carried out on deliberately substructured databases, made by merging data from different ethnic groups—some of which were presented at the London meeting by statistician Ian Evett of the UK Forensic Science Service—still give adequate results.

Morton isn't prepared to go quite that far. He points out that good defense lawyers will always attack a simple application of the product rule, making it important to account for substructuring. But he argues that there's a population genetic statistic called "kinship," or F_{ST}, that can describe substructuring, and he says it would be easy to correct the probability calculations to account for conservative values of F_{ST}.

Despite the barrage of criticism, Lander vigorously defends the ceiling principle. "The courts were asking whether there was any method that met the legal standard for 'general acceptance by the scientific community,'" says Lander, not a method that would precisely describe population substructuring. Pointing out that the ceiling principle could still give odds of up to 6 million to 1 for a typical matching profile, Lander says: "I realize that there are some statisticians who are convinced that the odds should be 6 billion or 6 trillion to 1, but I can't see the practical point." The goal, he says, was to find a method conservative enough to win over most critics of the product rule, while still providing impressive enough odds to allow convictions.

In that regard, the report has been at least partially successful: Although Lewontin is still critical, his coauthor Hartl is now a strong supporter of the ceiling principle. And even Bruce Budowle, the leading DNA fingerprinting expert with the Federal Bureau of Investigation, concedes that problems with the admissibility of DNA evidence do seem to have eased since the NRC report came out in favor of DNA fingerprinting.

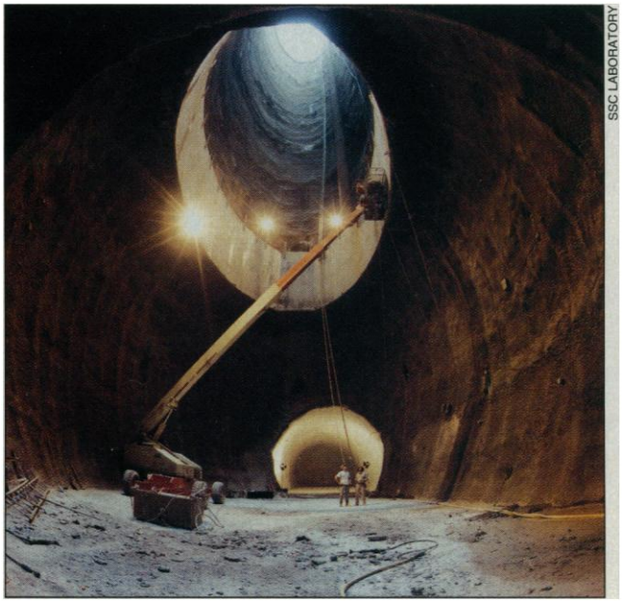
Indeed, some NRC panel members are worried that the current backlash against the report could undermine the progress Budowle describes. "I only worry that renewed controversy about wanting higher odds will confuse the courts into doubting that there is general acceptance that the ceiling principle provides a conservative estimate," says Lander. But Arizona State University law professor David Kaye doubts that defense lawyers would succeed in getting evidence ruled inadmissible because of this latest twist to the forensic DNA typing debate, as "nobody's disputing that some number should be presented." Indeed, Kaye predicts that the scientific criticism of the ceiling principle will eventually cause it to be replaced in the courts by less conservative methods. Maybe so, but it won't die a quiet death. Says Morton: "I don't think [we're] going to quit and forget about this."

–Peter Aldhous

SUPERCONDUCTING SUPER COLLIDER

The Presidential Transition Heightens Uncertainty

After last summer's near-death experience in Congress, when its funding was killed in the House, then revived in the Senate, the $8.3 billion Superconducting Super Collider (SSC) has remained precariously on the critical list. Now, with a new administration in Washington, its fate is more uncertain than ever. Japan—which SSC supporters hope will provide the bulk of the foreign funding for the giant accelerator—is awaiting a signal of Washington's intentions, and Congress is still split on the project's future. A quick cure—or coup de grace—for the beleaguered accelerator will have to come from the Clinton Administration, say physicists and policy makers.



SSC LABORATORY

Digging in. The earth is moving at the SSC site in Texas even though funding is stalled.

