says ESF consortium chairman Jacques Mallet, of the Centre National de la Recherche Scientifique's molecular neurobiology lab at Gif-sur-Yvette, near Paris. Since two or more disease-causing genes could be present in any one afflicted family, it's difficult to determine whether a particular marker is inherited along with the disease by looking at just a few families.

The search for the genes underlying mental illness is also confounded by the difficulty of diagnosing the conditions, and with small numbers of people in a study, a change in the diagnosis of only one or two can wipe out a seemingly positive linkage finding. Indeed, that's what seems to have happened to the linkage reported in 1987 by a team led by Janice Egeland of the University of Miami School of Medicine between manic depression and a gene on chromosome 11, based on a study of a single extended Amish family (*Science*, 17 November 1989, p. 886).

The ESF researchers believe their sample will be large enough to avoid similar problems, and the new deal with Généthon has further added to their confidence—removing lingering worries about the logistics of such a huge genotyping program. The original idea was for the participating groups to do the genetic screening themselves. But those plans began to change last fall, after a Généthon team led by Jean Weissenbach published in the 29 October 1992 issue of *Nature* a high-density linkage map containing hundreds of evenly spaced markers covering some 90% of the human genome. The map was ideal for the planned ESF gene search, Mallet says. And although Weissenbach's genetic probes are available to anyone, Généthon can do the job much more efficiently than a scattered collection of small genetics labs. "It would have been possible" without Généthon, says Mallet, "but with great difficulty."

Given past disappointments, some researchers aren't yet willing to bet that the ESF-Généthon collaboration will yield the promised harvest of positive linkage results. But if not, don't expect the psychiatric genetics community to revert to its old "small science" approach. If the first 2-year search is unsuccessful, Mallet is already contemplating a second trawl through the genome using a different set of markers. And, even if the ESF and NIMH-led projects individually give inconclusive results, it should be possible to combine their schizophrenia- and manic depression-affected families to create an even larger sample, as the respective project leaders have taken care to harmonize their methods. They plan to use many of the same markers, for example. With that prospect on the horizon, the world's psychiatric geneticists may soon find themselves amply compensated for the frustration they've endured.

–Peter Aldhous

SCIENTIFIC MISCONDUCT

MSU Officials Criticized for Mishandling Data Dispute

A stunning rebuke has just been delivered to top research administrators at Michigan State University (MSU) for their handling of a messy custody fight between a professor and his former graduate student over rights to data and research materials.

MSU officials initially sided with the graduate student, who removed materials from the lab of the principal investigator (her ex-professor) and used them to prepare a paper on which she was listed as the sole author. But late in 1991, after the professor filed misconduct charges against the student and three MSU faculty scientists who helped her publish the paper, university officials agreed to take a closer look. They called on Washington, D.C., lawyer and scientific misconduct expert Barbara Mishkin to put together an independent panel of inquiry. After a review costing MSU close to $300,000, the panel has now reached a verdict: MSU officials not only took the wrong side, they made an ugly dispute worse. Indeed, the panel concluded, MSU's actions "undermined important academic values such as respect for scholarly excellence, collegiality, and professional courtesy."

More than he bargained for. Percy Pierre launched inquiry.

A 100-page summary of the panel's findings* and several appendices were delivered to MSU president Gordon Guyer on 14 December and the summary has been made available to *Science*. MSU officials have declined to comment, and the researchers who were criticized in the report have been unwilling to defend themselves in public, pending action that could be taken by the university, and perhaps by overseers at the Department of Health and Human Services (HHS). But even as this tortuous process grinds on, one outcome is clear: University officials—especially vice president for research Percy Pierre—have been put in a tight spot. Just how tight is illustrated by the fact that Pierre, who inherited this dispute when he was made vice president in late 1990, is among the officials criticized by the report, yet he may be responsible for acting on its recommendations.

Whatever happens on MSU's campus, the repercussions of this case could extend into the wider scientific community. It raises the question of whether universities are capable of handling misconduct allegations fairly—an issue that critics such as Representative John Dingell (D–MI) have examined repeatedly in the past. Will Dingell focus congressional attention on this imbroglio in his backyard? That remains to be seen.

The roots of the dispute reach back to an incident in May 1989, when an MSU microbiologist, Jeffrey Williams, dismissed Ph.D. student Maie ElKassaby from his lab for what he described as "insubordinate behavior." The student had been working on an international project, funded by the National Institutes of Health (NIH), that focused on the uptake by human tissue of an antiparasite drug called ivermectin (see box). The project, headed by Williams, involved researchers at the Upjohn Company and physicians in Mexico and Sudan. After dismissing Elkassaby, Williams became furious when she kept tissue data she had worked on, refusing to return them to Williams or his collaborators.

