won awards.) Both collaborations dissolved in the 1970s, partly over Chagnon's belief that his work was not receiving proper credit. Asch died in 1994, Neel early this year.

Even as Chagnon continued his research, other researchers began to question his description of the Yanomamo as aggressive and "liv[ing] in a state of chronic warfare." The dispute grew heated in 1988, when Chagnon published an article (*Science*, 26 February 1988, p. 985) dismissing the common view that groups like the Yanomamo fight over scarce natural resources. Instead, he said, Yanomamo battles are mostly about women. Moreover, the killers—unokai, in the language—end up with dominant social positions that entitle them to more female partners, who provide them with more offspring, suggesting a genetic payoff for violence. At least three books attacked this sociobiological conclusion.

Among other points, *Darkness* argues that Chagnon's picture of the Yanomamo is not only wrong, but that some evidence for it was manipulated. Tierney—who spent more than a decade researching the book, including 15 months in the field—alleges that the anthropologist staged many of the fights recorded in his films with Asch. Worse, Tierney claims, some of these phony wars turned into real wars, as Chagnon introduced steel goods that led to deadly violence.

"There is no credible evidence to support Tierney's fantastic claims ...," responds Chagnon, who rejected *The New Yorker*'s offer to "submit to an interview." "Intelligent people base their judgements on evidence. Only believers in conspiracy theories and a large number of cultural anthropologists from the academic left leap to conclusions that are not only not supported by the available scientific evidence but contradicts and thoroughly refutes them."

Tierney's investigation of a 1968 measles epidemic has drawn the most attention. In a research trip to the area early that year, Neel, Chagnon, Asch, and the other members of the University of Michigan team vaccinated many Indians with Edmonston B measles vaccine, which was discontinued in 1975 and was already being replaced by vaccines with fewer side effects. Because the epidemic seems to have started at the places the research team vaccinated, Tierney suggests that the vaccine may have contributed to what became a terrible epidemic. Afterward, Neel apparently gave contradictory accounts about the way the epidemic started and did not explain why he used an older vaccine than the one used elsewhere in Venezuela.

In an e-mail to AAA officers that was leaked to the news media last week, Sponsel and Cornell University anthropologist Terence Turner—who are among the few anthropologists who have read the book—even speculate that Neel may have used the risky vaccine to test what they call his "fascistic eugenics" theory that dominant males like unokai could better survive catastrophes and pass on their genes.

Angered by these allegations, Neel's colleagues are lining up rebuttals. Samuel L. Katz, a measles specialist at Duke University, says the vaccine simply is not deadly, even to people without prior exposure. Doctors have "given hundreds of thousands of doses to malnourished infants in Upper Volta (now Burkina Faso) and Nigeria with no severe consequences," he argues in an e-mail passed on to *Science*. "Indeed, in the history of Edmonston B (a licensed U.S. product), I know of only two fatalities—two Boston children with acute leukemia under heavy chemotherapy."

The contretemps is not likely to end soon, although it may get better informed. Because Tierney is being kept mum by his publishers until the book appears, he cannot defend it. And some of his critics concede the oddity of attacking a work that they have not read. But even when both sides can fully argue their cases, in Sponsel's view, the debate will last a long time. "There's an incredible amount in the book," he says. "People are going to be working at it for years to come."

–CHARLES C. MANN

PALEOFORENSICS

Ice Man Warms Up for European Scientists

After spending about 45 million hours in a deep freeze, Italy's "Ice Man" was thawed for 4 hours earlier this week in an Italian museum to allow scientists to snip out tiny fragments of bone, teeth, skin, and fat. Scientists hope that turning up the heat on the famous emissary from Neolithic Europe could help solve such lingering puzzles as who his kin were and what caused his death.

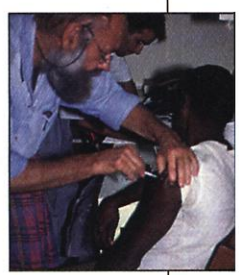
Hacked from a glacier in the Ötztaler Alps in 1991, the 5200-year-old mummy, known as Ötzi, has already provided researchers with a breathtaking view of life in that prehistoric era. He carried a copper ax—a precious object indicating a high social rank, perhaps that

Cool science. Researcher takes samples from Ötzi during 4-hour thaw in his frozen state.