Any such cure would require breaking out of what George Brown (D–CA), chairman of the House Science, Space, and Technology Committee, calls the "Catch-22 of foreign funding for the SSC." As Brown described it in a 21 January press release, "Major foreign participation has remained elusive because of uncertainty about the U.S. commitment to the project, yet our own commitment has wavered in large part because of the absence of substantial foreign funding." The Catch-22 intensified in December, when officials in Japan said they would postpone any decision on committing $1 billion or so to the SSC until President Clinton demonstrated his support. All of which adds to the pressure on Clinton to signal his intentions in his March budget request. "If Clinton makes it clear he wants this," says a leading physicist who recently returned from a trip to Japan, "they'll do it. If Clinton waffles, they'll waffle, and if Clinton kills it, they'll be relieved."

The question of foreign participation might have been resolved by now, says a senior staffer on the House science committee, if former President George Bush had been reelected. In that case, he says, the Japanese "wouldn't have had any excuse to say they needed to wait further and take the temperature of Washington. They would have let people know definitively one way or the other before our budget cycle got under way." But with Clinton's arrival, says the staffer, "the Japanese have been let off the hook for a while....Now they have legitimate excuse to wait."

In a 14 January letter to Brown, outgoing Department of Energy (DOE) Secretary James Watkins suggested that the United States take the lead in breaking the impasse. With the Japanese nondecision, he said, DOE could be confident of no more than $400 million in foreign commitments by 1999—far below the $1.7 billion DOE had promised it would raise. Watkins suggested bluntly that the only way to "have any hope of full success in obtaining foreign funding" is by authorizing and appropriating full funding of the SSC up front to ensure that it "be completed on schedule independent of foreign contributions if necessary."

But that would be a tough political sell. An aide to Brown told *Science* that to ask Congress "to vote up or down on $5.5 billion is the most difficult way to frame an SSC vote this year." Even Brown, one of the SSC's strongest supporters in Congress, did not offer his support to Watkins' suggestion, though he did say he personally remained "fully supportive" of the SSC. The SSC's future in Congress is so uncertain, in fact, that the staff of the House Energy Subcommittee, when asked to send a routine background paper on the project to the transition staff,

SSC Detectors Desperately Seek Donors

If the Clinton Administration gives its blessing to the Superconducting Super Collider (SSC), breaking the impasse now tying up foreign funding for the 87-kilometer particle accelerator (see main text), the project's supporters would finally be able to breathe easily, right? Well, not quite. There's still the matter of funding for the two vast detectors—the scientific heart of the machine, which would track and analyze the collisions it would generate. They will live or die depending on contributions entirely separate from those for the accelerator itself. So, even though the SSC itself is in jeopardy, detector physicists are carrying on a worldwide scavenger hunt, in search of everything they need to build their equipment, from cash to optical fibers to massive iron components.

Ultimately, that treasure hunt will have to raise about $500 million—half the cost of the detectors. Out of the SSC's $8.3 billion budget, only $550 million has been set aside for the two detectors—SDC (for Solenoidal Detector Collaboration), headed by George Trilling of the University of California, Berkeley, and Tom Kirk of the SSC Laboratory in Waxahachie, Texas, and GEM (for Gammas, Electron, and Muon detection), led by Barry Barish of Caltech and Bill Willis of Columbia University. Each detector alone will cost from $500 million to $600 million. "The detectors can cost anything we want them to cost," says Barish, "as long as the extra contributions are gotten from outside SSC."

Like the SSC itself, SDC—the primary detector collaboration—is counting on a major contribution from Japan. Already 100 Japanese physicists have signed on to the 900-member collaboration, and SDC is hoping the Japanese will commit $100 million to the detector, beyond whatever they might contribute to SSC. Another $100 million in in-kind help—equipment and manpower—may come from Canada, France, Italy, Britain, and Russia. None of these governments has committed yet, says Trilling; they're waiting to see if the SSC itself will actually be built. But he adds that the foreign research groups taking part in the SDC collaboration "are not just sitting there waiting for some money to come in. They have been very busy doing research and development work, which their governments are supporting."

