us. It has allowed Gene Alliance members to establish technical platforms," train staff, and develop strategies.

Both Mewes and Düsterhöft contend that the Europeans showed with the yeast sequencing project that a collaboration of small sequencing labs could compete with the large centers that dominate sequencing in the United States—such as The Institute for Genomic Research in Rockville, Maryland, and Washington University's Genome Sequencing Center in St. Louis, Missouri. "The Americans did not think the European 'network project' approach would work, but it has been a success," says Düsterhöft. Adds Mewes, "I think the European network approach—and the new Gene Alliance in Germany—offers more flexibility and also the counterbalance of know-how that is distributed among different firms."

Researchers in other European sequencing labs say they will be interested to see how competitive the Gene Alliance will be internationally. Andre Rosenthal, who leads the group at the Institute of Molecular Biotechnology in Jena, Germany, that is doing two-thirds of the sequencing for Germany's human genome project, calls the Alliance "an interesting concept," adding that "the major question for such companies is: Can they produce quality genomes at a competitive rate and speed?"

Members of the Alliance say the early response from industry has been encouraging. "Pharmaceutical companies especially are showing interest, because they like the concept of having one organization represent five different research facilities," says Peter Pohl, a partner in Alliance member GATC, founded in 1990 as Europe's first sequencing company. The pooling of resources is important for the five firms, most of which are small. The largest, QIAGEN, employs just 15 scientists and technicians in its genomics group; none of the other four companies have more than 20 scientists in total. Their ambitions are, nonetheless, on the large side. Says Düsterhöft: "We want to become one of the main players in Europe, and perhaps later, one of the major players worldwide."

–Robert Koenig

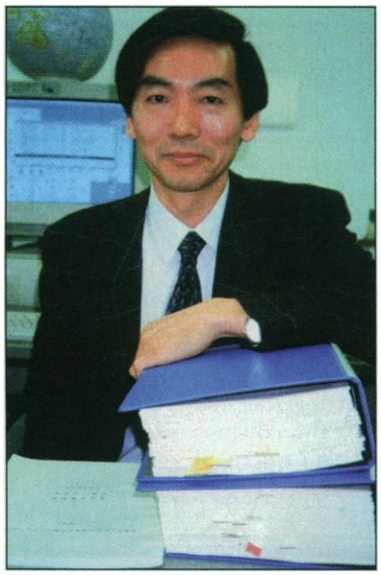
Robert Koenig is a writer in Bern, Switzerland.

EARTHQUAKE PREDICTION

Japan Urged to Drop Short-Term Goal

TOKYO—A 35-year-old research program to predict earthquakes days or weeks in advance appears headed for another 5-year extension even though a review last year concluded that the goal is not attainable in the near future.

Last week, an ad hoc group of Japanese scientists urged the government to abandon its attempt to achieve short-term prediction and focus instead on the search for underlying causes of earthquakes. They said the approach could help to identify earthquake-prone areas years in advance. Their suggestions follow a report last June by a special review committee that criticized the premise of previous prediction research (*Science*, 28 March 1997, p. 1870). Although the reports are an effort to bring Japan's Eighth Earthquake Prediction Plan more in line with activities around the world, critics say they represent a half-hearted attempt to fix a program in need of more fundamental reform.



D. NORMILE

Sending a message. Masayuki Kikuchi with a stack of e-mails from panel proposing a new approach to prediction.

The ad hoc group, composed of some 160 seismologists and earth scientists who swapped e-mail messages to hammer out their recommendations, has no official standing and was open to anyone. Its report is addressed to an advisory panel of the Ministry of Education, Science, Sports, and Culture (Monbusho), which is drafting the next 5-year plan that influences Japan's $145 million a year in earthquake-related research spending. The panel is expected to finalize the plan by this summer; it will take effect next April.

"The intent [should be] to measure and observe the processes building up to an earthquake rather than look for precursors immediately beforehand," says Masayuki Kikuchi, a seismologist at the University of Tokyo's Earthquake Research Institute and one of the organizers of the ad hoc group. By monitoring the movements of Earth's crust throughout Japan with global positioning system data and computer simulations, the report urges, researchers should be able to identify areas where the buildup of strain indicates that an earthquake will occur in the next 10 years. Such long-range forecasts, says the panel, could be used by the government to decide which buildings and bridges are most in need of reinforcing and to prepare disaster-response plans. The earthquake-prone areas could also be saturated with a network of instruments to eavesdrop on the processes that lead up to an earthquake.

Robert Geller, a University of Tokyo seismologist and outspoken critic of earthquake prediction, sees the new report as a plea for continued funding of questionable and misguided research projects. "In the end, this will be like *perestroika* was for Soviet communism," he says. "After making heroic efforts to improve it [with no results], it then had to be abandoned. The new 5-year plan will probably do the same for prediction."

Not so, say its supporters. Seiya Uyeda, a geophysicist at the Institute of Physical and Chemical Research (RIKEN), says he generally supports the goals of the ad hoc group and calls the process for drafting its report "a very good thing." Still, Uyeda has reservations about the value of trying to forecast earthquakes so far in advance, and he plans to continue his study of electromagnetic signals from the crust, which he thinks could eventually form the basis of short-term predictions. "In my view, short-term prediction would be much more feasible and testable," he says.

The 5-year plan does not have its own budget. Rather, it serves only as a guideline for the six ministries and agencies that fund earthquake prediction research. The prediction plans also are written in terms broad enough to encompass short-term prediction efforts such as studies of animal behavior and concentrations of radon gas—work long ago abandoned by most countries. "Hopes [for earthquake prediction] are deeply rooted here," notes Mizuho Ishida, a seismologist at the National Research Institute for Earth Science and Disaster Prevention in Tsukuba and president of the Seismological Society of Japan.

The scope of the report is also less broad than its organizers had once hoped. Hammering out a scientific program before the advisory council finished its work on the 5-year plan, says Kikuchi, left the panel with little time to examine such issues as a more transparent budget appropriation process and greater use of peer review in selecting research projects. But it will continue to work on such topics. "This is a real necessity," Kikuchi says. "Without [this reform], nothing will change."

–Dennis Normile