CREDITS: (TOP TO BOTTOM) T. JENKINS/AP PHOTO; A. OCHSENREITER/AP PHOTO

ScienceScope

Big Bucks for Big Diseases? The European Commission (EC) is gearing up to spend as much as $1 billion a year on three diseases closely linked to poverty. The windfall, to help countries suffering from AIDS, malaria, and tuberculosis, represents Europe's share of the commitment to combat the diseases made by the G8 group of industrialized countries at its summit in Okinawa, Japan, last July. Japan is also working on its post-Okinawa aid plan, said to amount to $3 billion over the next 5 years. The United States is unlikely to spell out its commitment until after the November elections, officials say.



A high-level roundtable this week in Brussels was expected to discuss how best to spend the additional aid. Meeting participants included EC president Romano Prodi, WHO Director-General Gro Harlem Brundtland, and the health ministers of potential recipient nations such as South Africa and Brazil. But no spending decisions are likely before December, says Lieve Fransen, an EC health policy analyst who is coordinating the roundtable. "The EC clearly recognizes that we have to do more, and do it better and faster," she says.

Fieldwork China has begun to draw up a detailed plan for handling genetically modified organisms in the wake of last month's signing of a biosafety protocol to implement a 1992 treaty. The so-called framework, which officials say will take years to implement, will attempt to strengthen the country's biosafety capabilities as well as conform to international standards.

China's previous regulations for transgenic materials mainly addressed laboratory practices and were promulgated by individual ministries. But the new rules will have "a much grander scope" that encompasses protecting the country's biodiversity, says Bai Chengshou of the State Environmental Protection Agency, which will manage the effort. Bai says the new framework will allow the country to improve its assessment of bioengineering technologies and stimulate biosafety research.

Chinese scientists have responded favorably to the framework. "We should pay more attention to the possible impact of transgenetic engineering on future generations, not just on its economic returns," says Wang Changyong, a research fellow at the Nanjing Environmental Scientific Research Institute. "We should take strict precautions against any risks."

of clan chieftain—and wore a waterproof grass cape much like those used by Alpine shepherds as late as the 19th century. Tattoos on his back and legs suggest that he practiced acupuncture—some 2 millennia before the therapy is described in Chinese records (*Science*, 9 October 1998, p. 242).

Indeed, Ötzi appears to have had good reason to seek pain relief. A short man who may have lived into his 40s—a ripe old age in the Neolithic—Ötzi had arthritis and his guts were infested with eggs of the whipworm, a parasite that would have caused wrenching pain. Needle marks near acupuncture points for the bladder hint at the possibility of a urinary tract infection as well.

Scientists studied Ötzi intensively in 1991, but a bitter custody fight between Austria and Italy imposed a 9-year hiatus on invasive research. After precise measurements showed that the mummy had been discovered 93 meters south of the Austrian-Italian border, Italian officials in 1998 installed Ötzi in a refrigerated room with a peephole for viewing in the South Tyrol Museum of Archaeology in Bolzano. Austrian and Italian scientists, who had by then mended fences, began planning new lines of inquiry.

On 25 September, a team of forensic scientists from the University of Verona, Italy, and the University of Glasgow, U.K., reexamined the body for signs of trauma. Their work in the months to come is aimed at answering one major question, namely, how he died. One hypothesis is that he simply fell asleep, exhausted, and froze. But Ötzi also had a few broken ribs, hinting at an accident. Damaged tissue in Ötzi's brain suggests a third hypothesis—a stroke. An effort to test this idea could get under way next year, says anthropologist Horst Seidler of the University of Vienna, who chaired the committee that selected the current projects. He and a team at Wake Forest University in Winston-Salem, North Carolina, next year will examine the timing of Ötzi's rib injuries.

Another key project seeks to clarify Ötzi's roots. In 1994, a mitochondrial DNA study showed that his genetic stock most closely matches that of modern central and northern Europeans (*Science*, 17 June 1994, p. 1775). Two Italian groups hope to extract better DNA samples from bone and narrow Ötzi's ancestry in hopes of learning more about migration patterns in Neolithic Europe. Complementing the DNA studies is an effort to analyze the strontium and lead isotopes in Ötzi's tooth enamel. Comparing the isotopic ratio with samples from 5200-year-old geologic layers in the region can help pinpoint where Ötzi spent his childhood.

