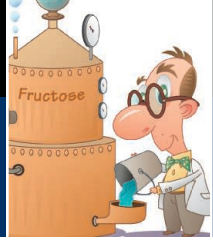
Empathetic mice? 1860



Plastic from fruit 1861

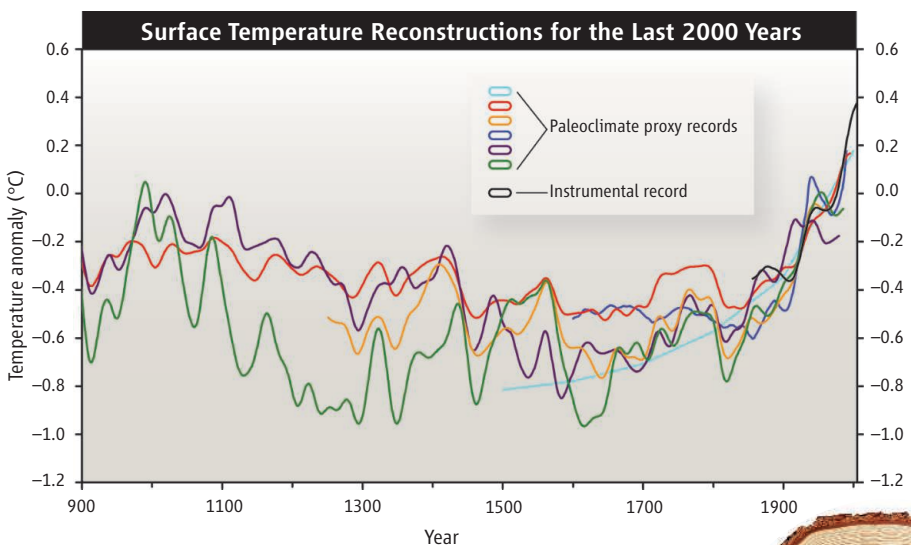
CLIMATE CHANGE

Yes, It's Been Getting Warmer in Here Since the CO_2 Began to Rise

WASHINGTON, D.C.—The last decades of the 20th century were most likely warmer than any comparable period in the past 1000 years, a National Research Council (NRC) panel announced* at a press briefing here last week. The expert committee thus confirms the outlines of the near-iconic "hockey stick" temperature curve—a long cooling followed by a sharp warming during the past millennium—that had become a favorite target of greenhouse contrarians. But the committee also says the evidence in parts of the stick is fuzzier than the public and many scientists might have thought.

The hockey stick arose from work published in 1998 and 1999 by statistical climatologist Michael Mann of Pennsylvania State University in State College and two colleagues. They compiled 12 Northern Hemisphere temperature records spanning the past millennium, using climate proxies such as the width of tree rings and the chemical composition of corals. The resulting temperature curve sloped gently downward for most of the millennium (the handle of the hockey stick), then rose sharply into the 20th century (the blade) until it topped the relative warmth of 800 to 1000 years ago. That turnaround suggested that humans played a hand in the recent warming.

After the hockey stick appeared prominently in a 2001 international climate assessment, the critics rushed in. Skeptics said Mann and colleagues had erred badly in their statistical analysis, and some hinted at deliberate distortion.



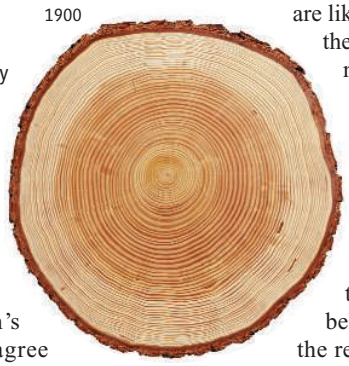
Warped sticks. The latest millennial temperature records (produced since the "hockey stick" came out using proxies such as tree rings) may have more squiggles, but they support a recent sharp warming to record high temperatures.

The NRC committee, chaired by meteorologist Gerald North of Texas A&M University in College Station, generally supported Mann's work. "We do roughly agree with the substance of their finding," said North. Mann's group sometimes erred, the committee found. "Some of their choices could have been made better," said statistician and committee member Peter Bloomfield of North Carolina State University, Raleigh, "but it was quite plausible at the time." In any case, the missteps "didn't have a material effect on the final conclusion," he said. And similar studies have followed from a half-dozen other groups, all giving the warm-cool–much warmer pattern.

In addition, none of the three committee members at the press briefing—North, Bloomfield, and paleoclimatologist Kurt Cuffey of the University of California, Berkeley—had found any hint of scientific impropriety. "I certainly did not see anything inappropriate," said North. "Maybe things could have been done better, but after all, it was the first analysis of its kind."

Although the committee generally supported the work Mann led, "there's a disagreement about how sure we are" about some of the study's conclusions, said North. The committee has "high confidence" that the late 20th century was the warmest period of the past 400 years—a time when high-precision proxy records are abundant. That's consistent with the idea that recent warming was in large part human-induced, Cuffey noted. But the committee has "less confidence" in Mann's conclusion that recent temperatures have set a record for the entire millennium. "The committee concluded that Mann and his colleagues underestimated the uncertainty" in the earlier part of the record, said Cuffey, for which records are of lower quality and fewer in number. "In fact, these uncertainties aren't fully quantified," he said.

When pressed, statistician Bloomfield characterized the committee's lesser confidence in the millennial result as "more at the level of 2:1 odds" that Earth is now warmer than it has been in at least 1000 years. The committee has "even less confidence" in Mann *et al.*'s 1999 conclusion that "the 1990s are likely the warmest decade, and 1998 the warmest year, in at least a millennium." "That's plausible," said Cuffey. "We don't know if it's true or not." A year or a decade is just too short an interval for comparison to the older paleotemperature record, he said.



Whether 2:1 odds for a millennial record are good or poor turns out to be in the eyes of the beholder. Long-standing critics saw the report confirming that the hockey stick had not stood up to scrutiny; defenders saw support for key findings. The committee, for its part, stressed that the hockey stick and other records resembling it are not the only evidence of human-induced warming, "and they are not the primary evidence." Cuffey, for one, argued staunchly that the case for anthropogenic global warming is compelling, with or without the hockey stick.

–RICHARD A. KERR

* *Surface Temperature Reconstructions for the Last 2,000 Years*, National Research Council, available at fermat.nap.edu/catalog/11676.html

CREDITS (TOP TO BOTTOM): ADAPTED FROM NRC; ROYALTY-FREE/CORBIS

Published by AAAS