



Not so fast. Critics have hit IPCC over a false assertion that Himalayan glaciers would melt away by 2035.

Scientists Grapple With 'Completely Out of Hand' Attacks on Climate Science

A symposium organized at the last minute at the annual meeting of the American Association for the Advancement of Science (the publisher of *Science*) by two of the world's most prominent scientific organizations addressed recent attacks on an increasingly beleaguered climate science community. The panel met in the uncertain aftermath of the stolen e-mails affair and critiques of the Intergovernmental Panel on Climate Change (IPCC) (*Science*, 12 February, p. 768).

The symposium was convened by U.S. National Academy of Sciences President Ralph Cicerone, in conjunction with AAAS, at a time when flaws in the latest IPCC report, and even the legitimacy of climate science, have made headlines. E-mails uncovered late last year revealed instances of scientists on the panel discussing withholding data and documents from those with opposing views, conspiring to keep contradictory papers out of influential reports, and encouraging colleagues to delete e-mails.

Despite a drumbeat of studies that corroborate the conclusion that the planet is warming and human activities are largely responsible, these recent skirmishes "have really shaken the confidence of the public in the conduct of science [overall]," said Cicerone, citing a number of recent polls on the public perception of science. "The situation is completely out of hand," said climate scientist Gerald North of

Texas A&M University in College Station, who has served as an IPCC reviewer. "One guy e-mailed me to say I'm a 'whore for the global warming crowd.'" His PowerPoint presentation at the meeting included a slide quoting conservative talk show host Glenn Beck, who suggested that scientists commit "hara-kari" to atone. "Scientists cannot use the same tone and rhetorical style as commentators and bloggers," North said.

Although much of the session at the meeting, titled "Ensuring the Transparency and Integrity of Scientific Research," focused on what Harvard University oceanographer and former AAAS head James McCarthy called the "abominable" press coverage, scientists owned up to their share of the blame. Small errors in the 2007 report were "careless," said McCarthy, but IPCC should have done a full and public examination to describe how they had come about: "The names of the authors, who was on the review, what happened—it all should have been up there, and it wasn't done. And I think that the institution was hurt as a result," he said.

The community allowed "the situation to get out of control," said Sheila Jasanoff of Harvard University. She said in general scientists had to connect better to the public. "There is a kind of arrogance—we are scientists and we know best," Jasanoff said. "That needs to change." —ELI KINTISCH



E-mail etiquette. Gerald North says scientists should not sound like bloggers.

The Latest on Geoengineering

Preliminary findings presented here suggest that some proposed techniques to cool the planet manually may have fewer barriers than previously thought. But many technical and societal barriers remain.

Even before they got to the sessions, the scientists had to contend with a smattering of activists with drums, cameras, and a megaphone alleging that the government is already performing geoengineering through the spraying of particles, in so-called chemtrails.

Physicist David Keith of the University of Calgary in Canada addressed the concept of spreading aerosol droplets in the stratosphere, where they could block a small fraction of the sun's rays. A paper published last year in *Environmental Research Letters* suggested that the leading proposal, spraying

Is a Dolphin a Person?

Are dolphins as smart as people? And if so, shouldn't we be treating them a bit better? Those were the questions scientists and philosophers debated at a session here on Sunday.

Dolphins, it turns out, are pretty darn smart. Panelist Lori Marino, an expert on cetacean neuroanatomy at Emory University in Atlanta, said they may be Earth's second smartest creature, after humans, of course.

Bottlenose dolphins have bigger brains than humans (1600 grams versus 1300 grams), and they have a brain-to-body-weight ratio greater than that of great apes (but smaller than that of humans), said Marino. "They are the second most encephalized beings on the planet."

But it's not just size that matters. Dolphins also have a very complex neocortex, the part of the brain responsible for problem solving, self-awareness, and various other traits we associate with human intelligence. And researchers have found spindle neurons in dolphin brains called von Economo neurons that in humans and apes have been linked to emotions, social cognition, and even theory of mind: the ability to sense what others are thinking. Overall, said Marino, "dolphin brains stack up quite well to human brains."

What dolphins do with their brains is also impressive. Cognitive psychologist Diana

sulfur dioxide gas, wouldn't work. Sulfur dioxide is converted in the atmosphere into droplets of sulfuric acid, which would clump and fall out of the sky before they could have much cooling effect. To get around this problem, Keith and colleagues have proposed using airplanes to spray droplets of the acid itself, rather than sulfur dioxide. In unpublished data, the team found that injecting only "a few megatons per year" of sulfuric acid could be more than twice as effective at blocking radiation as starting with sulfur dioxide.

While scientists are finding ways to overcome the engineering challenges, the environmental effects of planet-hacking techniques remain uncertain. One challenge in geoengineering a warmed planet is simultaneously restoring temperatures while minimizing disruption of rain and precipitation. (Stratospheric particles lower the total amount of energy striking Earth, the driver of precipitation.)

