NATIONAL LABS

DOE Panel Slams Reactor Management

For the second time in less than a year, the Department of Energy's (DOE's) management of its research reactors is under attack. This time the reactor in the spotlight is the High Flux Isotope Reactor (HFIR) facility at Tennessee's Oak Ridge National Laboratory. *Science* has obtained a copy of an unusually blunt report by an expert panel that blames poor communications and faulty lines of authority for problems that led to closure of the facility in January. It warns that future disruptions are possible unless DOE takes quick action.

HFIR, which produces neutrons for research in materials science and biology as well as isotopes for medical and industrial use, was slated for a restart this month after authorities shut it down on 5 January following a series of mishaps going back to last summer (*Science*, 6 March, p. 1444). A long-planned inspection extended the closure to nearly 3 months. Researchers reacted with alarm because DOE's only other neutron-producing reactor, at Brookhaven National Laboratory in Upton, New York, is out of service indefinitely due to a tritium leak—a debacle that DOE officials also blame on poor communication and muddled lines of authority.

Oak Ridge had already done an independent study of HFIR's problems, which concluded that the mishaps were the result of too much focus on paperwork and a lack of rigor. The lab reassigned the research reactor director and is paying more attention to day-to-day operations. Meanwhile, DOE assembled its own team to review HFIR operations, led by Richard Nolan of the department's operations office in Oakland, California. It declares that current management practices are "unacceptable and must be improved" to avoid "jeopardiz[ing] current and future HFIR missions."

Although Lockheed Martin runs Oak Ridge, the reactor itself is managed by DOE's nuclear energy office in Washington and a site office in Oak Ridge, and its bills are paid by DOE's Office of Energy Research (OER). Nolan's report concludes that these components don't get along. "Communication between all the parties is inadequate and ineffective," the report states. There's a "significant lack of trust and respect" among the parties, he says, leading to "high levels of frustration" and a lack of teamwork.

In particular, the reactor's operators often clash with its scientific users on such issues as scheduling maintenance. "Reactor operators did not appreciate the impact of their work on [research]," says Iran Thomas, materials sciences chief in the basic energy sciences division of OER. Operators insist that they are misunderstood, too. "[We're] really sorry at times that scientists can't conduct experiments, but we're not going to violate our safety criteria," says one. The problems are made worse, the report states, because officials in Washington have kept DOE's Oak Ridge office effectively out of the loop and have failed to give Lockheed Martin a reason to improve its performance.

These combined tensions "may directly contribute to a lack of focus on operations in the facility," the report states, which has led to problems ranging from an electrical injury to maintenance snafus with the cooling system. Nolan's team also found that status reports were often "poorly written" and faced an "arduous" approval process, and that a safety analysis study was years overdue. "There was an awful lot of acrimony that played out in paperwork that prevented people from walking the floor and running the reactor," says Nolan. "If you fight over your relationship, you are not attending to the real issues."

Nolan, Thomas, and other DOE officials say better communication rather than a major restructuring is sufficient to solve the problems. "The offices responsible for funding and operating the reactor are within 100 yards of each other," says Thomas. "We talk daily." But the hard part, he says, will be to "give a consistent message to the lab" about how to run the reactor.

It may be even harder to apply the lessons to other DOE facilities. DOE officials hope to do this as part of a plan that responds to the criticism in the Nolan report. The report is expected to be completed early this month.

–Andrew Lawler

PARTICLE PHYSICS

Asia Takes a Team Approach

TSUKUBA, JAPAN—The countries ranged from India to Japan, and the facilities from synchrotron light sources to heavy-ion machines for medicine to linear colliders for fundamental physics. But the 400 scientists and engineers from 15 countries who met here last week for the first Asian Particle Accelerator Conference had a common mission: pooling their expertise and resources in search of new knowledge and applications in physics, materials science, and biomedical research.

Organizers hope to make this conference the Asian counterpart to long-standing accelerator conferences in North America and Europe. "Now it's time to have an Asian one," says Hirotaka Sugawara, a major organizer of the new conference and director-general of Japan's High-Energy Accelerator Research Organization (KEK), the former National Laboratory for High-Energy Physics.

