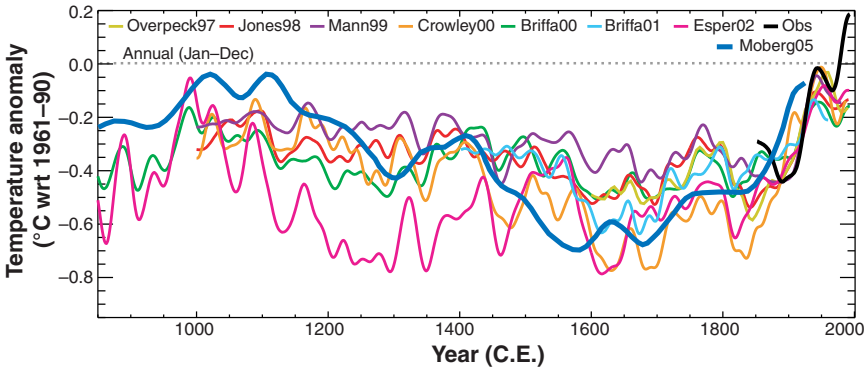
GLOBAL WARMING

Millennium's Hottest Decade Retains Its Title, for Now

The scientific consensus that humans are warming the world stands on three legs, one of which has been getting a workover lately. For a decade, paleoclimatologists have combed through temperature records locked in everything from ancient tree rings to ice cores, yet they've failed to find a natural warming in the past 1000 years as big as that of the past century. That implied that humans and their greenhouse gases were behind the recent warming, as did computer studies of warming patterns and the trend of 20th century warming. But in a soon-to-be-published *Geophysical Research Letters* paper, two researchers attack the recent warming reflected in an iconic paleoclimate record as an artifact of a programming error.



Still no equal. Temperature records recovered from tree rings and other proxies broadly agree that no time in the past millennium has been as warm as recent decades (black).

Even as greenhouse skeptics revel in what they presume is the downfall of one of global warming's most prominent supports, paleoclimatologists have come up with yet another analysis. In a paper published this week in *Nature*, Swedish and Russian researchers present their first entry in the millennial climate sweepstakes. They consider new sorts of measurements and apply a different analytical technique to the data. Their conclusion: Even the surprisingly dynamic climate system doesn't seem to have produced a natural warming as large as that of the past century. "The past couple of decades are still the warmest of the past 1000 years," says climate researcher Philip Jones of the University of East Anglia in Norwich, U.K.

The millennial climate debate has revolved around the "hockey stick" record published in *Nature* by statistical climatologist Michael Mann of the University of Virginia, Charlottesville, and his colleagues in 1998 and revised and extended in 1999. He and his colleagues started with 12 temperature records extracted from, among other things, the width of tree rings, the isotopic composition of ice cores, and the chemical composition of corals—so-called proxies standing in for actual measurements of temperature. They compiled the proxy records and calibrated them against temperatures measured by thermometers in the 20th century. The result was the "hockey stick" curve of Northern Hemisphere temperature over the past millennium. Temperature declined slowly during most of the millennium, creating the long, straight handle of the stick, before rising sharply beginning in the mid–19th century toward the heights of the 1990s, forming the tip of the upturned blade of the stick. Those temperatures handily exceed any temperature of the past millennium.

Two researchers are now saying that the millennial curve doesn't resemble a hockey stick at all. In their latest paper, Stephen McIntyre of Toronto, Canada, a mineral-exploration consultant, and economist Ross McKitrick of the University of Guelph, Canada, make two charges. They claim that "what is almost certainly a computer programming error" in the statistical technique used by Mann and colleagues causes a single record—from ancient bristlecone pine trees of the western United States—to dominate all other records. And the bristlecone pines had a late growth spurt apparently unrelated to rising temperatures, they say. They also charge that Mann's techniques create the appearance of statistical significance in the first half of the millennium where none exists. When McIntyre and McKitrick kicked off a publicity campaign late last month, greenhouse contrarians were gleeful.

