practically useless. Only two papers compared the quality of papers submitted as a manuscript with the version that later appeared in print, and their results were difficult to generalize. "If I manufactured a drug called peer review and went to the Food and Drug Administration with it, they would collapse laughing," Jefferson concluded.

The study—which, like all contributions at the meeting, had been peer-reviewed—was "pretty depressing," concedes *BMJ* editor Richard Smith. Still, Smith and other editors remain convinced that the review process helps, even if studies can't objectively show it. Part of the problem may be that standardized quantitative scales are not the right way to gauge a paper's quality, says "*JAMA* deputy editor Drummond Rennie, because they don't capture certain flaws, such as a researcher misinterpreting his data. "I could name scores of scientists who have had their reputations saved by peer review," Rennie says.

Although peer review is clearly here to stay, a few editors urged their colleagues to at least shatter the secrecy surrounding the process—specifically, by releasing the names of the reviewers. Critics say that anonymous review enables researchers to trash a rival's paper for no good reason—and sometimes get away with it. "It's power without accountability," says Rennie. "And it's an anachronism." But many journals argue that guaranteeing anonymity is the only way to assure reviewers that they can speak their minds without fear of retaliation.

In a pioneering move 3 years ago, the *BMJ* began making reviewers' names known to authors; since then, "the sky hasn't come down," says Smith. Only 20 or 30 of the *BMJ*'s 5000 or so reviewers have quit, and although the reviews tend to contain less verbal abuse, they have not become less critical, Smith says. BioMed Central, an online publishing house, even goes a step further, by posting the reviews of all papers accepted by its 40 medical journals on the Web, along with the author's response.

Other journals watch such experiments with interest—but few plan to follow suit. Rennie, for instance, has not been able to convince fellow editors at *JAMA* to reveal reviewers' identities. Horton would like more evidence that the "culture of robust and honest criticism" doesn't suffer before lifting the veils of *The Lancet's* peer review system.

Unfortunately, says Smith, big funding agencies like the National Institutes of Health, the Medical Research Council, and the European Union have so far shown little interest in supporting studies of peer review. "They want to study diseases, not the scientific process," says Smith. "To them, it looks like navel-gazing." **–MARTIN ENSERINK**

ASTROPHYSICS

New Model Shows Sun Was a Hot Young Star

According to Genesis, when the newborn Earth arrived on the scene, "darkness was upon the face of the deep." Not so, say two German astronomers. In fact, their elaborate computer simulations indicate that our infant planet's main light source—the young sun—was much hotter and brighter than astronomers have thought. "The sun started out quite different from what people have assumed until now," says Günther Wuchterl of the Max Planck Institute for Extraterrestrial Physics in Garching. If they hold up, the new results could change the way scientists think about other young stars and Earth's early climate.

Brighter. Young stars, such as these in Cygnus, may be more luminous than astronomers thought.

CREDIT: SUBARU TELESCOPE, NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN

At an age of 1 million years (1/4600th of its current age), Wuchterl says, the sun was still a protostar—a ball of gas in which the nuclear fusion of hydrogen into helium was just about to start. It's no surprise that this protostar shone more brightly than today's sun, because its contracting gases temporarily released more energy than fusion does now. But whereas current evolutionary models peg its luminosity at just twice the present value, the new simulations estimate that the young sun was four times as bright as it is now and that its surface was 500 degrees hotter.

Using a special-purpose supercomputer called GRAPE (*Science*, 13 July, p. 201), Wuchterl and his colleague Ralf Klessen simulated the entire star-forming process, starting with a fragmenting interstellar molecular cloud and continuing through the formation of protostellar "embryos" and the accretion of gas onto the young protostar. Most earlier simulations treated each step "separately and, hence, inconsistently," says theoretician Adam Burrows of the University of Arizona in Tucson. "For 40 years, the astrophysics community has been seeking a comprehensive and predictive theory of star formation. This new work is a big step toward that goal."

The results, which have been accepted for publication in *Astrophysical Journal Letters*, may have consequences for the study of star-forming regions. Astronomers deduce the mass and age of a young star from its luminosity and surface temperature, on the assumption that young protostars get fainter with age. But if protostars start out brighter than current models predict, their ages may well be underestimated, Wuchterl says.

