ated" cells had twice as many chromosomes as usual: They were the product of fusion between two cells. Terada doesn't think that fusion explains all the other reprogramming results. "We're not denying any of those data. We're just saying, 'Be careful' " about possible explanations for unexpected results.

Developmental geneticist Austin Smith of the University of Edinburgh, U.K., says he and the team "approached the issue with open but skeptical minds." "All our other data said cells do become lineage restricted" —unable to form new kinds of tissues—as they progress toward becoming a certain cell type. He and his colleagues grew cells from adult mouse brains in a culture that also contained mouse ES cells. They then selected for cells that expressed Oct4 (a protein characteristic of undifferentiated ES cells) and also carried a gene present only in the brain cells. The team recovered more than two dozen cell colonies that seemed to have been reprogrammed. But on closer inspection, the cells had enlarged nuclei and twice as many chromosomes as normal: signs of hybrid cells, not reprogrammed ones.

Several of the original researchers are not dissuaded. "What they're saying is, 'Hey, fusion happens,' " says Diane Krause of Yale University, who has reported that cells from bone marrow can become a variety of tissues when injected into adult mice. Her lab is now checking whether its apparently reprogrammed cells formed from fusion of donor and recipient cells. Jonas Frisén, whose lab reported that brain cells can become a variety of tissues when injected into embryos, is also checking for evidence of hybrid cells, but he does not believe that cell fusion can explain all of their results.

The new papers come on the heels of two others that have cast doubt on the reported malleability of adult cells. In the March issue of *Nature Medicine*, Derek van Der Kooy, Cindi Morshead, and their colleagues at the University of Toronto report that they could not replicate earlier reports that cells from adult brain could become blood cells (*Science*, 22 January 1999, pp. 471 and 534). Instead, they report, cells kept in culture for many generations—as occurred in the original research—tend to accumulate genetic alterations that might lead to an apparent reprogramming.

And in February, Margaret Goodell of Baylor College of Medicine in Houston clarified one of her earlier reports on cells from adult mouse muscle. As she explained in the *Proceedings of the National Academy of Sciences*, the adult cells that seemed to give rise to blood cells were in fact rare blood stem cells that reside in the muscle.

The new results are a needed reminder for the field to stay vigilant, says van Der Kooy. "Our own data fail to replicate transdifferentiation, but there are so many reports out there. I'm still unwilling to believe all of them are false."

–GRETCHEN VOGEL

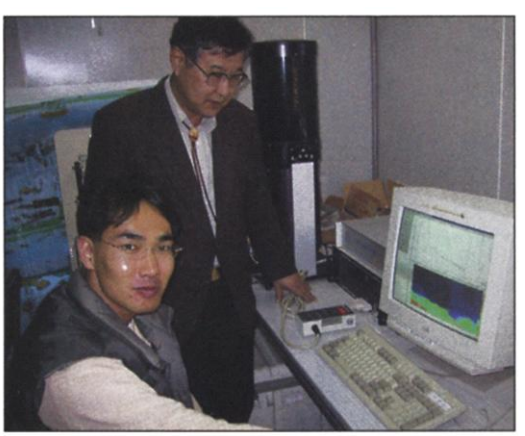
GRADUATE TRAINING

## South Korea Scrambles To Fill Ph.D. Slots

**SEOUL**—Jae-Gwang Won is a member of an increasingly rare breed: a Korean graduate student working on a homegrown science Ph.D. This month Seoul National University (SNU), long considered the country's most prestigious university, failed to fill its quota of graduate slots for the new semester. More embarrassing still, SNU would have fallen short even if it had accepted every applicant.

Korea's postwar economic boom in the 1960s and 1970s certainly benefited from the belief that technical know-how was essential for a rising standard of living. Although many of those scientists were trained abroad, the strategy paid off: By 1995, for example, Korea's economy was the 11th largest in the world, and the country was second behind the United Kingdom in the percentage of its college-age population with technical degrees. "It was a good time for science in Korea," says Sung H. Park, SNU's dean of natural sciences, and there were plenty of good jobs.

Faith in technology as an economic driver hasn't disappeared, but it's being undermined by several factors. One is a loss in status. "When I was in high school, science was prestigious," says 53-year-old Yoon Soon-chang, an SNU professor of atmospheric science and associate dean of planning. "Being a scientist meant being proud." But today's students are more interested in careers that pay well, Yoon says.



