Does Research in the Former Soviet Union Have a Future?

James D. Watson and Gerson S. Sher

The state of research in the former Soviet Union (FSU) has never been more grave than during the past year. Once lavished with attention and funding by the centralized government of an empire, scientists are now forced to compete for resources against other arguably more urgent needs, such as economic reform and social welfare, in a fragmented and chaotic political environment. The Russian scientific establishment is having deep divisions over how it should be organized and funded (*1*). The basic science budgets of the other countries of the FSU, previously heavily subsidized from Moscow, have suffered severely as local priorities pull strongly in the direction of applied research and development (R&D) (*2*). Research institutes are becoming empty shells and a prime source of commercial rental space. Talented scientists are facing painful decisions over whether to stay in science and live in near poverty or to abandon their scientific careers and venture into the more lucrative private sector. It has been a time of choice at all levels.

The International Science Foundation (ISF) was created in December 1992 by George Soros to reverse the momentum of these developments by giving new choices and opportunities to the most meritorious scientists of the FSU. When Mr. Soros dedicated a $100-million budget to this enterprise, he foresaw that even this substantial sum of money would not be enough to provide more than 2 years of relief for the beleaguered FSU science community, and cautioned that the time would come when others would have to step in and share the burden. That time has come.

Nearly two-thirds of the ISF budget has been devoted to competitive grant programs targeted at individual researchers. The first phase consisted of a program of emergency grants of $500 each to more than 25,000 scientists. In the second phase, the ISF has shifted its focus to long-term research grants, on which nearly $50 million will be spent this year. More than 15,000 long-term proposals are being reviewed through a rigorous, international merit review system consisting of tens of thousands of individual reviewers and 15 disciplinary panels organized with the help of American learned societies. In the end, about one in five or six proposals will be granted. The average award size of these grants is about $15,000 and covers customary costs such as individual support, equipment and supplies, travel, and 20% overhead to the host institute.

Other ISF programs address the ongoing needs of the science infrastructure in the FSU countries: telecommunications, travel to scientific meetings, and library support. These programs have the common objective of integrating the scientists of the FSU into the world scientific community after seven decades of politically motivated isolation. For the past year, the Conference Travel Grant program has been responsible for the participation of more than 2000 scientists from the FSU, who otherwise would have been unable to attend, in major international scientific meetings. The Library Program is delivering key journals in all disciplines to more than 60 scientific libraries throughout the region, and the Telecommunications Program is working closely with FSU agencies and organizations to create an integrated network with international and regional Internet connectivity and user support.

The results of the grant competition, while incomplete, reveal some general patterns. The huge number of proposals in the face of tough eligibility criteria (five publications in the last 5 years, exclusive use of English, and National Science Foundation–style proposal-writing requirements unfamiliar to FSU scientists) indicates that, despite economic difficulty and professional uncertainty, there remains a strong interest in doing science in the FSU. The proposals were also of surprisingly high quality: The review panels generally indicated that some 5% of the proposals would be funded in Western countries and expressed regret that many deserving proposals could not be funded because of financial limitations. In addition, the broad disciplinary distributions reflect in part traditions of excellence in FSU science. The three largest numerical clusters were in solid-state physics, molecular and cellular biology, and physical and surface chemistry, with strong but smaller numbers of proposals also submitted in theoretical physics, mathematics, astronomy, and other fields. The ISF grants list, when complete, will be a useful resource for tracking first-rate basic research in the FSU.

The results of the grant competition have been geographically tilted. Fully 82% of the grants so far have gone to researchers from the Russian Federation, and 59% of all the grants went to Muscovites. (Ukraine has led the non-Russian newly independent states with 8%.) A number of factors could account for this apparently unbalanced outcome, including the competition's publication requirements and uneven dissemination of application and information materials. However, the geographic distribution does reflect the centralized structure of the old Soviet science system, which attracted talent and resources toward the nucleus. Does this mean that we should simply forget about "the provinces," as Muscovites tend to call anything beyond the Beltway? The answer is obviously "No," but the solution must now be framed in a new political context. The old centralized system has given way to a new one, where basic research will no longer be subsidized from the center and where pressures to increase the role of science in economic development will be intense. The former republics, and large parts of Russia, now resemble developing countries, often to be sure with strong centers of scientific excellence, and it behooves our policy-makers to give serious attention to this issue.

An intangible result of these programs is that the proven availability of financial support, albeit modest and allocated on the basis of scientific merit, has led to a positive shift in the mood of the scientific community—and even in the press coverage of the ISF in these countries. Although the evidence at this stage is impressionistic and far from uniform, it appears that there has been broad acceptance of the results of the long-term grants competition despite the low success rate of the proposals. Such mood changes may be attributable to two basic factors: Good scientists can entertain reasonable hope of getting some support, and there is a widespread perception in the FSU science community that an effective assistance program has emerged. Ultimately these changes signify the appearance of hope, and they therefore mark a critical step forward for the scientists of these countries.

More concretely, the governments of the region have recently contributed additional funds to the long-term research grants. To date, the Russian government has pledged $12.5 million to match a similar commitment by Mr. Soros, the Lithuanian government has pledged $250,000, and the Ukrainian government has pledged $1.5 million. These sums in perspective represent roughly 5% of the Russian government's entire basic research budget (*4*) and about 15% of the total Ukrainian basic

J. D. Watson is President, Cold Spring Harbor Laboratory, Bungtown Road, Cold Spring Harbor, NY 11724, USA, and Chairman, Executive Board, International Science Foundation, 1054 31st Street, NW, Suite 110, Washington, DC 20007, USA. G. S. Sher is Chief Operating Officer, International Science Foundation.

research budget for 1994. The long-term goal of any properly designed assistance program must be to provide incentives to local funding sources to assume the burden progressively over time. These major commitments from local governments provide encouragement that this outcome is possible for FSU science.

