POLICY FORUM: SCIENCE EDUCATION

Science and Higher Education in Russia

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The fall of the Soviet Union nearly a decade ago deeply affected Russia's ability to maintain excellence in the natural sciences and engineering. In the early 1980s the Soviet Union had the largest community of scientists and engineers on Earth, larger than that in the United States by 10 to 30%, depending on the definition of degrees and fields (*1*). Today, dramatically reduced research budgets have led to the departure or dismissal of more than half of Russian scientists and engineers compared with those active in 1990. Many of those who remain are forced to work part- or full-time outside their research institutions, usually at tasks not requiring scientific education, in order to supplement their meager salaries. Less than one-third of Russians with a science or engineering education are now actively working in their specialties.

The fall of the Soviet Union and the end of centralized planning necessitated fundamental changes in Russia's higher education and research structure. Here, we describe these changes and examine governmental and foreign initiatives directed toward supporting science and education (*2–6*).

In Soviet times, the Academy of Sciences, which predominated in basic research both in funding and in number of research institutions, received its budget directly from the Soviet government, and financial support for Soviet research was distributed on the basis of block funding to the institutes, without peer review. A rather strict division was made between scientific research and teaching; universities were not, as a rule, strong in basic research, a function given to the academy institutes. All educational institutions were free, without tuition fees. There were no private or nongovernmental universities or colleges. Soviet education was also highly specialized, and young people were required to make early decisions about the careers they wished to follow, which greatly limited the course choices they could make. There was no tradition of liberal education in the arts and sciences.

A superficial look at the current state of Russian science and higher education might indicate that significant and beneficial changes are being made. Despite the severe financial crisis and the brain drain that has hit the scientific research community particularly hard (*7*), several reforms have been enacted in science and education, at least on paper. Peer review has become a familiar practice to many leading Russian scientists, and the Russian government has created a rough equivalent to the National Science Foundation, the Russian Foundation for Basic Research. A host of new universities and colleges, many of them nongovernmental, has been created. Between 1993 and 1997, the number of higher educational institutions in Russia increased by 40% to 880, and many of the new institutions of higher education are nongovernmental (302 or 34% of all institutions of higher education are now nongovernmental) (*8*). Some of these institutions, such as Smolnyi College (a division of St. Petersburg University), are trying to introduce liberal arts education and elective courses. Student enrollment in higher education in Russia today equals the peak reached in 1980, when it was a part of the Soviet Union, with over 3,000,000 students enrolled (*9*). The Russian government is attempting to integrate scientific teaching and research more closely and has attracted support from foreign foundations to help achieve this goal. The Russian Academy of Sciences has recognized that it must work more closely with universities and local governments in order to obtain funds and to maintain the strength of fundamental research. An effort is also being made to broaden technical education by initiating more courses in the humanities and social sciences. Tuition fees have been introduced in many institutions, often with continuing free education in some disciplines.

An uncertain future. Founded in 1755, Moscow State University is one of the few Russian universities with a strong research tradition in the natural sciences.

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When one looks closely at these developments, however, a more complicated and often troubling picture begins to emerge, especially for the natural sciences. The increase in the number of institutions of higher education in Russia does not in itself imply an increase in the amount or quality of scientific research performed in these institutions. In fact, most of the new nongovernmental institutions have very weak research facilities and devote themselves to teaching in the areas now popular with young Russians, among which natural science and engineering rank relatively low. More than 75% of all courses taught in the new nongovernmental institutions are in management, law, and economics. Next in popularity are subjects such as psychology, religion, and journalism (*10*).

Scientific research is much less popular in today's Russia than it was in the Soviet Union and remains concentrated in traditional institutions—the institutes of the academy and a few universities, most notably Moscow State University (see the figure) and St. Petersburg State University. Even in the few Russian universities with strong research traditions in the natural sciences, a division is often made between research and teaching staffs, with most scholars engaged only in teaching, while a few others only do research. In 1997, only 8.5% of all researchers in all fields in Russia with doctoral degrees and 12.6% of those with the "candidate" degree were in universities (*11*). In contrast, American universities in 1995 employed 54.2% of all scholars with the degree of Ph.D. (*12*). Furthermore, the teaching load of university professors is growing. The additional burden on university teachers is caused in part by the reduction in graduate programs in the institutes of the academy. Also, many professors have to teach in several different institutions at the same time in order to survive financially.

