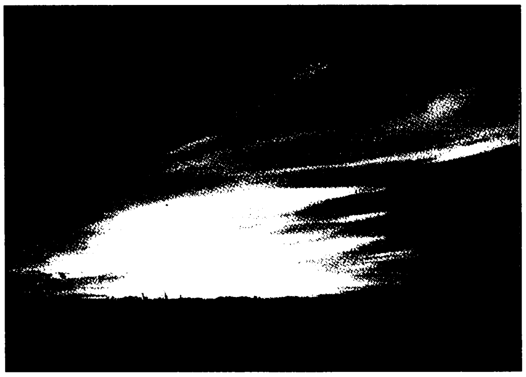
noise turned out to be humongous particles containing nitric acid. The polar stratospheric cloud (PSC) particles that form in the extreme cold of polar winter generally run a few tenths of a micrometer to a micrometer in diameter and are made of water and nitric and sulfuric acids. But these new, oversized particles, more than 3000 times the usual mass, ranged from 10 micrometers to 20 micrometers. "These things are rocks" compared with the usual PSC particles, says Fahey. They are most likely made of solid nitric acid hydrates. Atmospheric chemists aren't sure yet how they formed, says Fahey; "no one was expecting to see" such large particles.

The discovery of PSC rocks is catching researchers' attention because of their potential role in removing nitrogen from the stratosphere. All PSCs provide surfaces where chlorine and bromine can be liberated from their inactive forms to enter their ozone-destroying forms. But PSCs that contain nitric acid can also play an indirect role in ozone destruction by taking nitrogen out of circulation. Because nitrogen can tie up chlorine and bromine in inactive, harmless forms, when it becomes tied up in PSCs—a process called denitrification—more chlorine and bromine can remain active to destroy ozone. And because PSC rocks fall far faster than feathery-light PSC particles, the rocks can efficiently ferry nitrogen out of some layers of the stratosphere.

Researchers had found denitrified air over the poles before, but there was no evidence to prove how it was happening. The discovery of PSC rocks is "the first time we've clearly seen reactive nitrogen being stripped from the polar arctic stratosphere," says James Anderson of Harvard University. The rocks are so big that they sink 1.5 kilometers per day compared with 0.1 kilometer per day for ordinary PSCs, Fahey and his colleagues calculate. Although relatively rare, the particles are so massive that in only a few days, their sinking could have removed about half the nitric acid above an altitude of 20 kilometers. "The removal is more widespread than we expected," says Anderson. Last year it seemed to cover an area the size of the United States.

"Now the most important question is how this system will respond to greenhouse loading," says Anderson. Fahey and his colleagues point out that the atmospheric models used to simulate denitrification are now obviously inaccurate, because they don't properly account for rocks. By allowing more chlorine and bromine to remain in their active forms, denitrification could help keep ozone destruction going over the Arctic even after PSCs disappear in the spring. And increased greenhouse gases would likely enhance that process: Although they keep heat in lower down, greenhouse gases cool the stratosphere by radiating heat to space, encouraging the cold that leads to denitrification. Also, levels of stratospheric water vapor are rising along with greenhouse gases, which would also encourage the formation of the water-rich PSC rocks.



CREDIT: ARC/NASA

Pretty but dangerous. Polar stratospheric clouds with "rock" particles may destroy more arctic ozone.

Denitrification "doesn't portend massive ozone losses" like the Antarctic's, notes Susan Solomon of NOAA, Boulder. But Fahey and his colleagues do note that it could delay recovery of ozone over the Arctic as chlorine and bromine emission controls take effect. "If you want to calculate the response of the Arctic to climate change," says Fahey, "the existence of these large particles says you need a rather sophisticated model." The next step in building such a model will be figuring out how rocks start to grow in the first place.

–RICHARD A. KERR

GENOME RESEARCH

Progress for the 'Mouse Gene Encyclopedia'

TOKYO—The imminent publication of the draft sequences of the human genome will be a major milestone in the history of biology. But many researchers regard having the sequence as the first, not the last, step in understanding how the genome works. It's also necessary to identify the genes, which constitute only a small fraction of the human genome sequence, and determine what they do. An international consortium led by Yoshihide Hayashizaki of the RIKEN Genomic Sciences Center in Yokohama, Japan, has now provided the first installment of what promises to be a key resource for filling this gap.

