New station recommended for the South Pole

As government officials look for ways to trim the budget, some have wondered whether the United States truly needs its costly and aging science station at the South Pole. An independent review board last week strongly endorsed continued research at the South Pole, however, and recommended that the United States carry out plans to rebuild the dilapidated station.

Recognizing the difficulty of selling a big expenditure to Congress, the panel trimmed the price tag of the new facility and concluded that scientists should sacrifice some funding to help defray its cost.

The National Science Foundation, which runs the three U.S. research facilities in Antarctica, convened the 10-person panel last year to provide an independent assessment of science on the southernmost continent. Norman R. Augustine, chairman and CEO of Lockheed Martin Corp., led the review committee of scientists, engineers, and businesspeople. He previewed the panel's report last week in testimony before the House Science Committee.

Despite the cost of operating in Antarctica, the continent provides unique scientific opportunities, concluded the panel. "The region serves as a one-of-a-kind scientific laboratory for the investigation of phenomena which range from the microscopic to the Earth-shaping," Augustine told Congress.

Perhaps more important to Congress, the United States has political reasons for maintaining a presence on the continent, specifically at the South Pole. Government policy since the Cold War has held that U.S. dominance in Antarctica is needed to ensure political stability in a region where other countries have made overlapping land claims that converge at the pole.

The United States has operated a permanently occupied facility at the South Pole since 1957 and built the current station in the 1970s. In recent years, the station has started showing its age, as drifting snow slowly covers the large geodesic dome. Sewage leaks and other utility glitches plague the station, and providing enough space for the researchers is a perennial problem.

"Critical safety and health shortcomings exist at U.S. facilities in Antarctica, particularly at South Pole Station," Augustine testified. "The U.S. would not send a ship to sea or a spacecraft to orbit in the condition of some of the facilities in Antarctica, particularly the one at the South Pole."

The National Science Foundation several years ago designed a replacement station for South Pole that would cost upwards of $180 million. The Augustine panel proposed trimming $30 million off that figure by eliminating costly components, such as a sewage treatment system, windmills, and solar cells.

The committee also suggested that Antarctic scientists sacrifice $20 million in funds over the 5-year construction phase to help pay for the facility.

"I expect to hear complaints from the scientific community," commented F. James Sensenbrenner Jr. (R-Wis.), chairperson of the House Science Committee.

Cornelius W. Sullivan, director of the agency's polar research office, suggests that NSF can cut costs without trimming science. The solution may be for some researchers to conduct polar studies at home instead of in Antarctica, where costs run high. These homebound investigators could analyze data previously collected in Antarctica or build new instruments for future trips, he suggests.

Congress allocated $25 million in 1997 to address the most serious safety issues at South Pole. That leaves a shortfall of roughly $100 million for rebuilding the station and making repairs to the other two Antarctic stations. Congress must now decide whether to fund the new station or leave polar scientists out in the cold. — *R. Monastersky*

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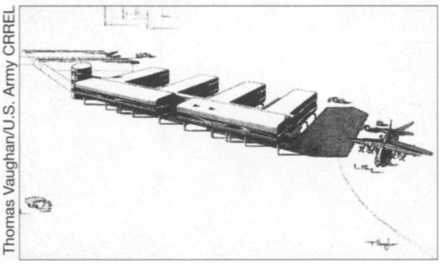
Thomas Vaughan/U.S. Army CRREL



Existing station at South Pole (top) and sketch of proposed replacement.

Gene tool may crack open microbial secrets

In a world without microorganisms, dead trees would keep their carbon to themselves. Although the trees would still die, topple, break into small particles, and eventually be buried, they would not liberate this element, an essential building block of life. It takes methane-producing microbes like some archaea to turn carbon into methane gas, which they release into the atmosphere.

Scientists have now invented a genetic tool that may help them discover how archaea, a poorly understood form of life, accomplish this elemental task.

Last summer, researchers sequenced the entire genome of *Methanococcus jannaschii*, a methane-generating species of archaea living on the ocean floor (SN: 8/24/96, p. 116). That feat provided an inventory of the microbe's genetic instructions, but understanding of the inventory remains incomplete.

Of the reported 1,738 genes in *M. jannaschii*, only 44 percent resemble genes from known organisms other than archaea. The new tool, described in the March 18 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, will enable scientists to discover the functions of the unidentified genes in *M. jannaschii* and in a broad collection of other methane-producing archaea.

"We haven't really been able to get at a lot of how these organisms live and grow," says William W. Metcalf, a microbiologist at the University of Illinois at Urbana-Champaign. "This is the first breakthrough that's going to help us do that."

Metcalf worked with colleagues at the University of Illinois and the University of Maryland at Baltimore to develop the new genetic tool, which he thinks will help researchers figure out how archaea convert carbon to methane.

Scientists' understanding of archaea lags far behind their knowledge of other microorganisms. Before 1977, biologists lumped archaea with bacteria. Then, Carl R. Woese of the University of Illinois argued successfully that archaea deserved their own branch on the tree of life.

The new tool consists of a small ring, or plasmid, of archaea DNA to which the researchers added a gene for resistance to antibiotics. The scientists can add to the plasmid whatever genes they need for their experiments and then insert the plasmid into an archaea. The plasmid can even carry genes from one species of methane-producing archaea to another.

William Whitman, a microbiologist at the University of Georgia in Athens, called the development "an extraordinary contribution." Scientists have had only two other genetic means of studying archaea, neither of which helped them examine the methane-producing group, he says.

"These guys are really highly specialized," he says of the methane producers. Such archaea live in environments ranging from decaying teeth to the intestines of animals, acid baths, and boiling water thousands of feet beneath the sea. Scientists hope to learn how these different archaea perform their common function and how they survive extreme conditions, Whitman says. — *P. Smaglik*