The Education Ministry is now taking steps on its own to revamp university science teaching. It has launched a 4-year program that will spend $25 million this year on 853 projects around the country to give university labs new equipment, send professors and students on field expeditions, and support science contests and Olympiads. "This will enable us to partly solve the acute problem of rejuvenating university departments," Tikhonov told *Science*.

Hoping to expand such reform into the research arena is the BRHE initiative, which was established in an agreement inked last March after extensive informal discussions between the Education Ministry and the CRDF. The 1-year pilot project, set to begin 1 July at UNN's Physico-Technical Research Institute, is the first step. With a $500,000 grant funded equally by Russia's Education Ministry and CRDF, the institute will build a world-class center for scanning probe microscopy to explore the physics of nanostructures. "Traditionally, RAS institutes were equipped much better than the universities," says George Maximov, UNN's vice rector for scientific research. "We intend to correct this imbalance." The lab will be staffed by scientists from both the university and nearby institutes and is expected to train dozens of undergraduates and grad students in the latest techniques. The project's long-term success, says Maximov, will be measured by its ability to "grow a new generation of highly educated and trained young scientists."

Following the pilot project, which will be evaluated by the ability of the center's scientists to win peer-reviewed grants and to publish in international journals, CRDF and the Education Ministry hope to expand the program to as many as 14 more universities countrywide. The BRHE program council, an 18-member body composed equally of Russian and U.S. science education experts, would draw up a list of about 60 eligible university departments and solicit proposals for Research and Education Centers, roughly modeled, says Sher, on the U.S. National Science Foundation's Science and Technology Centers—interdisciplinary, university-based centers each devoted to a particular line of research. After peer review of proposals, winning institutions would receive about $3 million each over 5 years.

The BRHE also plans to hand out about $10 million worth of grants to about 40 top young investigators at Russian universities, who received a Ph.D. no more than 6 years before the date of their grant application. Those selected competitively would each receive $250,000 over 5 years, a level of support rivaling that of the Howard Hughes Medical Institute's program for scientists in Eastern Europe (*Science*, 14 July 1995, p. 155).

The broader program hinges on the success of fund-raising efforts. MacArthur Foundation Senior Vice President Victor Rabinowitch, the son of a prominent Russian physicist, is now making the rounds at other organizations to help CRDF put together a coalition of funders. "Vic's role has been essential, catalytic" at getting the BRHE off the ground, says Andrew Kuchins, associate director of Stanford University's Center for International Security and Arms Control. "The real challenge now is to get funders to put money on the table—he's getting close."

The Russian government has already pledged to shoulder its share of the program's costs. In a letter last December to Sher, Tikhonov said he believed that if the U.S. side anted up the money, "then it will be met by an equal amount of funds from the Russian side." And in a subsequent letter, Deputy Prime Minister Sysuev expressed his support for the proposal and gave Tikhonov carte blanche to implement the project in Russia. "There's real buy-in from Russia," says Kuchins. "They've put their rubles on the table." Even the RAS leadership has embraced the project. Academy leaders have generally resisted efforts to reform Russian science, and, says MIT's Graham, "there were fears that academy officials would oppose it." According to Kuchins, "The academy sees the writing on the wall and realizes some change needs to take place."

If BRHE is fully funded, the World Bank is making noises that it might kick in big bucks in a follow-on program to BRHE if Russia were to request such a loan. "The bank is very interested in this program," says Mary Canning, a senior education specialist at the World Bank in Budapest, Hungary. Although the bank isn't ready to put money into the program yet, Canning says, "if the program reaches fruition, we would certainly consider supporting it."

