Early humans make their marks as hunters

The earliest undisputed remains of *Homo sapiens*, dating to around 100,000 years ago, come from caves at the mouth of South Africa's Klasies River. For the past 15 years, a heated debate has centered on whether those ancient coastal humans occasionally hunted in simple ways, such as driving their prey over cliffs, or obtained meat solely from carcasses left by lions and other predators.

A new analysis of animal bones previously unearthed at the Klasies River site suggests that *H. sapiens* exhibited much more hunting prowess than either side of the debate has given them credit for.

"Early modern humans at Klasies River mouth were active hunters," contends anthropologist Richard G. Milo of Chicago State University. "Their behavior appears to have been as near-modern as their anatomy."

Milo conducted a microscopic study of the frequency and distribution of butchery marks on more than 5,400 animal bones found among *H. sapiens* remains in a Klasies River mouth cave. He presented his analysis at the annual meeting of the Paleoanthropology Society in St. Louis last week.

Nearly one in five of the animal bones bears incisions typical of butchery, Milo says. That proportion far exceeds a prior estimate for the same material reported by Lewis R. Binford of the University of New Mexico in Albuquerque.

Butchery marks appear on bones from animals of all sizes and congregate at major skeletal joints, where a fresh kill would have been most easily cut into pieces. The prime body parts, such as upper legs, found in the cave indicate ready access to carcasses by hunters, Milo notes. The remains display few signs of carnivore chewing or gnawing.

In addition, the broken tip of a spear point is embedded in a neck bone from an extinct giant buffalo, one of the largest Stone Age game animals in southern Africa. Deep gouges in five vertebrae from other ancient creatures may represent stab wounds inflicted by human weapons, according to Milo.

Early *H. sapiens* at Klasies River probably formed coordinated hunting groups that exploited the behavior and habits of their prey, Milo proposes. In his view, hunting parties drove animals into pits studded with pointed stakes and may have run smaller game off nearby cliffs.

"This is a very important study," remarks Alison S. Brooks, an archaeologist at George Washington University in Washington, D.C. "Milo has exploded the argument that Middle Stone Age people were not competent hunters and did not produce projectile points."

Brooks theorizes that the folk at the Klasies River mouth ambushed animals from carefully chosen hiding spots and then thrust spears into them.

Other evidence suggests that human ancestors living in Africa between 400,000 and 90,000 years ago made sophisticated stone tools and other items linked to modern cultural behavior (SN: 12/2/95, p. 378). In Europe, wooden hunting spears have recently been dated to 400,000 years ago (SN: 3/1/97, p. 134). —*B. Bower*

Showy comet lives up to its billing

Halley's comet captured the public's imagination but proved disappointing as a spectacle. Hyakutake's limited engagement left scientists hungering for more. Hale-Bopp, however, has satisfied both audiences.

"This is the first time we've had a comet with a lot of notice that really did live up to expectations," says Brian G. Marsden of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. Hale-Bopp's closest approach to the sun, on April 1, sped the melting of the comet's nucleus, making the tail longer and wider. The comet should remain bright for a few weeks, but the waxing moon may obstruct the view, Marsden said.

While Hale-Bopp's fiery performance unfolds, astronomers are compiling an inventory of its ingredients. The list consists mainly of common molecules like water and carbon dioxide, but it includes some never before detected in a comet, says Harold A. Weaver of Johns Hopkins University in Baltimore.

These molecules—formic acid, sulfur dioxide, cyanoacetylene, H_2CS—and new isotopes of hydrogen cyanide and carbon monosulfide may have existed in other comets but in such tiny proportions that they were hidden behind more abundant ones. "You need a very bright comet like Hale-Bopp to detect them," says Weaver.

The comet's next appearance is tentatively scheduled for 4397.

—P. Smaglik

I. Griffin/Astronaut Mem. Planetarium & Observ.

Cell death protein triggers diabetes

In the grisly film *The Silence of the Lambs*, serial killer Hannibal Lecter becomes angry with a jail mate and uses formidable powers of persuasion to convince him to commit suicide by swallowing his tongue.