If Williams thought the university would back him up, he was sorely disappointed. MSU officials, citing the student's right to free speech and the right of researchers to publish data they had worked on, advised associate dean of the school of osteopathic medicine Justin McCormick—a microbiologist—and two faculty pathologists to help her prepare a paper on the sequestered data. Williams objected and refused to have anything to do with the paper. The Upjohn collaborators on the Sudan project also informed MSU officials that they wouldn't participate in the publication because they had been denied access to the data. McCormick, however, helped ElKassaby revise the paper and persuaded the editor of *Tropical Medicine and Parasitology* in Germany to accept it. (It eventually appeared in the June 1991 issue.) Williams was not cited as a contributor, nor, the Mishkin report says, was he allowed to see the text before publication.

MSU's official support of ElKassaby prompted Williams to file charges of scien-

*"Report of the Investigative Committee to Michigan State University on Allegations of Scientific Misconduct Relating to Research Supported by NIH Grant No. AI-16312 (Sudan Grant)," December 4, 1992.

Project Sought Treatment for River Blindness

The research materials now in dispute at Michigan State University (MSU) were produced by the "Sudan project," a group of scientists and doctors investigating parasitic diseases—particularly "river blindness" (onchocerciasis) in Sudan and Mexico. The lesions and swellings of this disease are created by a small, tropical nematode (*Onchocerca volvulus*) that inhabits the gut of a certain fly and, through the insect's bite, invades human tissue. If the parasite attacks the eyes, it can cause blindness.

Members of the Sudan project, led at MSU by microbiologist Jeffrey Williams, were trying to refine the use of the drug ivermectin as a means of preventing blindness. The drug—an antiheartworm medicine currently used in dogs—is not licensed for human use in the United States, but is used to treat onchocerciasis in Mexico and Sudan. Researchers still have concerns about its possible side effects, however, and MSU scientists hoped to find a way to monitor its uptake in human tissue.

To gather raw data on this question, doctors in Mexico and Sudan formed a collaboration with Williams and others at MSU. They ran a clinical trial in which they administered ivermectin to patients, drew blood, and collected tissue samples. They also obtained permission from the Upjohn Company to modify a serum radio-immune assay developed by Upjohn and try it out on human tissue. Williams recruited a graduate student, Maie Elkassaby, to carry out this project. She did the lab work successfully, but in the middle of it, she had a falling-out with Williams and refused to give back the human tissue samples and the monitoring data she had assembled while she prepared a paper on the research. The paper was eventually published with just one author, ElKassaby, over Williams' objections. The Sudanese were furious.

Since then, the article has received heavy criticism in a report written by an outside investigative panel (see main story). The report notes that the paper did not receive adequate peer review at MSU or at the journal that published it, *Tropical Medicine and Parasitology*. In correspondence with Williams, the journal's editor, Dietrich Büttner, said he had not been informed about the authorship dispute. He explained that he decided to print it mainly because an MSU faculty member, associate dean Justin McCormick, had assured him of its quality.

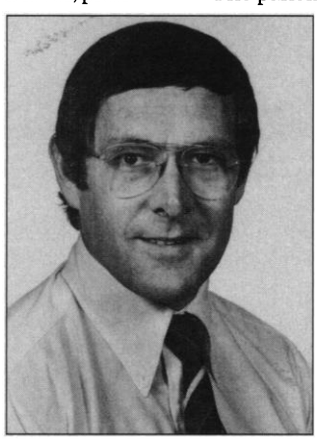
According to the independent investigative panel, however, the article was badly flawed. It was "poorly presented," according to the panel, "lacking important information," and "replete with errors." Most of the data in it were "confirmatory and of little interest," the investigators found. And the fact that it was even submitted for publication, the panel wrote, "suggests poor standards of internal review" and "little regard for the health of Sudanese patients." In sum, the decision to promote the article, the report says, was "an embarrassment to an academic institution."

–E.M.

tific misconduct with Pierre in November and December 1990. At first, Williams charged only the student. Later, he broadened his case to encompass McCormick and the two other professors. In addition, Williams notified NIH of the fracas and asked for an investigation. According to the Mishkin report, McCormick returned the materials to Williams only after Williams took these extraordinary steps—though McCormick told investigators the delay was due to an oversight. (The student had turned the materials over to McCormick 4 months earlier.)

