personal computer hard drives or a stack of CD-ROMs nearly 2 kilometers high. Particle physicists have always had to deal with reams of data flooding from their detectors, but nothing like LHC. "The current experiments at CERN's Large Electron-Positron collider generate a few terabytes per year," says David Strickland, a Princeton physicist working at CERN. "The new experiments will create 1000 times more data than that"—data that thousands of collaborators will need to find and use.

The researchers also need massive computer muscle to crunch the numbers. In SDSS, for example, an astronomer trying to puzzle through a possible case of gravitational lensing might need to sort through 10 million galactic objects in order to find an effect, using sophisticated statistical wizardry and careful mathematical filtering. "The resources required, for economic or political reasons, just cannot be created at any single location," says Foster.

Physicists now spend heaps of time locating data files and getting them processed. In searching for images representing how new particles created in a collision were slamming around the detector chamber, for example, a researcher may have to punch in a horrendous chain of computer commands to translate the raw numbers into a useful picture of the results.

GriPhyN and DataGrid will also work together with the Particle Physics Data Grid (PPDG) at the California Institute of Technology (Caltech) in Pasadena to provide a connected computational lattice for big physics experiments. Harvey Newman, a physicist at Caltech, is a principal researcher on PPDG and also a senior member of the GriPhyN group. "We'd always planned to study data transfer and file caching in the short term, then build a longer life system," Newman says. "Then GriPhyN came along." Farther afield, the European Commission's Information Society Technologies program has just invited DataGrid to apply for EU9.8 million (about US$8.6 million) to build research grids in Europe.

The international culture of physics fosters such grand sharing, but pitfalls may loom. "We're all nervous about this," says physicist Paul Avery, co-PI of the project at the University of Florida, Gainesville. "My experience in large software projects is that unless you sit on top of this all the time, you do diverge." Newman was also nagged by doubts initially after hearing people discuss the idea at a meeting. "Some people said, 'We'll build our national grids and then make them work together.' But this does not work," Newman says. "Fortunately we haven't built anything yet, so there is a good chance that we'll all build the same thing."

Strickland, who is not directly involved in the grid construction, says that the grid builders appear to be taking the right tack by funding software engineering rather than just buying lots of new hardware: "They seem to be throwing the right resources at the problem." But that alone is no guarantee of success, he cautions. "Obviously, we've got a long way to go." –DAVID VOSS

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ANTHROPOLOGY

Misconduct Alleged in Yanomamo Studies

E-mail has been ricocheting among anthropologists as they nervously await the publication of a new book that charges some prominent researchers with professional misconduct—and much worse—in their studies of the Yanomamo, a native people in the Brazilian and Venezuelan Amazon. Written by journalist Patrick Tierney, *Darkness in El Dorado* (W. W. Norton)—an excerpt of which is scheduled for publication in *The New Yorker* next month—accuses anthropologists of creating a false picture of the Yanomami, manufacturing evidence, and perhaps setting off a fatal measles epidemic. "This is the Watergate of anthropology," says Leslie Sponsel of the University of Hawaii, Manoa. "If even some of the charges are true, it will be the biggest scandal ever to hit the field."

Although few anthropologists have actually read the book, which will not be published until mid-November, it has already stimulated an enormous reaction. The American Anthropological Association (AAA) has promised to hold a session on the book at its upcoming annual meeting. Napoleon Chagnon, a prominent Yanomamo specialist now at the University of California, Santa Barbara, whose research is challenged by Tierney, has already refused to participate in what he calls "a feeding frenzy in which I am the bait." (Instead, he is consulting libel lawyers.) Meanwhile, other researchers are recruiting statements to defend the late James V. Neel, a University of Michigan geneticist whom Tierney charges with distributing a measles vaccine in 1968 that may have worsened or even caused an epidemic that led to "hundreds, perhaps thousands" of deaths, say those who have read galleys of the book.

"Yanomamo anthropology has been a battleground for years," says one anthropologist with extensive experience in the area. "But the scale of these allegations is far beyond anything I've ever heard of before." The researcher, who requested anonymity for fear of being drawn into litigation, adds, "The prime rule for anthropology is not to harm the people you're working with. … This book is apparently saying that researchers have grotesquely violated those standards for 30 years."

The debate over *Darkness in El Dorado* is the latest, biggest skirmish in a decades-long battle over the Yanomamo. Living in more than 200 small villages near the headwaters of the Orinoco River, the 24,000 Yanomami are among the least Europeanized people on Earth. Although missionaries contacted them in the 1950s, the first long-term anthropological study of the Yanomami was not published until 1968, when Chagnon published *Yanomamo: The Fierce People*. Based on his University of Michigan dissertation, the book was quickly acclaimed as a classic, selling almost a million copies and becoming fodder for introductory anthropology courses across the globe. Meanwhile, Chagnon entered into collaborations with Neel, who was beginning a long-term study of Yanomamo genetics, and Tim Asch, a documentary filmmaker. (They eventually made 39 films, several of which

Anthropological warfare. Allegations have reopened a bitter battle over depiction of Yanomami as warlike.

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."