Penn State scientist at center of a storm

December 9 2009, By Faye Flam

A few words culled from some hacked e-mails in Britain have generated chaos in the world of climate science -- throwing dark clouds over Pennsylvania State University and stirring up negative publicity for the field that shows no sign of abating.

The disturbance, now known as "Climategate," is threatening to damage scientists' careers, inflame cynicism over the science of global warming, and perhaps alter the course of the major U.N. climate summit in Copenhagen.

The stolen and leaked e-mails that have generated the most discussion focus on the so-called hockey stick graphs created by Penn State climatologist Michael Mann and others -- graphs that have famously illustrated world temperatures taking a sharp turn upward in the 20th century.

But in all the sound and fury, one inconvenient truth is emerging -- the e-mails give little new information and appear to have failed to change the mind of anyone within the scientific world.

One bona fide climate expert, Richard Lindzen of MIT, has gone on the record accusing Mann and others of data rigging and outright falsification. But Lindzen is well-known for expressing doubts that global warming should be a serious concern. The meteorology professor says he's thought for years that the hockey stick graphs were generated through dishonest means. The newly leaked e-mails underlined what he already believed.

Many others familiar with the issue say that at worst, the whole "scandal" reveals a few endemic problems with data sharing and perhaps bias in this field, but that any accusations of misconduct are unjustified and insult the entire scientific enterprise.

The consensus that human activity has altered the atmosphere and warmed the planet rests on much more than a hockey stick.

The controversy began last month when hackers broke into a server holding a decade of e-mails from the Climate Research Unit (CRU) at the University of East Anglia in England. The CRU is one of three institutions leading efforts to chart the climate's course over the last millennium.

The other two big players in this field, sometimes known as "paleoclimatology," include Penn State and the National Climatic Data Center in Asheville, N.C.

Reconstructing climate in the years before thermometers requires a kind of environmental forensics. Scientists search for clues in ancient tree rings, bore holes, coral bands and the composition of gas bubbles trapped deep in the ice sheets of Antarctica and Greenland.

To get those, they scuba dive off remote islands, trudge through swamps in search of ancient stumps and brave frostbite on the ice caps.

As adventuresome as that can be, nearly all the 1,000-odd hacked e-mails communicate technical and mundane aspects of the job -- details on data analysis and logistics over attending conferences, for example.

The whole controversy swirls around a small handful -- most of them correspondence with or about Penn State's Mann. Critics of climate research have focused on one message in 1999, which referenced a

"trick" and an effort to "hide" a temperature decline.

That e-mail was written by the East Anglia climatologist Phil Jones. He wrote that he planned to use Mann's "Nature trick," referring to a paper Mann had published in the journal Nature the previous year.

That paper incorporated the tree rings, ice cores, corals and a number of other "proxies" into a kind of formula that could approximate the world's temperature as it fluctuated over the last 1,000 years.

Also included in the graph were real temperature measurements, starting in the mid-1800s and continuing to the present.

Others before Mann had reconstructed the historical Medieval Warm Period and the Little Ice Age that gripped the world during the 1700s, but Mann's paper was the most complete to date and revealed the influential graph that became known as the hockey stick.

Many scientists were sounding the alarm over human-generated climate change well before that graph appeared.

Phil Jones, who has stepped down temporarily as CRU director, has said publicly that he never meant to imply that he or Mann had used deception. By "trick," he said he meant only a technique for highlighting data on a graph.

The trick, said Mann, who faces a Penn State inquiry, was simply a concise way of showing the two kinds of data together -- clearly indicating which was which. "There's nothing hidden or inappropriate," he said. Mann said his method of combining proxy data has withstood numerous statistical tests -- lining up neatly with thermometer readings during the 150 years where they overlap.

Critics also pointed to the phrase "hide the decline" in an e-mail written by Jones. That, said Mann, referred not to a decline in measured temperatures but to a decline reflected in a certain kind of tree-ring measurement that relies on wood density.