Mann calls the McIntyre and McKitrick charges "false and specious." He has been parrying their claims since they responded to his 1998 paper with what he says was an analysis of an inadvertently corrupted data set. The bottom line from the latest go-round, Mann says, is that the same hockey stick appears whether he uses his original technique, variations on it, or a completely dif- ▶

CREDIT: ADAPTED FROM K. R. BRIFFA AND T. J. OSBORN, *SCIENCE* **295** (22 MARCH 2002), AND A. MOBERG *ET AL.*, *NATURE* **322** (10 FEBRUARY 2005)

BIOINFORMATICS

With a Stumble, Microsoft Launches European Research Project

The Microsoft Corp. is about to increase its research presence in Europe. On 2 February, company Chair Bill Gates told a meeting of government leaders in Prague that Microsoft plans to fund several research centers, graduate scholarships, and scientific meetings across Europe, focusing on the interface between computer science and biology, agriculture, and engineering. The venture has been widely welcomed, except for one problem: Its name, the EuroScience Initiative, is already taken.

The initiative's first site will be the Center for Computational and Systems Biology in Trento, Italy. The center will receive up to €15 million over the next 5 years, 60% from national and local governments and 40% from Microsoft. Corrado Priami, a bioinformatics professor at the University of Trento who will head the center, says up to 30 researchers will focus on understanding complex systems such as the chemical communication within a cell and developing tools for biologists and computer designers. Priami says all research results will be made public, and intellectual property will remain with the university, although Microsoft will have an option to exclusively license products that result from the funded research.

Microsoft is reportedly in discussions with universities in Germany, France, and the U.K. and plans to announce several more centers later this year.

As for the name, the EuroScience Association, a group of more than 2000 European scientists founded in 1997, cried foul. The organization, which last year held a European-wide meeting called the EuroScience Open Forum (*Science*, 3 September 2004, p. 1387), also advises the European Union on policy issues, says spokesperson Jens Degett. "If suddenly there is no difference between EuroScience and Microsoft, it will be very damaging" to the group's credibility as an independent organization. In response, Microsoft said it would work with the group to eliminate any misunderstanding and is planning to rename the program. **–GRETCHEN VOGEL**

ferent methodology. Observers have been slow to wade into such turbid statistical waters, citing instead the other half-dozen paleoclimate studies employing a variety of data analyzed using two different types of methodologies. McIntyre, however, sees far too much overlap among analysts and data sets and perceives far too many problems in analyses to be impressed.

Now comes a joint Swedish-Russian effort that clearly breaks away from the pack. Climate researcher Anders Moberg of the University of Stockholm, Sweden, and his colleagues have not participated in previous millennia analyses. Tree rings don't preserve century-scale temperature variations very well, so they added 11 proxy records ranging from cave stalagmites in China to an ice core in northern Canada. They also used a wavelet transform technique for processing the data, a new approach in millennial studies.

Moberg and his colleagues found that temperatures around the hemisphere fell farther during the Little Ice Age of the 17th century than in Mann's reconstruction and rose higher in medieval times. The medieval warmth equaled that of most of the 20th century, but it still did not equal the warmth of 1990 and later.

Moberg's result is only the latest to suggest that the handle of "the hockey stick is not flat," says paleoclimatologist Thomas Crowley of Duke University in Durham, North Carolina. "It's more like a boomerang," he notes. The near end still sticks up—albeit less dramatically—above all else of the past 1000 years.

–RICHARD A. KERR

TOXIC AIR POLLUTANTS

Inspector General Blasts EPA Mercury Analysis

Power plants buying and selling the right to spew toxic mercury from their smokestacks—the mere prospect raises the hackles of environmentalists. But when the U.S. Environmental Protection Agency (EPA) proposed such a cap-and-trade system last year, it argued that it was the most effective way to cut back the 48 tons of mercury, a known neurotoxin, emitted nationwide each year. Last week, the agency came under fire anew—this time from its own Inspector General (IG), who accused EPA officials of deliberately skewing their analyses to burnish the cap-and-trade approach. EPA denies the charges, but environmentalists say the report* will give them a leg up in court if they sue over the final rule.

