The magnitude of the accident

Based on the observed neutron radiation levels, Hiroshi Sekimoto from the Nuclear Reactor Institute of the Tokyo Institute of Technology initially estimated that the chain reaction may have involved $1–8 \times 10^{18}$ fissions, consistent with a steady-state power 0.7–4 kW. (The thermal output of a typical commercial power reactor is about 3000 MW.) Since then, using information about the fission products found in samples taken from the precipitation tank on 20 October, he has revised his estimate to $1.8–2.8 \times 10^{18}$ total fissions.

Peterson and Ahn have also made a preliminary estimate of the power level reached during criticality and hence the maximum radioactive releases, by making some assumptions about the heat balance in the tank. They have concluded that the chain reaction generated heat at a rate of 5–30 kW. At that power level, it may have produced 30 to 180 curies of xenon-133 and 10–60 curies of iodine-131. (The explosion at the 1986 Chernobyl nuclear power plant in Ukraine spewed out tens of millions of curies of these isotopes.)

Thomas Cochran of the Natural Resources Defense Council has put the Tokaimura episode in perspective by examining 22 criticality events at US nuclear facilities other than reactors (all but one of which occurred before 1964). He found that the number of fissions generated by fairly similar accidents was in the range of $10^{17}–10^{19}$. Assuming that the Tokaimura accident was in the same ballpark, Cochran estimates releases of ^{131}I that overlap with those calculated by Peterson and Ahn. Cochran has concluded that the radiological impact on the public of the Tokaimura episode is not likely to be larger than that of the 1979 nuclear accident at the Three Mile Island nuclear power plant in Pennsylvania.

McLaughlin has been working over the past year to update a report on criticality accidents around the world by incorporating data now available on accidents in the former Soviet Union. Although he can't yet say what happened at the JCO plant, he did refer us to the list of "lessons learned" from past accidents. He noted that what many of the accidents have had in common have been failures in communications and operator training, improper procedures, lack of fissile-material accountability, and new or unfamiliar operations. Judging by the standards in the US, McLaughlin said, it appears that, in the Tokaimura incident, regulatory agencies and plant managers were not diligent in following approved procedures.

The entire JCO plant, not just the purification operation, is now shut down, and STA has revoked JCO's operating license for the plant. Various investigations by government agencies are under way.

BARBARA GOSS LEVI

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UC to Open New Campus in Central Valley

The University of California plans to open its tenth campus, near Merced in the San Joaquin Valley (the southern part of the Central Valley), with the first class of undergraduates to enter in the fall of 2005.

UC Merced is being planned as an all-around research university, but initially the emphasis will be on science and technology, says psychologist Carol Tomlinson-Keasey, who was named chancellor of the new campus this past summer, and has held academic and administrative positions at UC for nearly two decades.

To that end, UC Merced planners have begun forging ties with Lawrence Livermore National Laboratory, the Department of Energy weapons lab located about 85 miles northwest of Merced, with whom they hope to collaborate in areas such as environmental sciences, computing, and nonpolluting transportation. Also planned is the Sierra Nevada Research Institute, which would begin as a coalition of several existing UC multicampus research organizations, and would focus on natural resources and policy topics relevant to the region, such as water, air quality, and climate change.

In choosing a site for the new campus, "we quickly narrowed it down to the Central Valley," recalls Tomlinson-Keasey. "The reason was that it is woefully underserved in terms of higher education." The plan is to set up several UC Merced satellite sites around the valley—the first one opened in Fresno two years ago—where professional courses will be offered and some UC Merced courses will be available by video conference. Planners are also working closely with ten or so community colleges up and down the valley, so that "folks can get some portion of their education" cheaply and without leaving home, explains Tomlinson-Keasey.

Eventually, the new campus may serve up to 25 000 undergraduate and graduate students. But to begin with, the planners are aiming for 1000, and 100 faculty members, growing to 5000 and 300, respectively, within five years. That's only a small fraction of the 60 000 additional students that the UC system expects to be enrolling by 2010, notes Tomlinson-Keasey. "It's a terrific squeeze." There is also talk at UC of switching from the nine-month academic calendar to a year-round schedule, adds Karen Merritt, UC Merced's chief of academic planning.

The state of California is expected to provide about $250 million for construction of the new campus, and UC is seeking other sources of public and private funding. "It's not like it was in the sixties, when the state funded almost everything," says Merritt, referring to the establishment of the three youngest UC campuses, in San Diego, Irvine, and Santa Cruz.

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GREG HUBBARD, MERCED SUN-STAR

FUTURE UC MERCED STUDENTS? Local fourth graders survey the site selected for the new campus, and draw their ideas of what it might look like when completed.

Canadian Institute Starts Program in Nanoelectronics

Nanoelectronics is the thrust of a network of scientists recently set up by the Canadian Institute for

Advanced Research (CIAR).

A private nonprofit organization started in 1982 by medical-doctor/researcher-turned-entrepreneur Fraser Mustard, the CIAR is unusual in the way it supports research: The institute chooses a field, and then forms a loose network of 20 or so scientists spanning many disciplines, for whom it buys time off from teaching, and pays for postdocs, technicians, conferences, and visits to other institutions. The money goes for people, says CIAR president Stefan Dupré, "not for bricks, mortar, or equipment. We call ourselves a 'university without walls.'" The networks are particularly useful in a place like Canada, where researchers are geographically dispersed. Each network is intended to build on an existing core of scholarship in Canada—although only about half of the 160 or so CIAR members live there, Dupré notes.

