without demanding a Grand Inquisitor. "That's been part of the problem—there's a very large burden on the accuser. We have to find someone who is willing to put his own reputation on the line."

Although Hall and Martin saw the draft policy as implying that an accuser was necessary, Duwayne Anderson, associate provost for research and graduate studies, says that is not the case. With enough evidence, the administration can set up a committee to investigate, he says.

Anderson added that he and Fackler and Hall have been following the tritium results closely to see if an inquiry was warranted. Last week, they met after hearing that Wolf had found light water—a possible sign of spiking—in an electrolyte sample left over from one of the Bockris cells that had produced a lot of tritium (see box). The result of the meeting: "I haven't quite passed the threshhold of being sure that we have enough evidence to go forward with an inquiry," Anderson said.

The A&M experience illustrates how tricky it can be dealing with possible fraud. A university must find a balance between making it too easy to start an investigation and making it too hard. One lesson here may be that demanding someone act as a formal accuser or whistle-blower is too restrictive. An even clearer lesson seems to be that a university should have a well-defined fraud policy in place before problems arise. Martin says, "Part of the problem of why the university didn't do more is that it is just now coming up with a policy. There was a lot of confusion on what the policy is."

But there is an even deeper issue that is not so clear-cut: the question of at what point scientists should stop being scientists and start being fraud investigators. Fackler and Anderson say they believe this point has not yet been reached in the case of Bockris's tritium results. "Our people say this is an area of dispute arising from conflicting data," Anderson says, and the proper way to deal with it is to continue to do experiments to determine what has been going on.

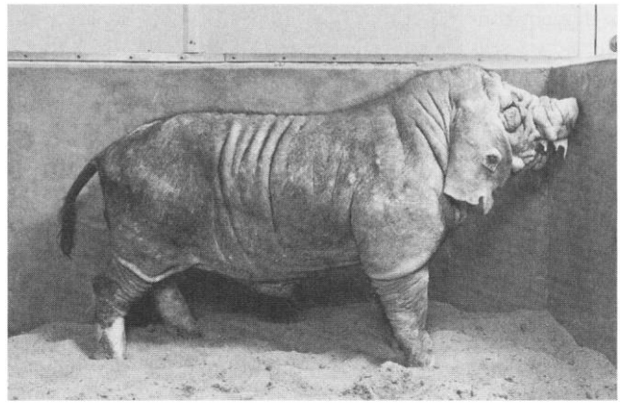
Both Fackler and Anderson pointed to the case of "polywater" 20 years ago, where dozens of researchers chased a chimera created by minute contaminants in measuring instruments. That experience showed that bad science comes out in the wash and, barring further evidence of possible fraud, that is what the A&M administration will let happen. It is important to keep in mind, Anderson pointed out, that "honest error and misinterpretation" are excluded from the definition of "fraud." ■ **GARY TAUBES**

Gary Taubes, a science writer, is working on a book on cold fusion.

North Carolina Protests Chinese Pig Cartel

NC State researchers want access to Chinese pigs but all the animals are owned by other institutions who won't give any up

CLEMENT MARKERT, a biologist at North Carolina State University, would love to get his hands on a Chinese pig. But he has a problem: Every Chinese pig in the United States is owned by the Agricultural Research Service (ARS), Iowa State University, and the University of Illinois, and they have a pact not to let any of the animals out of their facilities. Last month, North Carolina State was officially told that its researchers couldn't have access to any Chinese pigs for at least 5 years.



Desirable. *Chinese pigs are more fertile than U.S. breeds, which makes them a hot property for genetics research.*

Markert wants to try a technique he developed when he was at Yale University that might enable him to transfer selected traits from the Chinese animals into domestic swine far more quickly than conventional breeding techniques would allow (*Science*, 6 October 1978, p. 56). The attraction of Chinese pigs is that they have much larger litters than U.S. breeds—an average of 15 offspring per litter, compared with 10 for domestic breeds—and they reach sexual maturity much earlier. Markert says he is "outraged" that the three institutions are "monopolizing a scientific resource paid for in part by public funds." Says Markert: "It's clear they don't want anybody to compete with them."

