) National Laboratory (ORNL). "Inside launch is . . . an elegant way to get the material where it needs to go," he says.

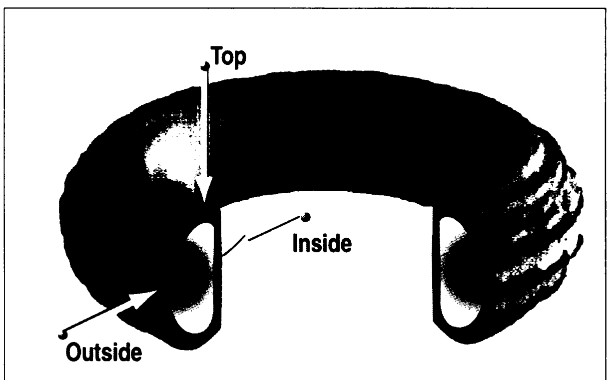
Peter T. Lang and his colleagues at the Max Planck Institute for Plasma Physics in Garching, Germany, pioneered the method. This spring, ORNL scientists observed dramatically improved penetration with pellets launched from inside and atop the doughnut of the DIII-D National Fusion Facility in San Diego.

These pellets penetrated twice as far into the ring despite traveling at only a fifth the speed of pellets launched at the outside locations. Engineers must slow pellets heading for inside or top penetration because of the danger of shattering them in the twisted pipes required to reach those spots. Experiments continue this week at ORNL.

The Garching results have already won many converts. "Now, every big fusion machine is changing to this new scenario," Lang says.

Wayne A. Houlberg of ORNL explains that the magnetic field strength around the ring drops off from the inside walls toward the outside ones. He and other theorists suspect that pellets vaporize in microseconds to form mixed clouds of protons and electrons with weak electrical fields. Magnetic forces then push the clouds outward toward fainter magnetic fields, he says. —*P. Weiss*

General Atomics/ORNL



Magnetic forces in this doughnut of ionized gas, or plasma, push fuel into the hot core (orange) from inside the doughnut hole but repel it from outside.