For reasons researchers still can't explain, those wood measurements track neatly with temperatures from the late 1800s to the 1960s. After that, they show temperatures going down while the thermometers show the opposite.

Scientists have been discussing this "divergence" problem in the open for years.

Opinions differ among scientists as to the importance of the divergence problem, but most say there's enough other evidence to support the hockey stick. One exception is MIT's Richard Lindzen.

"Anyone familiar with these issues would say these (e-mails) explicitly refer to falsification and rigging of data." Lindzen said the failure of the proxies to reflect temperature trends in the last few decades is a real problem. If the proxies don't align with temperatures for the last 30 years, he said, how can we rely on them to tell us what the temperatures were for the last 1,000?

He accuses the scientists of covering up this deficiency, thus creating a more alarming-looking graph. "The trick here is replacing the kind of data you're using with something to make it look different."

Other climatologists found Lindzen's accusations shocking. "I haven't seen anything in the e-mails that calls into question the fundamental science," said Thomas Peterson of the National Climatic Data Center. "I don't see how one comes to the conclusion that it's fraudulent."

Nor does the current flap change his view. "There are so many independent lines of evidence that the warming in the present time is really unusual," he said. "These e-mails do nothing to undermine the strong scientific consensus that Earth is warming and this is from human activities."

Andrew Solow, an expert on geostatistics at Woods Hole Oceanographic Institution, agrees about the lack of trickery. "I would use a word like that to describe some methodological step," he said, "but it wouldn't mean it was meant to trick anyone."

Still, he said it's not obvious to experts how the hockey stick graphs are created. "These are complicated things to do, and in my opinion there has been a lack of clarity over what exactly has gone into these reconstructions," he said.

This is not the first time Mann's work has been put to the test. In 2006, Texas A&M climatologist Gerry North was asked to lead an investigation for the National Academy of Sciences.

North worked with three statisticians and several high-ranking climate experts, picking through Mann's arguments and data. He said the panel came away with a few quibbles over Mann's methods and when they re-did it, the graph didn't have as dramatic an upward slant as the original hockey stick.

But overall, "we thought that qualitatively the paper got it right. The last 30 years were warmer than any 30-year period in the last 600 years and plausibly the last 1,000 years."

North said he did not agree with the way that some other researchers created a continuous graph of global temperatures over the last 1,000 years by combining the proxy data in the past with thermometer data in

recent years.

In the late 1990s, he said, "people were running up and down the halls of Congress waving these graphs and saying the Earth was about to burn."

Still, he saw no fraud in this. "It's not the way I would have done it -- but it's not a lie."

The two other charges leveled at Penn State's Mann and his counterparts in East Anglia were gleaned from e-mails that mentioned their unwillingness to share data and their suggestions to boycott a scientific journal for publishing a paper by known climate skeptics Willie Soon and Sallie Baliunas.

Peterson said the data-sharing issue is important but the responsibility for this rests on the worldwide scientific community.

Many institutions refuse to give up temperature data for free, he said. "This is one of the things I've been very frustrated by."

Solow said that while 20th-century warming is undeniable, the field has been plagued by unjustifiable assumptions of precision -- as when people claim that any particular year is the hottest of the millennium.

The other problem Solow sees is an unhealthy mating of science and advocacy. He says his students sometimes tell him they want to be involved in policy so their work will have meaning. "I tell them if you lay down with dogs, you get up with fleas."

Texas' North, echoing many others, said that even if Mann and Jones had decided to go into some other field and their work never existed, he'd still be concerned about global warming.

Climate models, he said, are becoming increasingly alarming. Then there's the retreat of glaciers and shrinkage of sea ice. Even basic physics helps make the case, he said. If the carbon dioxide component of the atmosphere doubles -- as predicted -- the temperature should go up by about 2 degrees. That part, he said, is hard to deny.

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