Reg Gomes, dean of the College of Agriculture at Illinois, says the three institutions paid to bring the pigs into the United States last year under a carefully worked out contract and they decided it would be unwise to alter the arrangement now. (The ARS's share of the costs was, of course, federal money.) NC State had an opportunity to join the Chinese pig consortium when it was formed 2 years ago, Gomes says, but the university turned the offer down. "To reopen this now would not be productive," Gomes says.

Part of the reason for the tight controls over the animals, Gomes says, was to allay fears of pork producers that undesirable traits of the Chinese pigs—they are fat and grow relatively slowly—might be transferred into domestic breeding stock along with their high fertility. There was also a desire on the part of the pork producers to keep germ plasm out of the hands of private companies, but this was rendered moot last year when Dekalb Genetics of Sycamore, Illinois, imported its own batch of semen directly from China.

Philip Carter, an NC State researcher involved in the negotiations over the pigs, suggests, however, that the Illinois and Iowa pork producers have direct commercial reasons to oppose broadening the consortium to include his university: North Carolina producers would then have access to the research. Gomes acknowledges that the advice of the Illinois and Iowa pork producers' associations and the National Pork Producers' Council must be sought before any changes are made to the agreement. In Illinois, at least, the pork producers helped support the university's request for state funds to bring the pigs over, but "there was no promise, real or implied, that they own the germplasm or control the germplasm," says Gomes. "We have no intention of locking this research up and making sure it doesn't get out of Illinois."

But NC State officials are not taking "no" for an answer. They have enlisted the help of their senator, Republican Jesse Helms, who has called senior Agriculture Department officials. Helms is particularly miffed be-

cause it was partly thanks to him that the Chinese pigs were imported in the first place.

When U.S. researchers first became interested in studying Chinese pigs in the early 1980s, they faced a serious roadblock: Trade restrictions made it illegal to bring any of the animals into the United States. Markert and Carter, who was then associate vice chancellor for research at the university, approached Helms in early 1986 to explore the possibility of lifting the ban. At the time, Helms was chairman of the Senate Agriculture Committee. Within months, recalls Carter, Congress passed legislation allowing Chinese pigs into the country.

Once the way was cleared came the question of how the import would be arranged and who would pay for it. A meeting was held between officials from the ARS and representatives of several universities, including NC State, to explore the possibility of forming a consortium to divvy up the costs and the animals.

By mid-1988, however, only Illinois and Iowa State, along with the ARS itself, had agreed to come up with the estimated $600,000 each institution would have to pay to bring the animals over and quarantine them for 4 months. Carter says that at that point NC State decided it couldn't afford the entry fee.

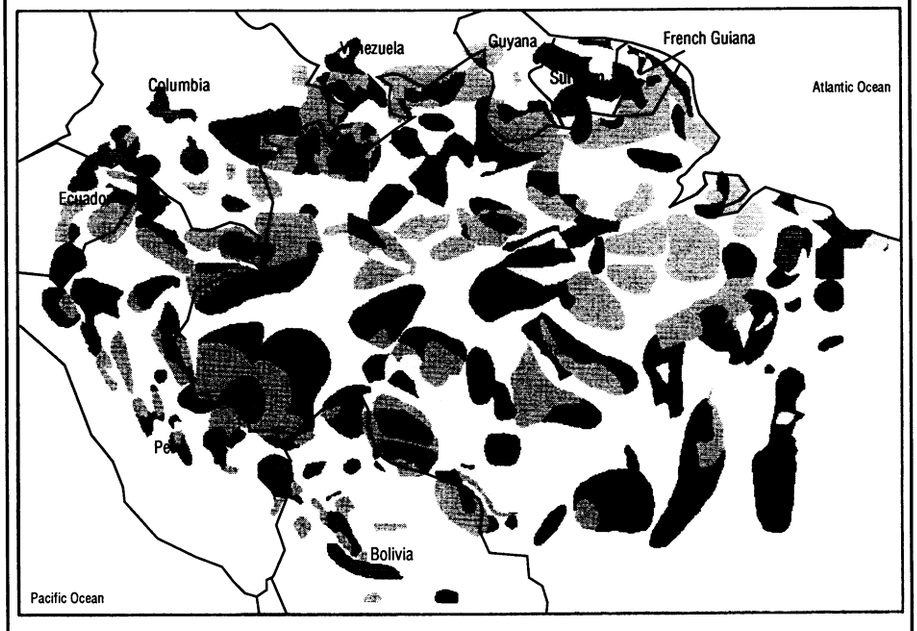
A contract was drawn up between the three institutions in July 1988 and an agreement was reached with the Chinese on 28 September to buy 147 pigs. They arrived early last year and were quarantined in Florida until 29 July, when they were divided up among the consortium members.

