A New Initiative for Russian Science

U.S. organizations and the Russian government are launching an effort to establish centers of scientific excellence by linking Russian Academy of Sciences institutes and universities

Perched on a bluff overlooking the Volga River, Nizhny Novgorod once served as a sentinel for the Russian empire against the invading Mongol horde. Now this city some 400 kilometers east of Moscow has a new mission on an entirely different frontier: to serve as a test-bed for reforming Russian research and higher education. This summer, scientists from two ailing behemoths—the Russian Academy of Sciences (RAS) and the country's university system—will join forces to launch a pilot project at the University of Nizhny Novgorod (UNN) aimed at ratcheting up the level of teaching and stimulating cutting-edge research.

If the experiment succeeds, Russian officials and U.S. organizations are hoping to launch a $60 million, 5-year initiative to create elite research centers—staffed with top academy and university scientists—at up to 15 universities throughout the country. Several U.S. foundations and other groups supporting science in the former Soviet Union, led by the John D. and Catherine T. MacArthur Foundation in Chicago, met separately last week to discuss making substantial contributions to the effort. The program also has strong backing from reformers in the Russian government, including Education Minister Mikhail Tikhonov and Deputy Prime Minister Oleg Sysuev—both of whom survived President Boris Yeltsin's Cabinet shuffle earlier this month. "If the program works, it could transform the Russian scientific community," predicts Harley Balzer, director of the Russian areas study program at Georgetown University.

The goal of the proposed initiative, called the Program for Basic Research and Higher Education in Russia (BRHE), is to break down a firewall between the academy's 325-odd institutes—where much of Russia's best research is still carried out—and the universities, which generally lack world-class scientists. Administered by the Russian Education Ministry and the Civilian Research and Development Foundation (CRDF), an Arlington, Virginia–based nonprofit that supports research in the former Soviet Union, the initiative would create a cadre of elite research centers at universities that can help attract and train the next generation of scientists.

After the Soviet Union collapsed in 1991, budget cuts and high inflation drove tens of thousands of scientists to labs in foreign countries or out of research altogether. Western organizations, most prominently financier George Soros's International Science Foundation, funneled money to Russian scientists determined to tough it out. The main task was to "keep these people from starving to death," says Loren Graham, a Russian science historian at the Massachusetts Institute of Technology (MIT). (The Russian government estimates that about 100,000 scientists are now active in civilian research in Russia—just 10% to 20% of the total civilian research community in 1992.) After the economic turmoil had subsided a bit and it became clearer where the scientific talent lay, Western support shifted to funding collaborations between Russian and Western labs (*Science*, 24 January 1997, p. 468).

SOVPHOTO

Pilot project. CRDF, headed by Gerson Sher *(top left)*, and the Russian Education Ministry, headed by Mikhail Tikhonov *(top right)*, are funding George Maximov's new center.

To many observers, the BRHE would be a logical next step in these efforts to sustain Russian science. "It took a few years for funders to realize that you can't keep throwing lifelines forever," says Balzer. Now, he says, organizations realize that "it's necessary to start helping Russia stand on its own feet." That means devising a program that helps Russia make structural changes to its research and education system. "This is a very good time to undertake this program," says Marjorie Senechal, a mathematician at Smith College in Northampton, Massachusetts, who co-chairs, with Tikhonov, a BRHE program council organized by the Education Ministry and by the CRDF.

The division between research and teaching that the BRHE initiative aims to mend dates back to Peter the Great, who established the RAS some 275 years ago as a place for Russia's top scientists to work unfettered by the demands of teaching. The division was sharpened in the Soviet era, when the best scientists often ended up in academy or military research institutes for political reasons: University faculty generally had to be Communist Party members to properly indoctrinate students, says CRDF director Gerson Sher, and the best scientists weren't necessarily party members.

A few exceptional universities, such as Moscow State University, were able to retain skilled researchers and cherry pick the best students from around the country. But most bright students in the provinces can no longer afford to study in pricey Moscow or St. Petersburg. "In the Soviet era, 80% of the students at [Moscow State] came from outside Moscow," says Balzer. Now, he says, that figure is about 20%. Talented students who attend provincial universities get little exposure to top-quality research, says Sher. "For universities to be significant players in research, they need help," adds Glenn Schweitzer, director of the office of Central Europe and Eurasia at the U.S. National Research Council.

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.