The funding available to university researchers from governmental resources is very limited. According to expert estimates, the average budget for a research project in Russia's universities in 1998 was equivalent to $4500 (*6*). University researchers now have other sources of income, such as non-

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governmental funds from contracts with businesses, teaching contracts with other institutions (including the new private ones), rentals of university space, and foreign foundations. Still, the funding situation at the universities is dire. The new Russian Foundation for Basic Research gives much more money to academy researchers than to university ones: between 1994 and 1997, researchers in universities received less than one-quarter the grants from the foundation relative to researchers in institutes of the academy (*13*). Defenders of the privileged position of the academy would say that its predominance in research is a result of the superior quality of its researchers; critics would say that the system is biased against the universities and in favor of the academy. As there is a strong opinion among scientists in Western countries that the most productive and highest quality research occurs where senior researchers and young students work closely together (a particular strength of the American university system), the building up of research universities would be a healthy reform in Russia. Close relations between leading scientists and young students is not a characteristic of the Russian Academy of Sciences.

Financial support for graduate students is very limited, and most students cannot afford to study far from their homes. Science and education in Russia are becoming more widely distributed geographically, a result of the increase in the number of students outside the major cities, in contrast to Soviet times, when the majority of outstanding students went to the best institutions in a few very large cities. This has decreased the quality of the students in the most highly regarded institutions. It may, in the long term, improve the quality of local institutions, but the higher education institutions in smaller cities often do not have adequate libraries and equipment or highly qualified staffs. Also, many of the new nongovernmental universities and colleges offer substandard programs of instruction, in which poorly prepared teachers teach without adequate texts or syllabi. And the best of these new institutions do not emphasize natural sciences.

As a result of these trends, education in Russia is becoming more socially stratified; only the students from the small group that has prospered in the new economic conditions can afford to study what and where they wish, whether in Russia, Western Europe, or the United States. Money is often more important than talent in determining a student's academic future. According to the Russian sociologist D. L. Konstantinovskii, children from workers' and peasants' families in the Novosibirsk area had less than half the chance of entering a university in 1998 as in the Soviet Union in 1963 (*14*).

In the past 6 or 7 years the Russian government has begun several programs calling for reforms in education, but very few of them give special attention to research in the natural sciences. An interesting exception is "The State Support of Integration of Higher Education and Fundamental Science" launched in 1997. One of its major goals is the creation of "Education and Science Centers" intended to strengthen collaboration between researchers from universities and institutes of the academy. Sometimes these centers are physically located in the universities and sometimes, in the institutes of the academy. More than 300 such centers were originally created (*15*). However, almost no funds were received from the Russian government for the purchase of new equipment or for conducting expeditions or fieldwork. As a result, only approximately 30 Education and Science Centers are expected to survive by the year 2000, and these 30 will mostly be in those universities and institutes that are already relatively strong in research.

Numerous foreign foundations have tried to assist in the Russian efforts by strengthening fundamental research, and several of them emphasize the bond between research and teaching (*16*). Opinions differ on whether foreign foundations should give preference to elite institutions or to regional institutions. The "Basic Research and Higher Education" (BRHE) program of the U.S. Civilian Research and Development Foundation (*17*), just now getting under way, is unusual in stipulating that the eight "Research and Education Centers" it intends to fund must be located in universities outside Moscow and St. Petersburg. Furthermore, it gives substantial support for new instruments and equipment, not just stipends.