Ray Jayawardhana of the University of California, Berkeley, agrees. "We still need a lot more work, both theoretically and observationally, to fully understand the picture," he says. But ultimately, the new work by Wuchterl and Klessen "might help us pin down the exact ages of very young stars better."

More tentatively, the new results might also change ideas about Earth's early climate. Our planet probably formed when the sun was a few million years old—about the time the bright protostar became a full-fledged star. Astrophysical models indicate that within a few hundred million years, the sun had faded to some 70% of its current luminosity before growing gradually brighter over the past 4 billion years or so. Yet geological evidence shows that average temperatures on Earth during the stellar chill-out never dipped below freezing. If the young sun was so faint, how did Earth stay warm?

The answer, Wuchterl and Klessen's simulation suggests, may be that the faint young sun wasn't so faint after all. But scientists caution that the new simulation covers only the first few million years of a star's life—far too short a time to give a conclusive ruling on the "faint young sun" paradox. "The important question … is whether these effects [of higher temperature and luminosity] persist until after more than 100 million years of the sun's history," says Christopher Chyba of the SETI Institute in Mountain View, California.

Some experts say there's no need to adjust the solar thermostat at all. "Climatologists already have an answer—a very good one, I would argue—to the faint young sun paradox," says Jim Kasting of Pennsylvania State University, University Park. Greenhouse gases such as carbon dioxide and methane, he says, would have kept Earth warm during a solar cold spell. "The Earth system can very easily counter a 30% decrease in solar luminosity," Kasting says. "So, from my standpoint, no drastic revision of solar evolution theory is needed."

Wuchterl and Klessen hope to test their results by observing very young binary protostars that eclipse each other as they orbit. In such systems, temperatures, luminosities, masses, and sizes could be determined observationally and compared with the new models. "So far," says Wuchterl, "such systems are not known. But the search is going on."

–GOVERT SCHILLING

Govert Schilling is an astronomy writer in Utrecht, the Netherlands.

CANADA

Inuit Claims Hinder NASA Mars Project

OTTAWA, CANADA—The past, present, and future have come together to create a controversy on the Arctic's largest uninhabited island. Hanging in the balance is a research project to explore whether an ancient crater might help to prepare U.S. astronauts training for a landing on Mars.

Some 23 million years ago, a meteorite tore out a 20-kilometer-wide chunk of barren land in what is now Nunavut Territory in northwestern Canada. In 1997, a 60-member team of researchers began spending their summers at the site on Devon Island, testing the idea that the apparent similarity between the Haughton crater and the martian surface might be scientifically important. In particular, the team hopes that studying what happens when meteorites strike Earth might tell them more about the evolution of geological formations on Mars. NASA provides slightly more than half of the project's $500,000 annual budget, with the rest split among some 50 universities, corporations, and private organizations.

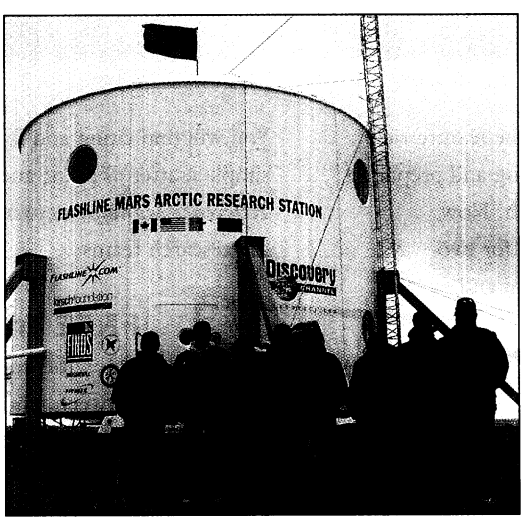
For 3 years the researchers roamed the crater freely. They mapped formations such as hydrothermal vents and pipelike rock formations—warm and wet enough to allow for microbial growth—to learn more about how life arises in extreme conditions and environments. They even built a mock habitat, a stand-in for a landed spacecraft from which they carried out field studies in a sort of dry run of field science on Mars.