That's a more comfortable position than that of GEM, which is the newer of the collaborations and has no Japanese participation. Not that its fate is independent of the Japanese decision on the SDC. "If the Japanese do carry out their commitments, as we hope," says SSC Laboratory director Roy Schwitters, "then there will be enough money for a second detector, for GEM." But if Japan doesn't commit to SDC—which would be a "major perturbation" in plans—Schwitters has made it clear to his Program Advisory Panel that they might seriously consider sacrificing or scaling down GEM so that SDC might live.

In spite of GEM's cloudy prospects, its builders are carrying on what Larry Sulak, head of the physics department at Boston University and a GEM member, calls "furious negotiations," offering potential international partners a chance to play an active role in the research in return for funding or in-kind support. Sulak himself has spent much of his time in the past year pursuing these international collaborations for GEM; he figures he's been to 14 countries just since last summer.

What that search has turned up so far is the prospect of four major non-American commitments for in-kind support—all in the neighborhood of $50 million—and a dozen smaller ones. The major partners, according to Barish, in order of how far the negotiations have proceeded, are Taiwan, South Korea, China, and the former Soviet Union, where GEM may reap a windfall from the demise of the Soviet military. The Institute for Nuclear Research in Moscow, for instance, had been making quartz optical fibers for the military and now hopes to do the same for GEM; the AGAT Institute in Minsk, which built military electronics, would provide the same technology to GEM. In addition, the Budker Institute in Novosibirsk, a world leader in accelerator development, has offered to supply the 1000-ton block of iron that would shape the detector's magnetic field, as well, perhaps, as liquid krypton technology for the calorimeter.

But the GEM physicists aren't just looking for the big donors. Says Sulak, "The only way to fund detectors, and keep them within the budget, is to convince Ecuador, Colombia, Belorusse, Czechoslovakia, Albania, India, and others to pitch in. The key is to have them do what their specialty is. Albania has been building bronze swords for the last several thousand years. If you need copper for your calorimeter, as we do, you go to Albania. You get phototubes out of Czechoslovakia, quartz fibers and tungsten from Belorusse...." He and his colleagues are resigned to this piecemeal approach. "That's how you build a detector in the United States these days."

–G.T.

broke with tradition and sent two instead. "One was pro and one was con," says a staff member, "one recommending that it go ahead and maintain its schedule and be assured adequate funding to do the job; the other saying that it be terminated immediately."

The choice would seem to be Clinton's, but the omens for the SSC in the White House are equally mixed. As a candidate, Clinton told *Science* that he supported the giant accelerator—but said that it should be financed internationally (*Science*, 16 October 1992, p. 385). That says little about his willingness to break the current impasse, and as George Trilling, a University of California, Berkeley, physicist who is spokesman for a major SSC detector collaboration, puts it, "Mr. Clinton as candidate has spoken out in support of SSC, but Mr. Clinton as president is what really matters, and that is what we hope to see."

Vice President Al Gore, for his part, has been lukewarm at best toward the project. In 1991, then-Senator Gore struck a blow against the SSC. He voted against an (ultimately successful) motion to table an amendment that would have killed the project. It's not that Gore is against the SSC, says one of his staff members, it's just that "the SSC has never been his first priority." And Leon Panetta, the new director of the Office of Management and Budget, was a loud critic of the SSC in his days as a representative in the House.

There's one thing critics and supporters agree on. Both background papers say, as the energy subcommittee staffer puts it, that "no matter what is done, a decision should be made on the project as soon as possible: Either go ahead or halt it, but it makes no sense at all to drag it out either way." After the SSC's contretemps in Congress last summer, federal appropriations for fiscal year 1993 were reduced from the Administration's request of $650 million to only $514.7 million. According to Watkins, this reduction alone will add at least $50 million to the project's total cost and perhaps as much as $200 million, depending on how quickly the shortfall is made up. And as the project progresses, the cost of shutting it down if it is killed has already risen from a high-end projection of $180 million last summer to Watkins' best guess 6 months later of $278 million.

The stakes are rising in other ways as well, says Roy Schwitters, director of the SSC Laboratory. People have to realize, he says, that the accelerator is no longer a "paper project." "We've sunk a billion and a half dollars into the ground," he says, "There are tunnels being built. People have been moved off their farms. There are beautiful magnets being built. This thing is really rolling." To everyone involved in the debate, those signs of life make a decision on the SSC's fate, one way or another, all the more urgent.

–Gary Taubes