While diabetes may never become the subject of an Oscar-winning movie, researchers are finding that this autoimmune disorder may stem from a Lecter-like strategy: Immune cells in the body seem to induce suicide in the insulin-producing islet cells of the pancreas (SN: 2/1/97, p. 72).

A new study unexpectedly reveals that the suicide method chosen by the troubled islet cells depends on a cell surface protein called Fas. Furthermore, this finding suggests that scientists who have been pursuing a novel transplant approach to cure diabetes may need to modify their plan.

Researchers have recently found that Fas commands the cells that bear it—usually immune cells, not islet cells—to commit suicide when a cell bearing a protein called Fas-ligand (FasL) interacts with it. In this way, certain FasL-covered tissues, such as those of the eye and the testes, stay free of patrolling immune cells (SN: 10/21/95, p. 263). Even some cancer cells display FasL, thereby killing immune cells that target tumors (SN: 2/8/97, p. 88).

Inspired by these observations and hoping to create islets that would not be rejected by the immune system when transplanted, several research groups have rushed to genetically engineer mice to display FasL on the surface of pancreatic cells.

"The idea was to protect islet cells from attack by immune cells," says Alexander V. Chervonsky of Yale University School of Medicine. Mice of a diabetes-prone strain known as NOD, for example, were expected to become resistant to the disease when engineered to bear FasL on their islet cells.

Yet Chervonsky and his colleagues report in the April 4 CELL that mice of most FasL-bearing NOD strains develop diabetes frequently. Moreover, when injected with diabetes-causing immune cells, the FasL mice developed the disease even more quickly than normal NOD mice.

While probing these puzzling findings, Chervonsky's group discovered that the immune cells induce the islet cells of the mice to make Fas. Consequently, the islet cells, now carrying both Fas and FasL, trigger suicide among themselves. The resulting cell death leads quickly to diabetes.

The scientists next found that diabetes in NOD mice that haven't been genetically engineered seems to result from Fas production by islet cells. Both in NOD mice and in people, diabetes occurs in stages. First, immune cells invade the pancreas. Later, islet cells start to die—decreasing insulin production and elevating sugar concentrations in the blood.

Chervonsky's group found that as NOD mice age, their islet cells display more Fas, presumably in response to chemicals released by invading immune cells.

The scientists also bred NOD mice with mice that could not make Fas. The resulting hybrids never developed diabetes, even when injected with immune cells that ordinarily cause the disease, Chervonsky's team reports.

Therefore, diabetes in NOD mice, and probably in many people, occurs because immune cells gradually incite islet cells to make Fas, says Chervonsky. Those islets, he explains, commit suicide when their Fas molecules interact with FasL proteins on the immune cells.

Chervonsky and other researchers note that these findings suggest an extra requirement for the proposed strategy of transplanting FasL-bearing islet cells into people: Eliminate the suicide weapon.

"You should knock out Fas in the transplanted tissue," says Richard Duke of the University of Colorado Health Sciences Center in Denver.

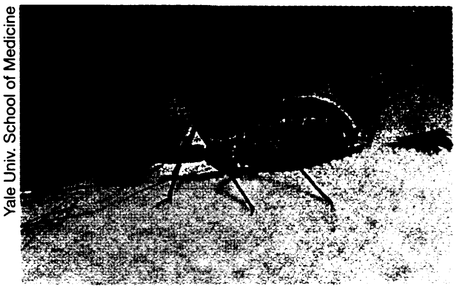
Some investigators, however, caution that diabetes-causing immune cells could have other ways of inducing Fas-deprived islets to commit suicide.

"There may be more than one way to kill the cell, or rather induce it to kill itself," says Jonathan D. Katz of Washington University School of Medicine in St. Louis. —*J. Travis*

Insect-borne disease: Curing the carrier

Like the cockroach and the pigeon, the reduviid bug has made itself at home alongside humans—literally. It lives within the walls of adobe houses in Latin America, where it plays a role in transmitting Chagas' disease.

The kissing bug (*Rhodnius prolixus*), as it's sometimes called, comes out at night to get a meal of blood from the face of a sleeping human host. The protozoan parasite it leaves behind can permanently infect a person. Heart and other muscles break down, often leading to death years or decades later.