That work was carried out with the necessary permits from the Nunavut government. But 2 years ago the local Inuit people denied the researchers access to 70% of the crater, citing a 1993 land claim agreement with the federal government that allowed them to erect "no trespassing" signs if they felt that their interests were being compromised. The crater is located within the hunting grounds of residents of Grise Fiord, a hamlet 200 kilometers across the Jones Sound from the island.

"There was a change of mayor, [and] things became political," says Mary Ellen Thomas, manager of research liaison at the Nunavut Research Institute, which administers research licenses. Marty Kuluguqtuq, a hamlet administrator, says that officials merely wanted to ensure that the 170 residents derive some benefit from the research and that the scientists protect the environment. "There is air traffic and people going by land on four-wheelers," he says. "We harvest animals out in that area: fish, caribou, and musk ox."

The hamlet has asked for a formal Inuit Impact and Benefits Agreement (IIBA), something normally struck only for large development projects or national parks. Stephen Foulds, legal counsel for the Inuit land claims organization in the Nunavut, says that the 1993 law allows for packages ranging from financial compensation to training, preferential hiring, and even housing. Kuluguqtuq says that the hamlet's demands are likely to include "some sort of tariffs" or similar compensatory package.

The next step is a meeting in November between Grise Fiord officials and Pascal Lee, a planetary scientist at the California-based SETI Institute and scientific leader of the Haughton-Mars project. Lee says he's eager to reach an agreement with Inuit leaders, provided it's affordable and falls within the law: "I'm told that an IIBA is a bit of an overkill, but perhaps we should still have something that spells out our responsibilities at the site."



Temporary thaw. Researchers welcome Grise Fiord officials to their outpost on Canada's Devon Island.

CREDIT: PASCAL LEE/NASA HAUGHTON-MARS PROJECT

Lee has already tried to diffuse the tension by hosting eight representatives from Grise Fiord this summer. He showed them the urine-filled drums that scientists ship out each season to avoid fostering the unnatural growth of mosses and other plants. "We also want to keep the site in this pristine, Mars-like state," he says.

–WAYNE KONDRO

Wayne Kondro writes from Ottawa.

ENVIRONMENTAL HEALTH

Second Look at Arsenic Finds Higher Risk

A National Academy of Sciences (NAS) panel, after being asked to update an earlier report on arsenic in drinking water, has found that the cancer risks are even greater than had been thought. The panel's report* comes 6 months after the Bush Administration shelved the Environmental Protection Agency's (EPA's) proposal to clamp down on arsenic, sparking an outcry from environmentalists and some members of Congress (*Science*, 30 March, p. 2533). EPA Administrator Christie Whitman, who requested the NAS review, now appears to have little choice but to adopt a standard at least as tough as the one she had delayed.

Studies of people exposed to high levels of arsenic in water have linked the metal to elevated rates of internal cancers. After a 1999 NAS review found that the current standard of 50 parts per billion (ppb) wasn't sufficiently protective, the outgoing Clinton Administration proposed tightening it to 10 ppb, based on a study of arsenic and cancer in southwestern Taiwan. But officials from Western states with high natural arsenic levels protested that the cost of cleaning up the water would be overwhelming. In April, EPA asked the academy to review the latest science supporting levels between 3 ppb and 20 ppb.

This new panel concluded that the analysis on which EPA based the 10-ppb proposal had actually underestimated the risks. "Four new epidemiological studies were key," says panel chair Robert Goyer, a pathologist retired from the University of Western Ontario who also headed the panel that produced the 1999 report. New studies from Chile and Taiwan supported results from the earlier Taiwan study, countering the suggestion that those results had been skewed by malnutrition. The panel recalculated the risks in a slightly different way from an analysis EPA used and concluded that the resulting risks for lung and bladder cancer were higher than EPA had assumed. For example, at 10 ppb, the study that EPA relied on estimated up to 0.8 extra cases per 1000 people, while the panel found a risk of 1.3 to 3.7 extra cases depending on whether it used the background cancer rate in Taiwan or in the U.S. population.

An EPA spokesperson declined to speculate on whether the new standard would be 10 ppb or lower but said Whitman is now "more concerned, not less" about arsenic risks. Her decision is due out by February.

–JOCELYN KAISER

* Arsenic in Drinking Water: 2001 Update, National Research Council, September 2001.