The Asian investment in accelerators has reached the point at which every country can benefit from regional cooperation, say organizers of the conference, which grew out of a bilateral China-Japan agreement. Japan already has several world-class facilities, while Korea, China, and Taiwan have each brought major new synchrotron radiation light sources on line within the last 5 years. China also has the Beijing Electron Positron Collider and the Heavy Ion Research Facility in Lanzhou. By 2000, Thailand hopes to be operating its own 1-billion-electron-volt (GeV) synchrotron radiation light source, the Siam Photon Project, while India's Center for Advanced Technology in Indore is building the 2-GeV Indus-2 synchrotron radiation source. There are also plans (see table) for even more ambitious projects if and when the region overcomes its current economic difficulties.

The participants acknowledge that, outside Japan, their facilities are not pushing the

ACCELERATING INTO THE NEXT CENTURY

	Name/Location	Description	Cost	Status
JAPAN	RI Beam Factory at RIKEN	Heavy-ion accelerator to study radioactive isotopes	$560 million	1st phase under way, completion in 2004
	Japan Hadron Project at KEK	Proton synchrotron for kaons and neutrino oscillation	$700 million	Decision due in 1998; to finish 2004 or later
	Neutron Science Project, JAERI	Linear accelerator for transmuting nuclear waste	To be determined	R&D funded; target start in 2001
CHINA	Tau-Charm Factory at IHEP in Beijing	Double-ring collider to study tau, charmed particles	To be determined	Feasibility studies completed
	Shanghai Synchrotron Radiation Facility	Soft x-ray, high UV light source	$100 million	Pending approval, target finish in 2003
KOREA	Multipurpose Accelerator Complex	Proton accelerator for transmuting waste, energy production	To be determined	R&D phase through 2002; target finish in 2006

SOURCE: CONFERENCE PRESENTATIONS

technological envelope. "Compared with the U.S. and Europe, there is still a large technology gap," says Shouxian Fang, director of the Beijing Electron Positron Collider National Laboratory and a former director of China's Institute of High Energy Physics. Asian countries are less interested in high-energy particle colliders for cutting-edge physics, he says, and more interested in lower energy synchrotron light sources and proton accelerators for basic research in commercially important areas, such as materials science, medicine, and the transmutation of nuclear waste.

Last week's meeting featured updates on more than a dozen accelerator programs, with participants presenting the latest designs for components and diagnostic devices and swapping ideas to squeeze the best performance out of their machines. It also allowed researchers from more advanced programs to share their knowledge with colleagues at emerging facilities, continuing what until now has been an informal tradition. For example, Richard Sah, a physicist at Taiwan's Synchrotron Radiation Research Center, whose center has already gotten help from KEK on boosting machine performance, aided Thai physicists designing a new control system for the Siam Photon Project.

Cooperation within Asia could also enable those without an accelerator program to keep up with the field. "We have no plans for any large-scale accelerator facilities in Malaysia," says Swee Ping Chia, a physicist at the University of Malaya and current president of the Malaysian Institute of Physics. But he says many of Malaysia's researchers would benefit from exposure to the experimental uses of accelerators: "We want to send people to participate in accelerator experiments and bring that knowledge back home." Indeed, scientists from Taiwan, South Korea, China, the Philippines, and India are part of the team working on the KEK B-meson facility, which will come on line next year.

At present, North American accelerator scientists meet in odd-numbered years and their European counterparts host a similar meeting in even-numbered years. KEK's Sugawara says he would like to see a 3-year cycle, with one major international accelerator conference each year. But Robert Jameson, an accelerator physicist at New Mexico's Los Alamos National Laboratory who served on the organizing committee for the Tsukuba meeting, says European and U.S. groups might not want to reduce the frequency of their own conferences. "Two years is about the right timing," Jameson says.

Regardless of scheduling obstacles, the Asian group plans to forge ahead. "We should promote this movement toward greater cooperation," says conference planner Makoto Inoue of Kyoto University. The next Asian meeting is scheduled for Beijing in 2001.