Yale Univ. School of Medicine

A blood-sucking reduviid bug deposits a droplet containing protozoan parasites and symbiotic bacteria.

"It's a very silent disease" with no good drug cure, says Frank F. Richards of the Yale University School of Medicine. Of the roughly 17 million people infected with the protozoan (*Trypanosoma cruzi*), an estimated 50,000 die from Chagas' disease each year.

Richards and his colleagues are taking an unusual approach to combating the disease by enlisting the services of a third organism—the bacterium *Rhodococcus rhodnii*, which lives symbiotically in the gut of the reduviid bug. The researchers have genetically engineered the bacterium to express cecropin A, a peptide in the defense system of insects that kills the protozoans, they report in the April 1 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Young reduviid bugs typically acquire the bacterium as they probe through fecal pellets left by other insects, a behavior the researchers are trying to exploit to disperse the engineered form. They are testing how well the dispersal and killing system works on caged insects in Guatemala.

"It's exciting work. This is just fun stuff," says Louis V. Kirchhoff, who is developing a vaccine for Chagas' disease at the University of Iowa in Iowa City. Still, he questions whether the intricate scheme will ever make a difference in developing countries like Bolivia, where Chagas' disease is widespread.

Transmission has already been reduced in other countries by plastering the walls of houses and applying insecticides. "The low-tech approach is clearly working," says Kirchhoff.

With pesticide use comes the threat of resistance and other problems, the Yale researchers point out. They say that their symbiotic strategy might also curb diseases transmitted by sand flies or tsetse flies, for example, or even some plant diseases. "The idea is that this could potentially be a generic system applicable to other insect vectors," says Yale's Ravi V. Durvasula. —*C. Mlot*

Superfluid gyro detects Earth's spin

Measuring fluctuations in Earth's rotation rate requires a sensitive laboratory instrument. Now, two groups of researchers have exploited the peculiar quantum properties of superfluid helium to build novel gyroscopes that can sense Earth's spin.

"We have demonstrated a new kind of instrument that can detect absolute rotation at a very sensitive level," says physicist Richard E. Packard of the University of California, Berkeley, who heads one of the groups. In principle, the new device has the potential to surpass the most sensitive gyroscopes available today for high-precision measurements of rotation rates.

Packard and his Berkeley colleagues Keith Schwab and Niels Bruckner describe their device in the April 10 NATURE. Eric Varoquaux of the University of Paris-South in Orsay, France, and his coworkers presented their findings last year at a conference in Prague.

A superfluid helium gyroscope takes advantage of the fact that the flow of a superfluid filling a doughnut-shaped container is quantized. In this case, the flow velocity multiplied by the length of the path along the center of the toroidal channel must be zero or a whole-number multiple of a fundamental quantity determined by Planck's constant and the mass of a helium atom.

Sitting on a lab bench, such a container actually rotates, owing to Earth's spin. For example, if the enclosed superfluid helium is in its zero-velocity state, displaying no net flow, the container must move relative to the helium. To an observer in the laboratory, however, the superfluid appears to be flowing around the torus.

The trick is to find a way of precisely measuring the relative motion of the helium inside the container.

A decade ago, Varoquaux and his colleagues demonstrated the possibility of making that measurement by placing a partition inside the torus and monitoring the flow through a tiny pinhole in the barrier. Because the superfluid has to maintain a zero net flow, liquid must squirt through the pinhole at a high speed in a direction opposite to the rotation.

Developing the requisite technology took much painstaking effort, however. Last year, Varoquaux and his coworkers succeeded in measuring Earth's rotation rate to within 2 percent. Then, Packard and his group made that measurement with a different device based on the same principle. They achieved a precision of 0.5 percent, independently corroborating and improving upon the French results.

Packard and his colleagues contend that it should be feasible to increase the sensitivity of their superfluid gyroscope by a factor of 10,000. Such an improvement would make it possible to monitor daily fluctuations in Earth's rotation rate using a laboratory instrument rather than by relying on astronomical or satellite-based methods. —*I. Peterson*