T. D. WHITE/BERKELEY

Close shave. Was flesh stripped from the 600,000-year-old Bodo skull in an act of cannibalism?

rian Alban DeFleur is finding that Neandertals may also have feasted on their kind in the Moula-Guercy Cave in the Ardeche region of France, where animal and Neandertal bones show similar processing. Taken together, says White, "the evidence from Krapina, Vindija, and Moula is strong."

Not everyone is convinced, however. "White does terrific analysis, but he hasn't proved this is cannibalism," says Bahn. "Frankly, I don't see how he can unless you find a piece of human gut [with human bone or tissue in it]." No matter how close the resemblance to butchered animals, he says, the cut marks and other bone processing could still be the result of mortuary practices. Bullock adds that warfare, not cannibalism, could explain the damage to the bones.

White, however, says such criticism resembles President Clinton's famous claim about marijuana: "Some [although not all] of the Anasazi and Neandertals processed their colleagues. They skinned them, roasted them, cut their muscles off, severed their joints, broke their long bones on anvils with hammerstones, crushed their spongy bones, and put the pieces into pots." Borrowing a line from a review of his book, White says: "To say they didn't eat them is the archaeological equivalent of saying Clinton lit up and didn't inhale."

White's graduate student David DeGusta adds that he has compared human bones at burial sites in Fiji and at a nearby trash midden from the last 2000 years. The intentionally buried bones were less fragmentary and had no bite marks, burns, percussion pits, or other signs of food processing. The human bones in the trash midden, however, were processed like those of pigs. "This site really challenges the claim that these assemblages of bones are the result of mortuary ritual," says DeGusta.

After 30 years of research, Turner says it is a modern bias to insist that cannibalism isn't part of human nature. Many other species eat their own, and our ancestors may have had their own "good" reasons—whether to terrorize subject peoples, limit their neighbors' offspring, or for religious or medicinal purposes. "Today, the only people who eat other people outside of starving are the crazies," says Turner. "We're dealing with a world view that says this is bad and always has been bad. ... But in the past, that view wasn't necessarily the group view. Cannibalism could have been an adaptive strategy. It has to be entertained."

–Ann Gibbons

BIOPHYSICS

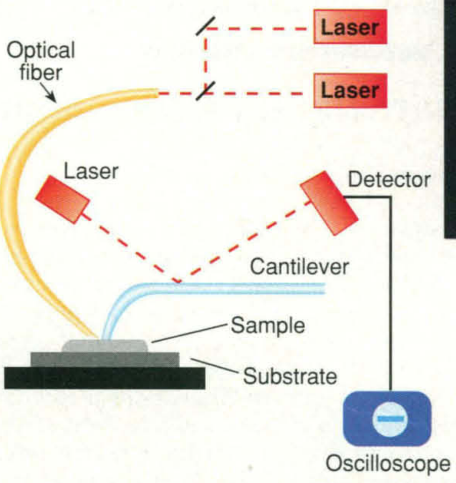
Feeling a Protein's Motion

There's a new way to watch proteins shimmy and dance as they carry out their biological tasks. Researchers traditionally follow these shape changes spectroscopically, deducing them from changes in the molecules' ability to absorb particular wavelengths of light. But in the 22 July *Proceedings of the National Academy of Sciences*, a group in Israel reports taking a more direct approach: planting the tip of an ultrafine glass fiber on top of the protein and actually feeling it move.

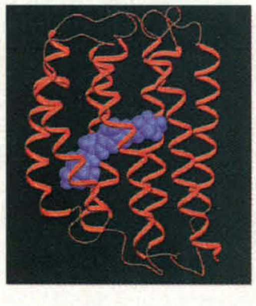
The technique gives researchers studying the rates and extent of conformational changes in proteins a new tool, sensitive to motions that spectroscopy cannot detect, says Mordechai Sheves of the Weizmann Institute for Science in Rehovot, Israel, a member of the group. Other researchers are intrigued, but say they want confirming evidence from other groups that the method really detects only protein motion.

The researchers—Aaron Lewis, Michael Ottolenghi, Sheves, and their colleagues at Hebrew University in Jerusalem and the Weizmann Institute—zeroed in on bacteriorhodopsin (bR), a protein found in the membranes of certain bacteria, where it responds to light by changing shape and pumping protons across the membrane. In order to "feel" these motions, the group used a variant of atomic force microscopy, a technique in which an ultrafine probe is scanned across a surface, sensing its atom-scale bumps and depressions to make an image.

For their experiment, however, Lewis and his colleagues kept the ultrafine probe in one place, poised atop a thin film of bR-filled membranes. In response to pulses of laser light, the proteins changed shape and then relaxed again in a matter of milliseconds. At the same time, another laser sensed a minuscule displacement of the probe tip. To show that the motion wasn't caused by laser-induced heating, the group used a well-documented property of bR—that another, appropriately delayed laser pulse of the right wavelength can reverse the photoreaction, stopping the protein midcycle and sending it back to its initial state. The second pulse sent the tip back toward the sample, as expected; heating would have displaced the probe further outward.



SOURCE: ROUSSO ET AL./PNAS 94



M. SHEVES/WEIZMANN INSTITUTE

Fine touch. Monitored by a laser, a probe senses shape changes in a film of the protein bacteriorhodopsin *(right)* when struck by pulses from other lasers.

Because the group's apparatus was equipped with an unusually stiff probe that is able to respond at high frequencies, they could track the protein motions on time scales of microseconds—unprecedented resolution for atomic force microscopy. The time course of the probe motion doesn't quite match the data obtained spectroscopically, but some of their time constants are in rough agreement. According to Sheves, the group also detected stages of the protein's shape change that researchers have never reported before. These "spectroscopically silent" motions, says Sheves, point to a new model for the initial responses of the protein to light.

Sheves expects the technique to deliver similar insights into the contortions of other molecules. "It gives you a new direct probe to look at conformational changes in proteins," says Sheves. Robert Glaeser of the University of California, Berkeley, is intrigued by the new model for bR's reaction to light, which he calls "unprecedented," but he thinks the work still needs some "reality checks." For one thing, while the researchers know the tip moved, they didn't convert the laser signal into an actual distance.

–David Ehrenstein