One intriguing project in the offing would look at the process of mummification by comparing Ötzi's soft tissues—particularly fatty acid content—with samples from Juanita and other mummies found in the Andes. Seidler is negotiating a joint study with the discoverer of the Peruvian mummies, Johann Reinhard, and the University of Arequipa. But he worries about the effects of Juanita's current tour of Japan, which involves stops in more than 20 cities. "I fear that all the shows and environmental changes would not be so helpful," he says.

Last week's quick analysis of Ice Man evoked no such concerns in Seidler. Monday, he says, "was a great day for my South Tyrolean friends." –RICHARD STONE

GENOMICS

Structural Biology Gets A $150 Million Boost

Structural biology got a shot in the arm this week. The U.S. National Institute of General Medical Sciences (NIGMS) selected seven centers to be the initial test-beds for structural genomics, a field that aims to work out the structures of large numbers of proteins using robotics and advanced computers. The 5-year, $150 million program is intended to speed up the determination of three-dimensional, atomic-scale maps of proteins, which in turn should accelerate discovery of new drugs by giving pharmaceutical companies a closeup look at the proteins they are trying to target.

STRUCTURAL GENOMICS CENTERS FUNDED BY NEW PROGRAM

Center	Lead Institute	Target
New York Struc. Gen. Research Consortium	Rockefeller Univ.	Bacteria/yeast/ human
Northeast Structural Genomics Consortium	Rutgers University	Roundworm/fly/ human
Southeast Collab. for Struc. Genomics	University of Georgia	Bacteria/round-worm/human
The Structural Genomic Center	Lawrence Berkeley National Laboratory	Bacteria
Joint Center for Structural Genomics	Scripps Research Institute	Roundworm/ human
TB Structural Genomics Consortium	Los Alamos National Laboratory	Tuberculosis bacterium
Midwest Center for Structural Genomics	Argonne National Laboratory	Archaea/bacteria/ eukarya

"This is a major undertaking," says Gaetano Montelione, a structural biologist at Rutgers University in Piscataway, New Jersey, and leader of the Northeast Structural Genomics Consortium. "It's just a starting point for structural genomics. But it's a good start."

The program grew out of the widespread recognition that the Human Genome Project and similar gene-sequencing efforts are only the first step to understanding biology and disease. Although genes harbor the cell's storehouse of genetic information, proteins carry out the bulk of cellular chemistry. Genetic sequences determine the order of amino acids in the proteins they code for, but the chainlike protein molecules generally fold into 3D shapes that cannot be predicted. Fortunately, proteins tend to cluster into families that share similar overall 3D shapes, or "folds." By finding examples of each of these folds, structural genomics researchers hope to identify patterns that will enable computer models to predict the shapes of unknown proteins from their amino acid sequences.

That's a fairly safe bet, says Andrej Sali, a protein modeling expert at the Rockefeller University in New York City and member of the New York Structural Genomics Research Consortium (NYSGRC). Using the estimated 800 known separate protein folds, Sali and his colleagues have been able to create computer models for at least portions of 200,000 proteins. As such, he says the new structural genomics research effort will help modelers achieve "huge leverage" in understanding novel proteins.

Officials at the National Institutes of Health (NIH) say they hope the new program will enable them to determine the structure of as many as 10,000 proteins in the next 10 years. That's just a smattering of the more than 1 million proteins thought to be present in nature. Nevertheless, it would mark a surge in the pace of discovery for structural biologists, who have collectively solved the structures for only about 2000 unique proteins in the past 4 decades. It's also expected that the coming bolus of protein structures will reveal a large fraction of the estimated 1000 to 5000 protein folds thought to exist.

The centers, each a consortium of institutions ranging from universities and national labs to companies, plan to take slightly different paths to obtaining their protein structures. The TB Structural Genomics Consortium, a center headed by Tom Terwilliger of Los Alamos National Laboratory in New Mexico, for example, is planning to focus its structural work on *Mycobacterium tuberculosis*, the organism that causes tuberculosis, in an effort to spur new treatments for the disease. The NYSGRC, meanwhile, will take a more varied approach. "We're doing proteins from bacteria to man" in an attempt to come up