These developments also give rise to the possibility for some institutional evolution in how research funds are allocated in the FSU. One of Mr. Soros's principal goals in creating the ISF was to develop, through the grant-making process, a competitive, merit-based model for science funding in the FSU and to root it into the countries of the region. This has now begun to happen. In another sense, the ISF grants are likely to have an impact on science funding by local agencies because they have in a sense accredited the leading scientists and groups of the region. Thus, when FSU science agencies finally try to address the crucial question, "Can Russia [the FSU] slim down to survive?" (*3*), they will be guided in part by the results of these and similar efforts.

Does research in the former Soviet Union have a future? We think the answer is yes. But there is an important caveat. Research has a future to the extent that credible measures are taken to persuade the best scientists to stay in science. In the short term such measures and support cannot come solely from indigenous sources. In view of the scale of resources needed and the extremely limited capabilities of the local governments, they must come from abroad, specifically from governments and large foundations. It is in the interest of all nations to bring the science and scientists of the FSU out of isolation and to establish them in a healthy, if more compact, basic research environment in their countries.

REFERENCES AND NOTES

1. A. Allakhverdov, *Science* **263**, 166 (1994).
2. For example, in Ukraine, where basic research accounts for only some 5% of R&D expenditures, the dollar equivalent of the Academy of Sciences' budget has dropped about 50% between 1993 and 1994 to a level of about $10 million.
3. P. Aldhous, *Science* **262**, 1200 (1993).
4. According to the Russian Ministry of Science, the Russian 1994 science budget is 4.5 trillion rubles, of which roughly 10% will be spent on basic research; at current exchange rates, the Russian basic research budget is thus $250 million.

Soros Support for Science Education in the Former Soviet Union

Valery N. Soyfer

The Russian education system was and is one of the most advanced in the world. As a result, Russian science has had a constant influx of young talent. But, because of current economic difficulties, the educational system, as many other aspects of Russian society, is facing serious troubles, and those educators who have distinguished themselves from mediocrity have found themselves in an especially precarious position. Since the collapse of the Soviet Union, there has been growing concern regarding the collapse of education. This problem was recognized by Western governments, foundations, individuals, and scientific societies. Their efforts were channeled toward assisting science and scientists in the former Soviet Union (FSU) by supporting institutions and individual scientists and by fostering scientific communication. However, the long-term health of science in the FSU will depend on the continued influx of talented and well-trained young scientists, and this poses new demands for substantial and well-organized monetary support.

The author is Chairman of the Board, ISSEP, and is in the Department of Biology, George Mason University, Fairfax, VA 22030, USA.

The Soviet education system has decayed along with other institutions such that problems in training, particularly in highly technical fields, are acute. The total number of high school teachers in Russia is 1,410,800. Among them, teachers of natural sciences, including mathematics, number 380,455. Loss of quality teachers and the best students will likely have a lasting impact on the health of science and will hinder efforts for improvement. Of the basic number of teachers who have left the profession, 34.8%, or 26,800 teachers, have moved into the private sector of the economy. The number of retired teachers has reached 13,400 (or 17.3%). About 2200 teachers decided to leave their profession because of dissatisfaction with living conditions and a poor salary. School administrators have tried to solve this problem in part by increasing class size, but in spite of this effort, since 1 March 1994 there are 3000 positions for teachers that are considered to be vacant, and many of these are in mathematics, physics, chemistry, and biology. The most severe deficit of such educators exists in Siberia, the Northern Territories, and the Far East. The most damaging result of this deficit, however, is that these positions are being filled with people who have no high qualifications or even sufficient education. The quality of education of both teachers and students has become a serious problem. There is a real threat that in a huge country, which had one of the best educational systems in the world, mediocrity will begin to predominate. This situation is especially undesirable, considering that Russia is still an extremely militarized country.

There is another evident problem. The gap between education at the high school and university level is serious and becoming even wider. For these reasons, George Soros recently announced (16 February 1994) a new initiative directed to education in basic sciences in Russia and other newly independent states, the International Soros Science Education Program (ISSEP). Here, I describe the goals of this program and the decisions made for implementing it rapidly. The recognition that aid was needed immediately and the decisions on how to best achieve objectives this year are illustrative of problems in implementing aid and reform in other areas, as well.

The goal of the ISSEP is to ensure the recognition of gifted young students at the high school level, to provide them with better teaching, and to fill an existing gap in science education between the high school and university level. The ISSEP will be funded for 5 years. During the first year, activity will be established in Russia, Ukraine, and Belarus. The ISSEP is governed by an Executive Board, which includes 10 representatives from Russia, 5 from the United States, and 1 each from Ukraine and Belarus (*1*). The ISSEP is a part of another recent initiative of Mr. Soros, his $250 million for Transformation of Education in Humanities and Economics at the high school and university level, and is related to another Soros initiative, his $100-million donation for establishing the International Science Foundation, which was announced one-and-a-half years ago. The establishment of the ISF was intended to provide immediate and direct support to the best scientists currently working in Russia.

The Board decided that the best way to achieve the goals of the ISSEP rapidly was to award individual grants to science educators and some students (*2*). In all, 10,000 of the best high school teachers in physics, mathematics, chemistry, and biology, 500 of the best professors at the university level in basic sciences, 5000 of the best undergraduate students, 1000 graduate students, and 250 professors emeritus will be awarded special individual grants. The size of the personal grant will be roughly equal to two