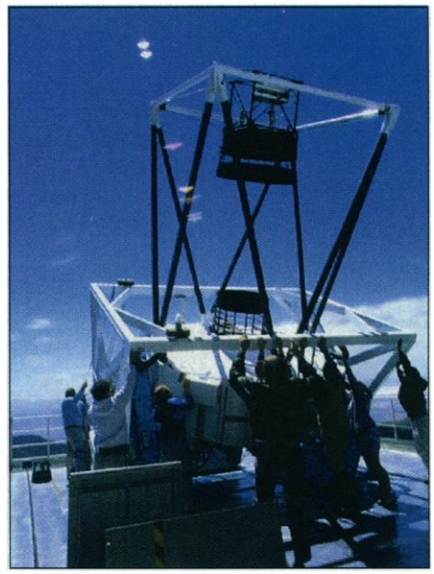
If the broader BRHE program plays out as experts hope, and the World Bank follows up, Balzer foresees Russia accumulating a collection of world-class university labs that would complement a leaner set of academy institutes—a research and higher education system more akin to that in France or Germany than to the U.S. system. "It would put the system on its own legs so it will be there 100 years from now," he says.

–Richard Stone

ASTRONOMY

'First Light' for Giant Sky Survey

The largest and most inclusive survey of the heavens ever undertaken has captured its first light. The $80 million project, called the Sloan Digital Sky Survey, will gather images of perhaps 200 million celestial objects and map the precise positions of a million galaxies in a 1.5-billion–light-year–wide chunk of the universe. Crucial to the imaging survey is a highly sophisticated electronic camera designed and built by a team led by James Gunn of Princeton University. Group members confirm that the camera, which can take in a swath as wide as the Big Dipper's bucket in a single image, has been successfully mated to the 2.5-meter Sloan Telescope at Apache Point, New Mexico, and has made its first images of the night sky.



GRETCHEN VAN DOREN/APACHE POINT OBSERVATORY

Aiming high. Sloan Survey members point the 2.5-meter telescope to the zenith after mounting the electronic camera.

"It's first light," said one member of the Sloan collaboration on 20 May. "There was all this frantic running around by Jim Gunn's team, and the result was an image on the camera." Or, as a breathless e-mail memo to the Sloan team put it on the night of 9 May: "The imaging camera was mounted on the 2.5-meter telescope and is now scanning the equator! It works!!!!"

The Sloan survey, which has been in the making for years, involves researchers at seven universities and research institutions in the United States and a collaboration called the Japan Participation Group. After a 1-year commissioning period, the project will spend about 5 years collecting images of celestial objects, in five different colors, by letting the night sky rotate past the camera's huge array of 54 charge-coupled devices. The survey will cover about a quarter of the northern sky and selected slices in the south. The team will also select the million brightest galaxies for a closer look. By analyzing the galaxies' light, the astronomers will determine their "redshifts"—wavelength shifts indicating galaxies' approximate distances.

The redshift survey will reveal in exquisite detail the filaments, clumps, voids, and walls traced out by the galaxies over vast reaches of space. "I'm looking forward to seeing what the universe looks like," says Adrian Melott, a cosmologist who studies large-scale structure at the University of Kansas, Lawrence. "I wish them luck."

The Sloan researchers' luck has held so far. Photos on the Apache Point Observatory's World Wide Web site, dated 7 May, show the imaging camera being mounted on the telescope for first light. Time-consuming glitches were inevitable with the survey's new, untested equipment, the astronomers had thought. But the exultant e-mail was circulated just 2 days later. The group isn't discussing its initial data any further until a scheduled press conference during the American Astronomical Society meeting in San Diego from 7 to 11 June, where it will unveil the first public images. "I cannot comment on first light until June 8," says a smiling Michael Turner of the University of Chicago and the Fermi National Accelerator Laboratory, who is the Sloan survey's spokesperson.

–James Glanz

Astrobiology Institute Picks Partners

The possibility of life on other planets has long inspired NASA's space exploration. Now NASA is funding a network of researchers dedicated to studying how life got started anywhere in the universe, including Earth. Last week, the agency chose interdisciplinary teams from 11 institutions to form a research network linked to the new Astrobiology Institute at NASA's Ames Research Center in Mountain View, California (*Science*, 20 March, p. 1840). Ultimately, agency officials hope the network will grow into a $100 million a year initiative.

Scientists from the winning institutions, who will divide some $4 million this year and an additional $9 million that NASA has requested for 1999, say they intend to use the new institute to leap traditional disciplinary walls, linking biologists, chemists, and researchers probing the origins of life on Earth. "This provides for the first time a comfortable intellectual home for these kinds of investigations," says Harvard University paleontologist Andrew Knoll, who is leading his university's effort. But the organizational hurdles are high. The top candidate to lead the institute declined the job last week, leaving the agency scrambling to fill the hole. And there is tension within NASA's bureaucracy over its funding and support.