–Dennis Normile

GENE SEQUENCING

France's Sequencers Aim to Join the Big League

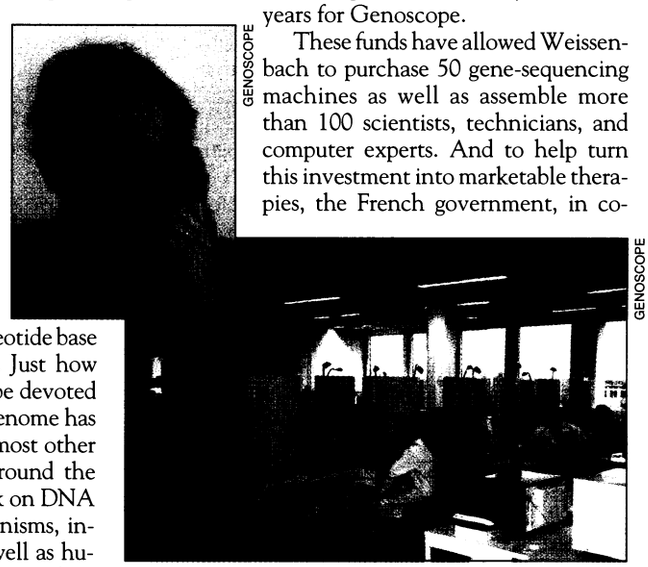
EVRY, FRANCE—As the worldwide effort to sequence the human genome moves into high gear, gene researchers are welcoming the latest member of the team: France's Genoscope, a major gene sequencing center in this industrial suburb just outside Paris. Genoscope, also known as the National Sequencing Center, plans to tackle between 5% and 10% of the human genome, which would put it in the same league as such major players as the Sanger Centre near Cambridge, U.K., Washington University in St. Louis, and The Institute for Genomic Research in Rockville, Maryland. As part of its preparation for this daunting task, the French center—which has been quietly tooling up since last summer—will soon complete its inaugural project: the sequencing of the genome of *Pyrococcus abysii*, an archaebacterium that lives at high temperatures and whose sequence may help resolve controversies about the nature of early life forms (see sidebar).

Genoscope's director, genetic researcher Jean Weissenbach, says the center will eventually churn out 300 million nucleotide base pairs per year of raw data. Just how much of this capacity will be devoted to sequencing the human genome has yet to be determined; like most other gene sequencing centers around the world, Genoscope will work on DNA from a wide variety of organisms, including plants and fish as well as humans. Weissenbach is also grappling with the difficult question of how quickly sequence data should be publicly released once it is generated—an issue that has been the subject of international debate for a number of years. This is a particularly sticky point because the French research ministry wants its biomedical research activities to pay off its public investment by generating patents (*Science*, 6 March, p. 1442).

Other participants in the human genome project say that Genoscope's contribution will be sorely needed if the goal of completing the entire sequence by 2005 is to be reached; only a little more than 3% of the 3 billion total base pairs has been completed so far. "The more effort we can muster in Europe, the better," says John Sulston, director of the Sanger Centre. Indeed, many French researchers believe that Genoscope's contributions might have come much earlier if French politics had not slowed the country's genome project down. "Our successive changes of government—left, right, left—have made a mess of genome policy in this country," says Bertrand Jordan, a molecular biologist at the Center for Immunology in Marseilles. Although the idea of a sequencing center was first proposed in 1990 under the Socialists, the project languished until 1996 when the conservatives revived it, but they spent many months agonizing over its location and funding. Fortunately the Socialists, who returned to power in June 1997, have stuck to their predecessors' commitment to budget $13 million a year over 10 years for Genoscope.

These funds have allowed Weissenbach to purchase 50 gene-sequencing machines as well as assemble more than 100 scientists, technicians, and computer experts. And to help turn this investment into marketable therapies, the French government, in cooperation with local governments and the French muscular dystrophy association, is making Genoscope the nucleus of a new genetic research park that will accommodate industrial partners as well as a publicly funded genotyping center—devoted to studying genetic diseases—that will be led by Mark Lathrop, currently director of the Wellcome Trust Centre for Human Genetics in Oxford, U.K.

The goal for Genoscope "is not necessarily to be the fourth or fifth center in the world and do exactly what all the others are doing," says André Capron, director-general of the Pasteur Institute of Lille and



Pitching in. Jean Weissenbach *(inset)* will devote some of Genoscope's 50 sequencers to the human genome effort.