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

to four times the average salary or stipend, respectively. As an example, the current salary for high school teachers is 127,000 rubles per month, which is 73% of the mean salary of those working throughout the country.

Because of the need to implement the program rapidly, a major problem was how to select appropriate candidates for the grants. The following procedure was suggested. Competitions will be organized; therefore, the obtaining of every personal grant will be based exclusively on mechanisms that are strictly different from previous totalitarian methods of promotion. For example, for the best high school teachers, it was recognized that nobody knows their teachers better than students of universities who successfully enrolled in institutions after passing their admission examinations. So 25,000 students will be polled by a questionnaire in which they are asked to name their best teachers from high school. The next round of selection will include competition among the selected teachers. This competition will draw upon the recognition of actual success of individual teachers in raising future scientists: Every teacher will be asked about the number and qualifications of their pupils who went on to become doctors of science, or outstanding inventors, or famous authors of textbooks, or who made serious contributions to science in some aspect. After checking the veracity of the information provided by the teachers questioned, the winners will be asked about their own efforts in writing new textbooks, manuals for students, or scientific articles. One of the components of the selection process will include a request to the teachers to express their vision on how to modernize and improve the educational process. The goal is to select 2000 teachers by autumn of 1994. Similar procedures will be applied for selection of the best professors and undergraduate and graduate students.

For the first year of the program almost 100 universities and institutes were chosen as sites for polling of students for the selection of high school teachers. Geographically, these institutes covered all the territory of Russia, Ukraine, and Belarus. The polls should be conducted in more than 50 cities and towns.

In order to award grants to teachers in the autumn, students had to be polled before the end of the spring semester. But in nearly all Russian universities, classes end between 10 and 20 May. To meet this deadline, the Executive Director of the Moscow office of the ISSEP, Vsevolod V. Borisov, and his staff organized meetings with enthusiasts of education. Within 1 week, with the help of the newly appointed Executive Officer of the Teachers Excellence Program, Mikhail M. Balashov, 13 people were hired to supervise polling in particular regions of Russia. Each region included from five to six towns (two specific regions had just one town, Moscow and St. Petersburg, where 15 and 6 institutes were chosen, respectively). Simultaneously, the supervisors hired 42 local representatives in each town.

To avoid any falsification of results, the number of students who were to be questioned in each town was predetermined based on information received from local representatives. All forms were placed into envelopes (one envelope per class), sealed in Moscow, and delivered personally to classes in each of the chosen institutes throughout the country. In the presence of the local representative, the envelope was opened in front of the class. Collected questionnaires were sealed similarly in front of the students to be delivered to the main office in Moscow. This unusual procedure was accepted with enthusiasm. By 3 May more than 12,000 forms had been completed. Implementation of this procedure gives hope that the plan for polling of all 21,550 students in Russia, and 2700 in Ukraine, will be fulfilled. There is some concern regarding the work in Belarus because, in this country, the polling has not even begun.

In only one of the institutes have local authorities prevented students from taking the poll. In Moscow State Technical University (formerly Bauman High Technical School), after the beginning of polling, the chairman of the Mathematics Department approached the local representative who conducted the poll and expressed his negative impression of all Soros activity. He requested that the representative stop further polling and immediately speak with the president (rector) of the university. Without any explanation, the rector ordered the representative to stop further polling and leave the building. The ISSEP Board decided that this university, including all its employees and students, will be excluded from further participation in any kind of future activity of the ISSEP.

Next week, in the Russian newspaper *Izvestia*, four new subprograms will be announced. The most ambitious program is for the organization of national competitions for high school students in basic science—the so-called Soros School Olympiad. It is anticipated that more than 100,000 high school students will participate in this competition, which will be organized in three rounds. Other programs will include the Organization of Professional Contacts, and special support for undergraduate and graduate students. The Organization of Professional Contacts is directed toward establishing collaborative work between Soros Professors from the university level and Soros High School Teachers at the high school level, and between Soros High School Teachers and the remaining high school teachers.

REFERENCES AND NOTES

1. Among the members of the Board are Nobel Prize winner and former president of Rockefeller University, Joshua Lederberg; home secretary of the National Academy of Sciences, Peter Raven; president of the Russian Foundation for Fundamental (or Basic) Research, Vladimir Fortov; chairman of the Attestation Committee of the Russian Government, Nikolai Karlov; writer and member of the Council of the Russian President, Anatoly Pristavkin; two members of the Russian Academy of Science, Vladimir Zakharov and Alexei Bogdanov; executive director of the Cultural Initiative Foundation, Yelena Karpukhina; and others.
2. Specialized subprograms of the ISSEP include establishing informational networks of educators and students in the territory of the former Soviet Union; providing special funds for professional contacts, both domestically and internationally; supporting competitions between students (in the form of organizing Olympiads); organizing exchanges of educators at the international level; providing library support; and supporting the publication of educational and scientific literature.