turn out flexible graduate students who will appeal to industry, which is creating research positions at a much faster rate than are academic and government institutes. Most doctoral programs, he says, turn students into "pinpoint specialists" without the skills to move into new areas, and that is one reason corporations hire so few Ph.D.s and why there is so little cooperation between universities and industrial research labs.

Keii's analysis finds some sympathy in the top echelons of Japan's corporate labs. Akinobu Kasami, head of Toshiba Corps research and development center whose own background is in applied physics and electrical engineering, agrees that changes are needed in graduate education. But he says it is too early to know if the new schools have the right answers. "In the United States, there is a clear difference in the capabilities of those who earn master's and those who earn Ph.D.s," says Kasami. "In Japan that is not the case. "The Hokuriku and Nara approach, he adds, "is an interesting educational experiment, but the results aren't in."

Keii's colleagues in the traditional academic world are less enthusiastic, however. They say research institutes attached to existing universities already have a structure similar to that of the new graduate schools, and that many institutions are pondering curriculum changes similar to what Hokuriku and Nara have adopted. "We don't fully understand the ministry's reasoning" for establishing the new schools, says Toshiaki Ikoma, professor of semiconductor electronics at the University of Tokyo's Institute of Industrial Science.

Scientists are also concerned that the planned doubling of graduate slots among the nation's top universities may trigger a bidding war for a limited number of students. "Without more financial support [for Ph.D. students] it is going to be difficult to increase the number of students," says electrical engineer Makoto Ando of Tokyo Institute of Technology, who has been deeply involved in discussions of curriculum reform at his institution. And Yasushi Hibino, a professor in the school of information science at Hokuriku, worries that the school's distance from major urban centers may hurt enrollment.

In the end, the biggest changes may not be in the academic structure or the curriculum, but in the attitude of the faculty. "We have to make the school attractive if we want to attract students," Hibino says. Says Hokuriku's Honda: "Adjusting to this new educational program is the biggest challenge for those of us from the old schools."

–Dennis Normile

Dennis Normile is a science writer based in Tokyo.

SUPERCONDUCTING SUPER COLLIDER

A New Problem: Too Much Money

The Superconducting Super Collider (SSC) may be dead, but the political wrangling over the project is still very much alive.

The latest episode in the SSC saga aired last week at a hearing of the House science subcommittee, with the Department of Energy (DOE) once again admitting it had erred in calculating the cost of some aspect of the project. But this time, the problem is a surplus—$167 million, to be exact. That's the amount DOE officials say they expect to have left over from the $735 million they have on hand to complete the shutdown. (The figure includes $640 million that Congress has appropriated to terminate the SSC at Waxahachie, Texas, plus $95 million in unspent funds from the project itself.)

Why is the perennially cash-starved SSC suddenly rolling in dough? And why has DOE requested an additional $180 million in 1995 to complete the shutdown? The simple answer is that DOE didn't have a firm estimate until February, months after its 1995 budget request had been submitted, of what the termination would cost. Now even that estimate—$695 million—has been whittled down by $127 million, principally by DOE's decision not to fill in the 14 miles that have already been dug for the planned 54-mile tunnel. Instead, DOE will simply plug up the access shafts for safety purposes and allow nature to turn the rest into an underground reservoir. The surplus is also based on DOE's belief that it has no legal obligation to reimburse Texas for the state's $500 million investment, beyond ceding title to the physical structures the state helped to build.

DOE isn't about to hand $167 million back to Uncle Sam, however. One reason: Texas may go to court to recoup its investment, and any settlement could wipe out the expected surplus. In addition, DOE is holding a competition to use some of the funds for an unspecified "follow-on" project in Texas. A commission set up by Texas Governor Ann Richards, a Democrat, has submitted three ideas—a superconducting magnet laboratory, a regional high-performance computing center, and a cancer and medical isotope facility using the nearly completed linear accelerator (*Science*, 4 March, p. 1211). DOE Secretary Hazel O'Leary has publicly supported Richards' proposal for up to $40 million a year in federal funding for such a follow-on project.

"The will of the House was to shut down the SSC as quickly and cheaply as possible."

–Rep. Sherwood Boehlert

O'Leary may have a tough time convincing Congress to go along with this plan, however. Representative Sherwood Boehlert (R–NY), the SSC's chief congressional foe, believes DOE is violating the spirit of the congressionally mandated "orderly termination" of the project and that its plan for a follow-up project is really an excuse to help Richards' re-election campaign this fall. "The will of the House—stated in no uncertain terms during last year's debate—was to shut down the SSC as quickly and cheaply as possible," Boehlert said at last week's hearing. But DOE, he said, appears to be "more interested in Texas politics than in federal interests."

Many high-energy physicists are also unhappy about plans to fund a new project at the SSC site. Representatives from several of DOE's accelerator laboratories told the agency's High Energy Physics Advisory Panel earlier this month that DOE instead should give more money to Fermilab and the Stanford Linear Accelerator Center to avoid interrupting planned experiments next year.

Martha Krebs, director of DOE's Energy Research program, acknowledged that the department's 1995 request "may have to be revisited" in light of the new cost estimates. But she defended the concept of a follow-on project as a way to satisfy a congressional mandate to "maximize the value of the [government's] investment" in the project. Indeed, Krebs later said DOE intends to provide extra funds to the SSC laboratory to retain a core of scientists who can evaluate the follow-on proposals and begin to work on whichever one, if any, is chosen.

But finding enough able hands may be a problem. SSC director John Peoples, whose permanent job is director of Fermilab, says that current targets require him to reduce the number of SSC scientists to 80 by July, down from nearly 2000 last year, and below the figure of 125 that the Richards' commission sees as the minimum to carry out a follow-on project. Krebs says DOE "is working with Texas right now to discuss how many people might be retained." But DOE will have to work fast: Only 130 scientists are now working at the lab, Peoples says, and they must be given a "significant incentive" to remain there.

–Christopher Anderson