Williams' charges led to an internal MSU inquiry by a panel of three faculty members established by the dean of the school of veterinary medicine, Janver Krehbiel. It reported in January 1991 that scientific misconduct had occurred, which under federal rules would normally trigger a full investigation. But the board sent mixed signals, noting that the accused faculty members had acted on advice from MSU administrators in helping ElKassaby publish the data. Indeed, two of the accused faculty members wrote to Pierre that his predecessor, John Cantlon, had expressly told them that the student had a right to publish the paper on her own. ElKassaby was not excused, however. Pierre decided not to launch a full investigation, telling NIH in March that it would be unnecessary if ElKassaby admitted her guilt and accepted sanctions. Pierre tabled Williams' charges against the faculty.

Meanwhile, NIH's misconduct squad had stepped in, informing the university that it, too, was ready to launch an inquiry. Rather than do the work itself, however, NIH agreed to let the university call in an independent review panel. Organizing the job fell to Pierre. He hired Mishkin to handle the details. She recruited four independent panelists, two of whom were also experienced in ethical issues. The panel included Carol Glover, president of the National Association of Graduate Students; J.K. Frenkel, former pathology professor at the University of Kansas School of Medicine; C.K. Gunsalus, associate vice chancellor for research at the University of Illinois, Urbana-Champaign; and Drummond Rennie, professor of medicine at the University of California, San Francisco, also an editor of the *Journal of the American Medical Association*.



MICHIGAN STATE UNIVERSITY

"Vindicated." Microbiologist Jeffrey Williams.

The panelists began work in February 1992. After 8 months of digging, they came down unanimously on Williams' side. ElKassaby, they wrote, had refused "to permit access by collaborators and the principal investigator to primary research materials and data for 15 months." Her behavior, the panel decided, constituted "a serious deviation" from the accepted practice of science and, therefore, was an act of scientific misconduct. The panel also ruled against her for publishing without crediting Williams, but noted that her guilt was mitigated by the fact that Cantlon and three faculty members assisted her. First Amendment rights must be protected, the panel wrote, but that "does not require the university to endorse publications that fail to meet university, departmental, or scientific standards of scholarship."

The panelists went on to praise Williams for his persistence, noting: "Had it not been for the dedication to academic principles displayed by Professor Williams, the problems we discuss might never have been examined critically."

The panel recommended that MSU conduct a formal investigation of charges that the three faculty members who aided the student had committed scientific misconduct and consider "corrective actions" against "all administrative personnel who were involved in this matter."

In a final section directed at MSU's leadership, the panel listed 10 major failings for which it holds the central MSU administration accountable. These include:

- "Unwarranted disparity in the treatment of the parties in conflict.
- Prolonged delays in responding to letters and requests for information [over 3 months in several instances]...
- Unwillingness to accept responsibility and confusion as to authority...

- Failure to communicate...
- No demonstrable understanding of the standards and traditions of biomedical science...
- Failure to comprehend responsibilities to the academic community.
- Neglect of evidence, unfounded assumptions, and attribution of malice.
- Failure to appreciate the health implications [of the research in question]...
- Failure to comply with federal regulations...
- Failure to honor MSU rules...."

Although the panel members are eager to discuss the report, they are following instructions from Pierre to remain silent. MSU officials and professors contacted by *Science* also said that they were obliged to await final resolution of the case, which may not come any time soon, for a decision by MSU can be appealed to HHS for final review. Williams says he is vindicated by the Mishkin panel's report, while ElKassaby failed to return a phone message left for her.

However, Zolton Ferency, a prominent civil liberties attorney representing ElKassaby, was willing to make a statement on his client's behalf. He denounced the whole proceeding as "ridiculous." It was, he said, based on "false" and "irresponsible" charges brought by Williams. Ferency points out that MSU has no quarrel with the student, so if the Mishkin panel's interpretation of scientific misconduct differs from MSU's, he asks, "Why should the graduate student be made to suffer?"

The question presents the issues confronting the university and federal ethics overseers in stark terms: Which interpretation of scientific misconduct is right—the university's or the reviewing panel's? And what should happen to a graduate student who gets caught in the middle?

For now, there are no answers. Pierre told *Science* that MSU is working on a response to the Mishkin report "expeditiously," and that a decision on its recommendations will come soon.