The researchers work at universities, research institutes, and NASA centers across the country (see table) and in Europe. NASA is arranging for each institute member to be tied to one another and to Ames in the coming months via the government's high-speed Next Generation Internet initiative.

The range of work varies enormously, even within individual proposals. The University of Colorado, Boulder, for example, intends to analyze the geochemical energy available on Mars, search for protoplanetary disks around other stars, study RNA catalysis, and examine the history of photosynthesis. "We also reached into the humanities by including philosophy and religion," says Bruce Jakosky, geologist and principal investigator. The university is creating two new positions to focus on geological and cellular aspects of astrobiology.

Harvard, by contrast, will concentrate on this planet's geologic record and past environmental change, drawing on geochemists and paleontologists from Harvard as well as the nearby Massachusetts Institute of Technology and Marine Biological Laboratory in Woods Hole. "NASA is keeping its eye on the prize—the return of samples from other planets," says Knoll. "And when that happens, they will need people like me to sit down with planetary scientists." NASA officials say they are betting that the institute will encourage researchers from different disciplines to forge those links.

TEAMING UP ON ASTROBIOLOGY

Institution	Research Focus
Arizona State University, Tempe	Distributed learning center, organic synthesis
Carnegie Institution of Washington, D.C.	Evolution of hydrothermal systems
Harvard University, Cambridge, MA	Earth geochemistry and paleontology
Pennsylvania State University, University Park	Earth biota changes in early evolution
Scripps Research Institute/ University of California, Riverside	Self-replicating systems, prebiotic worlds
University of California, Los Angeles	Study of ancient metabolisms
University of Colorado, Boulder	Origin/habitability of planets, RNA catalysis, philosophy
Woods Hole Marine Biological Laboratory, MA	Microbial diversity, complex system evolution
NASA Centers:	
Ames Research Center, Mountain View, CA	Planet formation, Earth and biosphere interactions
Jet Propulsion Laboratory, Pasadena, CA	Biosignatures, martian geochemistry and geology
Johnson Space Center, Houston	Biomarkers on other planets

SOURCE: NASA

The winners were chosen from a pool of 53 proposals by an outside expert panel. A team of NASA officials led by Gerald Soffen, director of the agency's university programs, approved the panel's choices, which recommended four more winners than NASA had initially planned. That higher success rate, says Soffen, is a clear sign of the scientific strength of the proposals. NASA will now negotiate cooperative agreements with each winner.

In the meantime, the institute faces bureaucratic challenges. Wes Huntress, the departing NASA space science chief, was the agency's first choice for the director's job. But he turned down the position just 2 days before the winners were announced to become director of the Geophysical Laboratory at the Carnegie Institution of Washington. "The [Ames] offer was made to me, and I wanted to make a decision as quickly as possible" so as not to stall the search, he told *Science*.

Soffen will head the effort until a director is chosen. Although researchers praise him, they worry about the delay in finding a permanent leader for an enterprise as complex as what NASA envisions. "Strong direction in getting us all to work as a unit would help," says Jakosky. Adds Knoll, "Good leadership is going to be important, because this animal could develop in a number of ways." Huntress, who takes up the Carnegie post in September, promises that "we will find a staff fairly soon."

Meanwhile, NASA's life and microgravity sciences office is keeping its distance from the institute, which is being supported primarily by the agency's space science office. Life sciences spokesperson Michael Braukus confirmed that the office will not contribute funding to the effort—instead, it is preparing its own series of grants in evolutionary biology. "Unfortunately, this is all mired in NASA politics," says one agency manager. NASA sources say Administrator Dan Goldin has instructed life sciences managers to cooperate with the astrobiology effort.

Despite those problems, investigators like Jakosky say they are looking forward to the fruits of "an amazing interdisciplinary perspective" growing from the collaboration. Adds Knoll: "Everyone sees a connection to their individual field—and it's also cutting-edge science."

–Andrew Lawler