In previous modeling efforts, adding sun-blocking particles uniformly across the globe has tended to undercool the poles while overcooling the equator. So Kenneth

Caldeira, a climate scientist at the Carnegie Institution for Science in Stanford, California, modeled various approaches to try to counteract a severe warming—the result of a doubling of preindustrial CO₂ concentration. In work yet to be published, he distributed the particles unevenly to try to minimize those effects; for example, by putting more at the poles versus the equator. (Global warming is greatest in the Arctic.) In models, that strategy helped fix the undercooling/overcooling problem, but it worsened the effects on precipitation. "There's a complex problem of how do you balance the damage that you do against the benefit," said Caldeira.

That said, simulating either geoengineering approach to counteract global warming—distributing particles globally or focusing on the poles—suggests a cooler world with less disruption of rain patterns than one in which warming continues unabated. "In a high-global-warming world, more people would be better off with geoengineering, but some people would be worse off," he said.

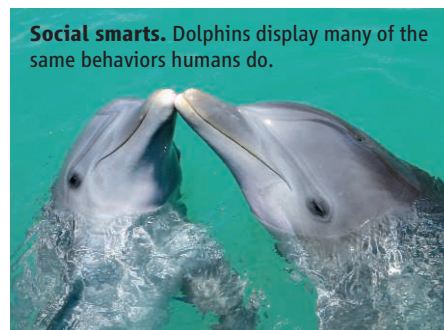
—ELI KINTISCH

Reiss of Hunter College of the City University of New York has been working with dolphins in aquariums for most of her career, and she said their social intelligence rivals that of the great apes. Dolphins can recognize themselves in a mirror, a sign of self-awareness. They can understand complex gesture "sentences" from humans. And they can learn to poke an underwater keyboard to request toys. "Much of their learning is similar to what we see with young children," said Reiss.

So if dolphins are so similar to people, shouldn't we be treating them more like people? "The very traits that make dolphins interesting to study," said Marino, "make confining them in captivity unethical." She noted, for example, that, in the wild, dolphins have a home range of about 100 square kilometers. In captivity, they roam one 10-thousandth of one percent of this area.

Far worse, Reiss said, is the massive dolphin culling ongoing in some parts of the world, which she documented with a graphic video of dolphins being drowned and stabbed in places like the Japanese town of Taiji.

Thomas White, a philosopher at Loyola Marymount University in Redondo Beach, California, suggested that dolphins aren't merely like people—they may actually be people, or at least, "nonhuman persons." Defining exactly what it means to be a person is difficult, White said, but dolphins seem to fit the check-



list many philosophers agree on. There are the obvious ones: They're alive, aware of their environment, and have emotions; but they also seem to have personalities, exhibit self-control, and treat others appropriately, even ethically. When it comes to what defines a person, said White, "dolphins fit the bill."

Still, experts caution that the scientific case for dolphin intelligence is based on relatively little data. "It's a pretty story, but it's very speculative," says Jacopo Annese, a neuroanatomist at the University of California, San Diego. Despite a long history of research, scientists still don't agree on the roots of intelligence in the human brain, he says. "We don't know, even in humans, the relationship between brain structure and function, let alone intelligence." And, Annese says, far less is known about dolphins.

—DAVID GRIMM

With reporting by Greg Miller.

More Highlights From AAAS 2010

Science reporters posted more than two dozen blog entries and podcasts from the meeting. Here is a sample. For full coverage, see www.sciencenow.org. And to see what our guest bloggers had to say, see news.sciencemag.org/sciencebloggers.

A Sexy Treatment for Traumatic Brain Injury

The hormone progesterone is best known for its work in the female reproductive system, where it plays various roles in supporting pregnancy. But starting next month, it will be the focus of a phase III clinical trial for traumatic brain injury. Researchers hope an infusion of progesterone given within a few hours of a car accident or other trauma will help prevent brain damage.

The Mathematics of Clumpy Crime

Even in a sprawling city like Los Angeles, California, crimes still clump together. Mathematical models presented at the meeting show that such crime hot spots form when previous crimes attract more criminals to a neighborhood. By understanding how these blobs form, researchers hope to help police break them up.

Are 'Test Tube Babies' Healthy?

When Louise Brown was born on 25 July 1978, she kicked off an era. The first "test tube baby" is a mother herself now, and she's been joined by millions of others born with the help of in vitro fertilization (IVF). But are babies born via IVF the same as those born naturally? Researchers have discovered some subtle genetic differences.

Drive Green, Make Money

Widespread adoption of plug-in electric vehicles could dramatically cut greenhouse gas pollution and reduce U.S. dependence on foreign oil. And results of a new electric-car pilot project provide added incentive to go electric: Car owners could return unused electricity to the grid and make real money doing so.

Science Is Kryptonite for Superheroes

Hollywood has a message for scientists: If you want something that's 100% accurate, go watch a documentary. A panel of screenwriters for superhero-driven movies and TV shows like *Watchmen* and *Heroes* said that their job is to get the characters right, not the science.