Beginning in 1995, the group set out to produce a complete set of complementary DNA (cDNA) copies of all the mouse genes transcribed into messenger RNAs—that is,

ScienceScope

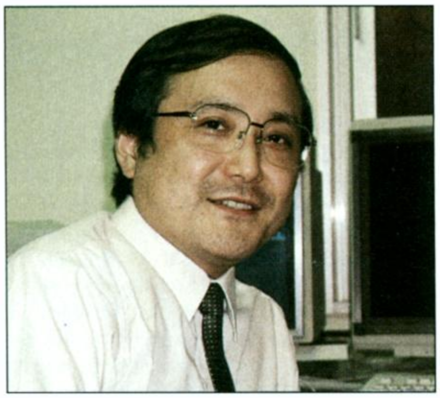
The Ideas of March The new chair of the House Science Committee is promising to move quickly to get his panel involved in the three E's—education, energy, and the environment. Representative Sherwood Boehlert (R–NY) last week said that the panel, which oversees the gamut of U.S. nonbiomedical civilian science, will hold hearings on the topics beginning next month. He also promised scientists that he will be "your staunchest ally and your fairest critic."

After ascending to the panel's top spot last month (*Science*, 12 January, p. 222), Boehlert outlined his agenda in a 31 January speech to the Universities Research Association, a group of 89 research institutions. First priority, Boehlert said, will be to examine ways to improve precollege math and science education—from creating incentives for top students to teach, to examining the impact of standardized tests on learning. On energy, he'd like to shore up support for research into renewables. And his committee will become "a central forum to learn about the science behind" environmental controversies such as global warming and genetic engineering, he vowed. Hearings will include diverse points of view, he added, "unlike those at which [lawmakers] don't want to be confused by the facts."

Talent Hunt The new InterAcademy Council (IAC) research organization—an international version of the study-producing U.S. National Research Council (*Science*, 19 May 2000, p. 1149)—has gotten its first assignment. Science academy presidents meeting in Davos, Switzerland, last week decided that the IAC's inaugural study should focus on developing better ways to promote scientific talent and research capacity, especially in developing countries. The presidents—led by IAC cochairs Bruce Alberts, president of the U.S. National Academy of Sciences, and Indian Academy president Goverdhan Mehta—also hired law professor Albert Koers of the University of Utrecht in the Netherlands as the group's executive director.

The study, to be funded by a Sloan Foundation grant and written by an e-mail–linked expert panel nominated by member academies, "will focus on developing young scientific talent worldwide," says Koers. A final product is due later this year. The IAC will have a small "core staff" in Amsterdam to help coordinate such projects, he added, but otherwise will be run as "a virtual organization."

Contributors: Richard A. Kerr, Pallava Bagla, David Malakoff, Robert Koenig



Clone collector. Yoshihide Hayashizaki leads the effort to collect full-length cDNA clones of all the mouse genes.

of all the active genes of the mouse genome. In this week's issue of *Nature*, the researchers report that they have sequenced and analyzed more than 20,000 full-length mouse cDNAs—one of the largest such collections for any organism. Because some genes were represented by more than one cDNA, the team estimates that they now have in hand cDNAs for nearly 13,000 different mouse genes—about 20% of the total encoded by the mouse genome. The consortium expects to complete the project by spring 2002.

Hayashizaki says the consortium set out to produce this "mouse gene encyclopedia," as he calls it, partly to aid in identifying the genes in the human and mouse genome sequences. Current methods of finding genes in genomic sequences, chiefly using computer prediction programs, are proving inadequate, missing genes and incorrectly identifying where gene coding regions start and stop. But having full-length cDNA copies of the genes makes it much easier to spot the genes in the genomic sequences.

This information should be valuable for understanding the human genome sequence as well, because many of the mouse and human genes are likely to be similar. Indeed, the public group sequencing the human genome is interested in collaborating with Hayashizaki in using the mouse cDNA data to identify genes in the human genome. "It is a very important resource," says Robert Strausberg, director of the Cancer Genomics Office of the U.S. National Cancer Institute in Bethesda, Maryland. "Hayashizaki is really to be congratulated; they are at the forefront of this work."