"The idea is to generate groups that will excite and inspire each other through their work and their interdisciplinarity," says Martin Moskovits, a University of Toronto physical chemist who in late October was named director of the nanoelectronics program. CIAR networks "bring people together who may not meet at other scientific meetings," he adds. The new program, for example, includes physicists, chemists, materials scientists, and engineers whose research involves, among other things, quantum transport, photonic bandgap materials, lithographic and other techniques for creating nanostructures, and materials synthesis. This fall, at the first nanoelectronics meetings, says Moskovits, "you could see the venetian blinds roll up over their eyelids. Theorists were saying, 'I didn't know that was doable.' At the same time, people who can synthesize [nanostructures] don't have to do it blindly. They can work to inspire [development of] devices."

With nanoelectronics, the CIAR now has a total of nine programs in both the social and natural sciences. Physicists participate in four of the nine: superconductivity, Earth systems science, cosmology, and the science of soft surfaces and interfaces (which, however, is being phased out). Programs are reviewed every five years.

Each program receives about Can $1 million (US $673 000) a year of the CIAR's $10 million annual budget, with about half of the total being provided by private donors, one-fifth by provincial governments, and the rest by the federal government, which kicks in one dollar for every two raised elsewhere. Much of the private money was donated on a one-time basis about five years ago to rescue the institute from closing, Dupré says. And with the current round of federal funding expiring next March, the CIAR has asked the government to double its contribution, by matching outside sources dollar for dollar.

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Journal Comparison Shopping Revisited

A buck spent on academic journals tends to go further when the publisher is a nonprofit rather than a commercial company. That and other conclusions of a study undertaken last year by the University of Wisconsin—Madison agree broadly with the findings of a 1988 study by the late physicist Henry Barschall (see PHYSICS TODAY, July 1988, page 56).

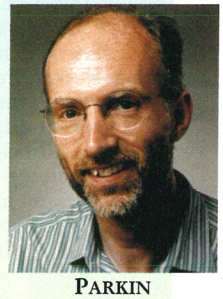
Using the same methods employed by Barschall to calculate the buyer's cost per 1000 characters and cost per citation frequency, the 1998 study evaluated 94 physics journals, as well as economics and neuroscience publications. Of the three fields, physics journals were found to have the lowest average cost, and neuroscience journals had the lowest average cost per citation frequency. Commenting on the study, AIP's executive director Marc Brodsky says "it's important to note that the 1998 findings used the institutional subscription rates paid by Madison, and that such rates could vary by country." (The study is summarized in the August 1999 newsletter of the Association of Research Libraries; for the full text see http://www.library.wisc.edu/projects/glsdo/cost.html.)

Notably absent from the 1998 study are publications issued by Gordon & Breach Science Publishers, which had sued Barschall, the American Institute of Physics (the publisher of PHYSICS TODAY), and the American Physical Society in four countries, for "illegal comparative advertising." Although Gordon & Breach was ultimately unsuccessful (except in France, where litigation is still pending; see PHYSICS TODAY, October 1997, page 93), its journals weren't included, says Madison libraries

AIP Industrial Physics Forum Held at Exxon

"Technological Innovation for Energy in a World without Walls" was the theme of this year's Industrial Physics Forum for Corporate and Academic Leaders—the new name for the American Institute of Physics' Corporate Associates annual meeting—which was held in October at Exxon Research & Engineering in Clinton, New Jersey.

More than 200 industrial and academic physicists, chemical engineers, and policymakers attended the meeting, including physicist and New Jersey Representative Rush Holt. They mingled, toured some of Exxon's research labs, and participated in talks on the economic, environmental, geopolitical, technical, and scientific aspects of energy consumption and production. For example, Exxon representatives reported on physics-based R&D efforts to find and transport oil.



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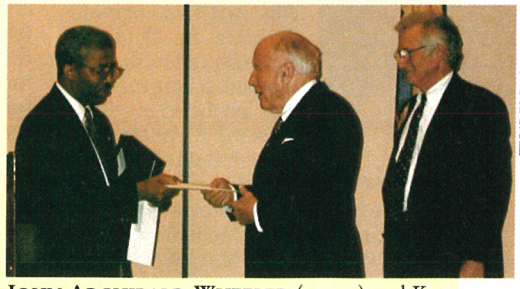
At the meeting, AIP awarded its 1999–2000 prize for industrial applications of physics, cosponsored by General Motors Corp and worth $10 000, to Stuart Parkin of IBM's Almaden Research Center in San Jose, California, for his "pioneering discoveries and original device demonstrations on giant magnetoresistive (GMR) sensors leading to the realization of GMR read head technology for the magnetic recording industry."

And AIP's 1999 science writing award was shared by John Archibald Wheeler, an emeritus professor of physics at Princeton University, and his former student Ken Ford (who was AIP's executive director from 1987 to 1993), for their collaboration on Wheeler's memoirs, *Geons, Black Holes and Quantum Foam: A Life in Physics* (Norton, 1998).

Next year's Industrial Physics Forum will be held in San Diego on 5–7 November at General Atomics, and will explore the theme "Physics, Energy, and Defense—Synergistic Interactions." More information is available on-line at http://www.aip.org/aip/corporate/general/meeting.html.



TIM INGOLDSBY/AIP

JOHN ARCHIBALD WHEELER (center) and Ken Ford (right) collect their science writing award from AIP's director of programs, Jim Stith.