Up in smoke. Coal-fired power plants account for most mercury emissions in the United States.

Coal-fired power plants are responsible for about 40% of all mercury emissions in the United States, making them the largest single source. Perhaps as much as half spreads considerable distances, while the rest is deposited locally, creating so-called hot spots. The primary route of human exposure is fish consumption, because mercury bioaccumulates in water. Nearly every state has fish consumption advisories, especially for pregnant women, as fetuses are considered most vulnerable.

No federal rules on mercury from power plants are in place yet, although EPA determined in 2000 that regulation was "appropriate and necessary." Under existing law, there is only one way to regulate a hazardous air pollutant like mercury (as opposed to less dangerous pollutants). This so-called MACT (maximum achievable control technology) approach requires all polluters to meet an air standard based on the average emissions of the cleanest 12% of power plants.

While calculating the MACT, EPA became enamored of pollution-trading approaches, allowed by law for so-called criteria or conventional air pollutants. For instance, the "Clear Skies" legislation, introduced in Congress in June 2002, included a pollution-trading scheme to reduce emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x). That's relevant to the mercury debate because the same scrubber technology that can clean up these pollutants can also reduce mercury in some situations, yielding what's called a "cobenefit."

After that bill stalled, EPA proposed a rule in January 2004 that would regulate mercury under a similar cap-and-trade system. The agency claimed that this trading approach would cut emissions by 70% to 15 tons by 2018—apparently a much better bottom line than the MACT approach, which EPA said would lower annual emissions to ▶

* Additional Analyses of Mercury Emissions Needed Before EPA Finalizes Rules for Coal-Fired Electric Utilities. www.epa.gov/oigearth/reports/2005/20050203-2005-P-00003-Gcopy.pdf

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ScienceScope

EPA to Consider Human Pesticide Tests

The Environmental Protection Agency (EPA) will once again accept data from controversial studies that deliberately dose human volunteers with pesticides.

EPA stopped considering such data in December 2001, after the advocacy organization Environmental Working Group (EWG) challenged them as unethical. A review by the National Academy of Sciences (NAS) recommended that EPA accept the results of certain human tests if they met strict scientific and ethical criteria (*Science*, 27 February 2004, p. 1272). Meanwhile, CropLife America, a Washington, D.C.–based industry trade group, had sued EPA arguing that the moratorium was illegal, and in 2003 a judge agreed.

Now EPA has announced in an 8 February *Federal Register* notice that unless the studies are "fundamentally unethical," it will consider them case by case until new guidelines, including an ethics review board, are in place. That's consistent with the NAS recommendations. Still, EWG's Richard Wiles is upset. "This is the worst possible outcome," he says. "There are no rules, as far as I can tell."

–JOCELYN KAISER

Harvard Creates New Task Forces on Women in Science

A month after making controversial remarks about why men outnumber women in most scientific disciplines (*Science*, 28 January, p. 492), Harvard University president Lawrence Summers last week set up two task forces on campus to change the situation. The first, led by historian Evelyn Hammonds, will work to improve faculty searches and create a senior administrative position for improving gender diversity. The second group, chaired by computer scientist Barbara Grosz, will probe why women are underrepresented.

–YUDHIJIT BHATTACHARJEE

Nascent Reform Bill Criticized

PARIS—French scientists took to the streets last week to protest a government bill designed to boost research by reforming it (*Science*, 7 January, p. 27). The bill hasn't been made public yet, but after reviewing a leaked draft, leading scientists have concluded that it focuses too heavily on applied research. The government has scheduled more meetings with unions and leaders this month, so the bill won't be presented to Parliament until March at the earliest.

–BARBARA CASASSUS

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