In addition to aiding in gene identification efforts, the cDNA clones can also be used to construct the microarrays now coming into widespread use for profiling gene expression patterns and for synthesizing the proteins themselves. "This is exactly what scientists would like to have in their labs: the ability to produce proteins and study their functional characteristics," says Strausberg, who is overseeing a U.S. effort to produce cDNA clones.

A number of U.S. university and public sector labs have already acquired mouse cDNA clones from RIKEN. Although RIKEN retains some rights over the material, a researcher at one institution says the usage agreement is similar to the ones at most U.S. universities. —DENNIS NORMILE

SWISS SCIENCE

New Program Draws Praise, Complaints

BERN—A major program launched last month to boost the fortunes of a select group of top Swiss labs has ignited a controversy in the scientific community. Whereas the winners say it will provide much-needed opportunities for networking, some observers complain that the program is elitist. And social scientists are unhappy about being excluded from the winner's circle.

Things got off to an auspicious start when 230 research groups across the country submitted preliminary proposals in 1999 to become one of the government's new National Centres of Competence in Research (NCCR). The Swiss National Science Foundation (SNSF), which will administer the grants, chose 18 finalists and submitted the list to the Science and Research Group (SRG), part of the Federal Department of Home Affairs. The SRG chose 10 winners, each of which will receive between \$1.7 million and \$3.1 million a year for the next 3 years (see table). The \$77 million is expected to be supplemented with funding for an additional 5 to 9 years as well as new money to fund a second round. The new centers, says SRG State Secretary Charles Kleiber, "are an instrument to reshape the Swiss research landscape."

The grantees were chosen according to several criteria, including scientific merit, their prospects for transferring the technology to industry, and their plans to train young scientists and advance women in the field. The awards are also meant to promote collaborations among Swiss scientists from various disciplines. The projects "provide a formal structure to put together complementary expertise from all over Switzerland," says computer scientist Gábor Székely of the University of Zürich, leader of an NCCR grant for computer-aided medicine. According to University of Geneva mouse geneticist Denis Duboule, another NCCR grantee, countrywide collaborations are needed in his field. With the advent of genomics and proteomics, he says, "most of the work in the next 15 years cannot be done by small groups."

But although the grants are meant to pull researchers together, they're sowing plenty of division as well. Critics contend that the NCCR, a successor to a smaller program that funded a handful of research networks, is making the rich richer. Grantees, they say, are already well known and have little trouble obtaining research funds. By rewarding established groups, the NCCR is taking "a big step back in our efforts to give free rein to young researchers," says Gottfried Schatz, president of the Swiss Science and Technology Council. The program also puts a premium on size, adds Ernst Hunziker, director of the Müller Institute at the University of Bern, whose proposal for an NCCR grant didn't make the final cut. "It discriminates strongly against

SWITZERLAND'S NEW ELITE NETWORKS

Topic	Lead institution	Director	3-year funding
Life Sciences			
Molecular oncology	ISREC, Lausanne	Michel Aguet	\$9.4 million
Genetics	U. Geneva	Denis Duboule	\$8.7 million
Molecular life sciences	U. Zurich	Markus Gerhard Grütter	\$6.4 million
Neural plasticity and repair	U. Zurich	Hanns Möhler	\$7.5 million
Plant science	U. Neuchatel	Martine Rahier	\$6.5 million
Information and Communications Technologies			
Medical imaging	ETH Zurich	Gábor Székely	\$7.8 million
Sustainable Development and Environment			
Climate science	U. Bern	Heinz Wanner	\$5.0 million
Other			
Novel electronic materials	U. Geneva	Øystein Fischer	\$8.7 million
Nanoscale science	U. Basel	Hans-Joachim Güntherodt	\$8.8 million
Quantum photonics	EPF Lausanne	Marc Ilegems	\$8.3 million

CREDITS: (TOP TO BOTTOM) DENNIS NORMILE; SOURCE: SNSF