CREDIT: SEOUL NATIONAL UNIVERSITY

**Minority view.** Jae-Gwang Won, seated, with SNU dean Yoon Soon-chang, is part of a dwindling pool of grad students.

## ScienceScope

**Southern Light** Spain is joining the synchrotron club. The science ministry last week approved building Spain's first major facility for probing three-dimensional structures. Plans call for breaking ground next year on the $110 million, 2.5–gigaelectron volt radiation source to open in 2008 near the Autonomous University of Barcelona (UAB). The new center—proposed by a UAB-led team in 1997—will have room for up to 160 research teams, planners say. And it will be open to scientists from across southern Europe, notes Andreu Mas-Colell, head of the Catalán government's research department, which will split the project's cost with the national government.

**Protein Probes** Biologists who use small molecules to explore how proteins work—an approach known as "chemical genetics" —will soon have a major new resource. The National Cancer Institute has just awarded a $40 million, 5-year contract to Harvard University for a Molecular Target Laboratory. The facility, to be headed by Stuart Schreiber, will be an outgrowth of Harvard's 4-year-old Institute of Chemistry and Cell Biology. It will develop tools such as protein arrays and build a public database that will catalog up to a million small molecules—synthesized by Harvard and other labs—that block or interact with proteins.

The high cost of the robotics, protein assays, and other tools needed to systematically screen sets of molecular probes has prevented chemical genetics from taking off, notes chemist Brent Stockwell of the Whitehead Institute in Cambridge, Massachusetts: "It's not an easy method to implement; this will make it more accessible." Harvard's Rebecca Ward says it's not yet known when the data will go online.

**Getting to Basics** The U.S. government should fund only basic research that is of high quality, is relevant to government missions, and meets clear performance goals, according to draft guidelines released earlier this month by the White House Office of Management and Budget (OMB) (see www7.nationalacademies.org/gpra). Although no researcher argued with that holy trinity at a recent National Academy of Sciences workshop on the criteria, many wondered about exactly how they will be used to decide which programs deserve cash—particularly when it comes to high-risk research that is bound to stumble. Maybe, OMB's Sarah Horrigan suggested, the guidelines should include "a way to reward scientific failure." That and other changes could be included in OMB's next draft, due out later this year.

charge along every fourth row of copper atoms, as they report in a paper posted on the Los Alamos preprint server (arxiv.org).

Also, Yoichi Ando and colleagues at the Central Research Institute of the Electric Power Industry in Tokyo report that in non-superconducting LSCO and YBCO, the electrical resistance is smaller for current flowing in the direction in which the stripes are thought to run. That indicates the stripes are conductive, they argue in a paper to be published in *Physical Review Letters*.

Any theory that explains superconductivity in the cuprates must now account for their stripes, Kivelson says. But the larger question, says Douglas Scalapino, a theorist at the University of California, Santa Barbara, is whether stripes help superconductivity or—as most researchers believe—hinder it: "Do you really need these stripes? Or are the stripes something that compete with superconductivity?"

On the other hand, Shoucheng Zhang, a theorist at Stanford, argues that the pattern of charge in BSCCO looks more like a checkerboard than stripes. One-dimensional stripes may be a special case of a more general two-dimensional "charge ordering," Zhang says. If he's right, then next year's fashionable theories may exchange stripes for plaids. **–ADRIAN CHO**

Adrian Cho is a freelance writer in Boone, North Carolina.

INDIA

## Academic Science Gets Big Boost in Budget

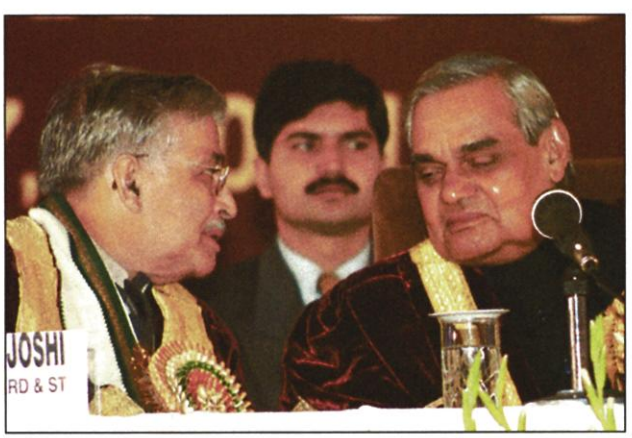
**NEW DELHI**—Indian university researchers are cheering the government's new science budget, which includes a doubling of funding for academic infrastructure. The overall $300 million increase, to $1.5 billion, brings the R&D budget close to 1% of the country's gross domestic product; Prime Minister A. B. Vajpayee has pledged to raise it to industrial-world levels of 2%. Scientists are also heartened that the 25% growth in civilian science will keep pace with increases for atomic energy, space, and defense, which have historically received the lion's share of the country's research dollars.