But by September 1988—after the consortium was formed but just before the contract with the Chinese was signed—NC State had not only changed its mind, but, according to Carter, it had also made several requests to join the consortium. The reason for the change of heart: The estimated cost of the whole operation had dropped to $1.4 million, or $350,000 apiece if it were split four ways. Carter says he had a written pledge for that amount from North Carolina pork producers.

So why didn't the consortium let NC State in at the last minute? Carter says he made the initial approaches by telephone to Roger Gerrits, an ARS official who helped organize the consortium. Gerrits declined to discuss the matter with *Science*. Illinois's Gomes says that the consortium members had nothing in writing from NC State until July 1989, when the pigs were about to be released from quarantine. But even then, ARS director Ronald Plowman wrote back to Carter suggesting that the consortium members meet with NC State representatives "to explore possible cooperative relations" after the animals had reached the three institutions.

Carter says there were several phone calls back and forth over the ensuing months, culminating in a letter signed by Plowman, Gomes, and David Topel, dean of Iowa State College of Agriculture. "After much discussion and careful consideration," the letter states, "we have decided to abide by the present agreement and not enlarge our circle of cooperators." The letter points out that the agreement prohibits transfer of pigs to any other party for 5 years—and then only "as mutually agreed upon."

■ COLIN NORMAN



Amazonian Biodiversity

The map shown above is the fruit of a workshop held in Manaus, Brazil, in January. It represents the first effort to consolidate the full spectrum of ecological information about Amazonia and decide which areas should receive highest priority for preserving biodiversity. The map's color scale runs from blue (lowest priority) through purple, yellow, and orange to red (highest priority).

Moving spirits behind the meeting, which drew more than 100 scientists, were Thomas Lovejoy of the Smithsonian and Ghillian Prance of the Royal Botanical Gardens at Kew in London. Consulted by the W. Alton Foundation, Lovejoy and Prance suggested that it was time to put into motion a project long talked about in ecological circles: mapping species distribution and consolidating hydrological, geological, and ecological research on the Amazon.

Workshop participants began by dividing into nine working groups: plant systematics, plant ecology, mammals, ornithology, herpetology, ichthyology, entomology, geomorphology, and units of conservation. The groups produced seven maps that were consolidated into three: zoology, botany, and geomorphology.

The zoology and botany maps were then combined into the final product shown above, which indicates that about 55% of Amazonia is a priority for conservation. The areas of highest priority are those that are so species-rich and high in species present only there that they should be effectively "fenced off" from further development, according to workshop participants. The remaining white areas, according to Lovejoy, are not necessarily regions where development should be allowed unchecked, but those where more ecological research is needed.

Publication of the map is intended to be part of an ongoing strategy of conservation. The Peruvian government is already using the map to set up a conservation area and it is likely that other governments and funding agencies will use the map as a guide to conservation efforts. ■ HARRIET KULIOPULOS

Harriet Kuliopulos is a free-lance writer based in Washington, D.C.