–Eliot Marshall

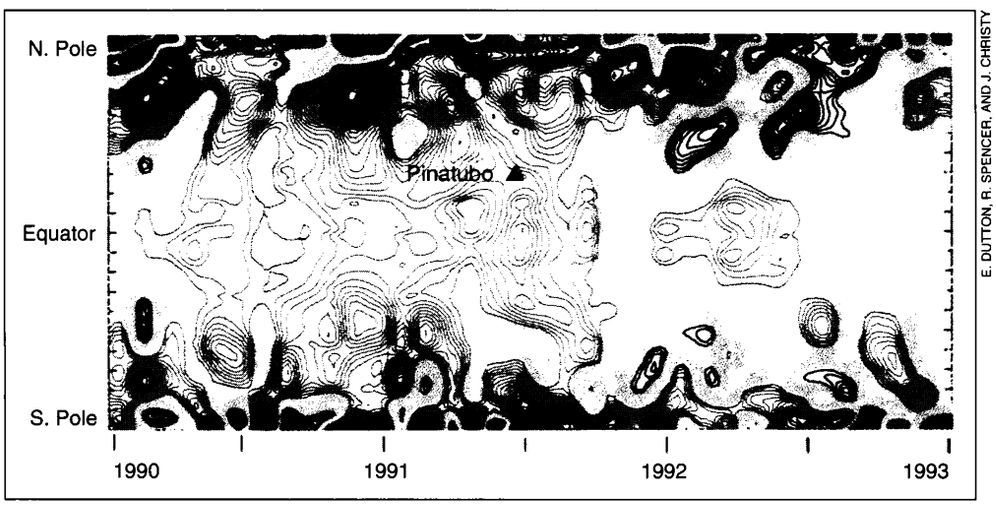
CLIMATOLOGY

Pinatubo Global Cooling on Target

Jim Hansen is on a roll. First, the climate researcher who heads the National Aeronautics and Space Administration's Goddard Institute for Space Studies made a bet that the annual global temperature would reach a new record high sometime during the first 3 years of the 1990s. The culprit, Hansen believed, would be greenhouse warming. He won that wager after the first year (*Science*, 18 January 1991, p. 274). Then, when the Philippine volcano Pinatubo blasted millions of tons of debris into the stratosphere in June 1991, Hansen used his computer climate model to predict that the shade cast by the debris would cool the globe by about half a degree Centigrade. Lo and behold, year-end temperature reports for 1992 are now showing that he was again on the money—dramatically confirming scientists' tentative belief that volcanoes can temporarily cool the climate and validating at least one component of the computer models predicting a greenhouse warming.

From the start, Pinatubo looked like a good prospect for testing climate theory. It lofted 25 to 30 million tons of sulfur dioxide gas, which turns into a long-lasting haze of sulfuric acid droplets. That probably made its sun-blocking aerosol cloud the most massive since Krakatau's in 1883. So Hansen cranked up his sophisticated computer model, estimated how much sunlight the Pinatubo aerosol cloud would eventually block, and came up with his prediction of a 0.5°C temperature drop—enough to set the globe back to the cool days of the early 1960s, albeit for only a few months.

Those few months of chill did indeed appear in the latter half of last year. A record compiled by Hansen and his Goddard colleague Helene Wilson shows that an irregular, year-long decline of global surface temperatures bottomed out at about 0.6°C below the average of the year before Pinatubo. As dramatically displayed in satellite-measured temperatures of the lowermost part of the atmosphere (see figure), the cooling set in rapidly at low latitudes and was only briefly impeded by a countervailing warming trend caused by El Niño early in 1992. "The last half of the year was pretty much right on our calculations of what Pinatubo would do," says Hansen. Such a clear example of a posteruption cooling should dispel any lingering doubts about the power of volcanoes to change climate, he notes.



E. DUTTON, R. SPENCER, AND J. CHRISTY

A sudden chill. Temperatures measured by NOAA satellites clearly show the cooling *(blue)* that set in a few months after the eruption of Mt. Pinatubo as well as El Niño's 1992 equatorial warming.

The cooling is also "an interesting test of the short-run physics" of climate models that predict greenhouse warming, says modeler Michael MacCracken of Lawrence Livermore National Laboratory. However, it is not a complete test. "You don't say the model is proven just because it reproduced the volcanic effects," he cautions. Greenhouse warming involves both short-term responses of the sort involved in volcanic cooling and long-term responses, such as a loss of highly reflective sea ice that further warms the climate by increasing the absorption of solar energy. Volcanic cooling is too short-lived to trigger such feedbacks, MacCracken notes.

That's one reason why few scientists are yet ready to accept Hansen's third contention, that greenhouse warming will become obvious to all in the next few years, once the climate system recovers from Pinatubo. In contrast, most climatologists believe that Hansen's success in calling for record warmth in the early '90s could have been blind luck and that it will be at least early in the next century before the greenhouse effect leaves an unequivocal signature in the temperature records. But the way is already clearing for a test of Hansen's third prediction. The tropical stratosphere is already nearly free of volcanic aerosol, says Larry L. Stowe of the National Oceanic and Atmospheric Administration in Camp Springs, Maryland, who monitors aerosols by satellite. And, he says, Pinatubo's influence should have faded from the rest of the globe by the end of the year.

–Richard A. Kerr