"It's a very welcome sign," says Martanda Varma Sankaran Valiathan, a cardiac surgeon and president of the Indian National Science Academy. "And it was long overdue."

The budget, presented in Parliament on 28 February, awards a 52% increase to the Department of Science and Technology (DST). Within its $152 million allocation, the department plans to double the $10 million Fund for Improvement of Science and Technology, created in 2000–01 to augment laboratory instrumentation and facilities in universities. The fund is being extended to cover school libraries, including electronic databases. Indian scientists have complained bitterly in recent years about the steady erosion and aging of scientific facilities, and last year a draft of the government's Millennium Science and Technology Policy declared that "there is an urgent need to revitalize the scientific enterprise" (*Science*, 14 December 2001, p. 2269).

Last year the fund supported 180 science departments within 50 universities. But more than 1000 departments came up empty-handed. One successful application was from a group at North Eastern Hill University in Shillong, Meghalaya, which received an automatic nitrogen-15 analyzer to aid in their search for strains of cyanobacteria that could enhance the productivity of local rice farmers. "Without this sophisticated instrument, our work was really suffering," says Ramesh Sharma, head of the university's biochemistry department. The Tata Institute of Fundamental Research in Mumbai used the fund to help purchase a $5 million, 900-megahertz nuclear magnetic resonance facility for studying biological samples.

DST also plans to double its $10 million program for multidisciplinary basic science, with substantial funding for a new program in nanotechnology. Seismic research will get a boost with a $2.5 million airborne laser terrain-mapping project by the Survey of India in Dehra Dun. All in all, says Valiathan, the new budget suggests that the government has finally embraced the idea that basic research is as important as mission-oriented science in strengthening the country's economy. **–PALLAVA BAGLA**




**Good listener.** Science minister M. M. Joshi (left) appears to have gained the ear of Prime Minister Vajpayee in this year's budget.

CREDITS: (TOP TO BOTTOM) CORBIS SYGMA; P. BAGLA

## ScienceScope

**Tower Study Pushed** Engineers last week told the House Science Committee that it will take several years and at least $40 million to fully understand why the World Trade Center buildings collapsed after the 11 September terrorist attacks—and how other skyscrapers might be made safer.

Researchers began studying the fall of New York City's 415-meter-tall landmarks even before the dust had settled. But their investigations were hampered by bureaucratic infighting and lack of timely access to the site, witnesses told the committee. Despite such travails, a government-sponsored panel is set to issue a preliminary report next month. It is expected to conclude that jet fuel from the hijacked airliners ignited fires that weakened steel beams, causing the collapse. But panel head W. Gene Corley said more study is needed to understand "an event of this magnitude and complexity."

National Institute of Standards and Technology (NIST) chief Arden Bement said his agency—the government's expert on fire science and building materials—is already planning studies that would examine everything from steel dynamics to sprinkler-system design. Science committee chair Sherwood Boehlert (R–NY) and other lawmakers have asked the White House to fund NIST's plan quickly. Bush Administration officials have yet to respond, although they have approved the concept.

**Victory Procured** French scientists have won their long battle against byzantine government rules for procuring laboratory supplies. Research minister Roger-Gérard Schwartzenberg announced last week that he had convinced the finance ministry to jettison the guidelines, which forced researchers to get competitive bids and special approval for even relatively small purchases, such as cartons of test tubes (*Science*, 12 March 1999, p. 1613). Lab directors can now spend nearly $80,000 annually on a product without triggering a bureaucratic paper blizzard.

"We have won the battle," says Betty Felenbok of the Institute of Genetics and Microbiology in Orsay, who led a reform campaign that included a petition signed by 5000 scientists. "It is truly a happy ending."

**Contributors: Xavier Bosch, Jocelyn Kaiser, David Malakoff, Michael Balter**