The outcome of all these efforts to support research and higher education in Russia, both by the Russian government and by foreign foundations, remains uncertain. Being a scientist in Russia today requires great dedication, and the situation is not likely to improve quickly. Although there is more financial support for teaching than for scientific research, the quality of both research and teaching continues to decline because of a combination of financial shortages and "brain drain." But science and education are not dying. Large numbers of young Russians still want higher education, and some still wish to pursue research careers in the natural sciences, despite the difficulty of finding good positions after graduation. Academician Alexander S. Spirin, director of the Institute of Protein Research of the Russian Academy of Sciences, reported in June that fewer students now choose to study his field, but that they are better trained and more highly motivated than students in Soviet days, when many people entered scientific fields just because it was prestigious to do so (*18*).

Although science in Russia will probably never regain the exceptionally favored position it held in Soviet times, there is hope that a new healthier basis for Russian science is being created. With the new research and education centers of the BRHE Program as an example, science has an opportunity to become an organic part of Russian society, instead of being imposed on it from above.

References and Notes

1. L. E. Nolting and M Feshbach, *Science* **207**, 493 (1980).
2. We base our analysis on our own research (*3*, *4*) and on papers on Russian higher education and science presented in June and July 1999 at conferences in Moscow (*5*) and St. Petersburg (*6*) in which we participated.
3. I. Dezhina, *Russian Economy in 1998: Trends and Perspectives* (Institute for the Economy in Transition, Moscow, 1998), pp. 294–307.
4. L. R. Graham, *What Have We Learned About Science and Technology from the Russian Experience?* (Stanford Univ. Press, Stanford, 1998).
5. "1999 Scientific Meeting of Scholars from the Baltics, Central Europe, and the Former Soviet Union," 22 to 25 June 1999, Moscow, sponsored by the Howard Hughes Medical Institute.
6. "Modern situation of higher education in Russia: What do we know about it and how may we study it?" 2 to 8 July 1999, St. Petersburg, sponsored by the Spencer Foundation.
7. Every year about 3000 researchers leave Russia permanently and about 7000 leave temporarily. The major destinations are the United States, Germany, and Israel [O. Ikonnikov, "Rastrata umov rossiiskikh uchenykh," *NG-Nauka* No. 2 (February 1998), p. 3].
8. *Nauka Rossii v tsifrakh* [Center for Science Research and Statistics (CSRS), Moscow, 1996], p. 16, and *Nauka Rossii v tsifrakh* (CSRS, Moscow, 1998), p. 16; *Vysshee obrazovanie v Rossii—1998* (CSRS, Moscow, 1998), p. 19.
9. In 1980 in the Russian republic of the Soviet Union there were 3,045,700 students in higher education; in 1997 in Russia there were 3,046,500 [*Vysshee obrazovanie v Rossii* (CSRS, Moscow, 1997), p. 19].
10. "Obrazovanie i kariera: Platnye vuzy," *Izvestiya* (21 April 1999).
11. *Nauka Rossii v tsifrakh—1998* (CSRS, Moscow, 1998), pp. 31, 37. The Russian doctoral degree is a higher qualification than the U.S. Ph.D.; the "candidate" degree is roughly equivalent to a U.S. Ph.D.
12. *Science and Engineering Indicators—1998* (Data for 1995), Appendix tables 3–7 (National Science Foundation, Washington, DC, 1998), Appendix p. A-109.
13. Data obtained from: http://intra.rfbr.ru/ [in Russian].
14. Vladimir Magun, personal communication.
15. Izbrannye naukoi, *Poisk* No. 48, 15 (1998); *Poisk* No. 19, 12 (1999).
16. In 1995, it is estimated that foreign foundations supplied about a third of the support of Russian fundamental science. In 1993, the International Science Foundation, created by G. Soros, gave more money to the Russian Academy of Sciences than the Russian government itself. In recent years, support of natural science by foreign foundations has, unfortunately, decreased [I. Dezhina, "Nauka: Sostoianie sfery issledovanii i razrabotok v pervom polugodii 1995 g.," *Rossiiskaia ekonomika v pervoi polovine 1995 goda: tendentsii i perspektivy* (Institute of Economic Problems of the Transition Period, Moscow, 1995), vol. 13 pp. 82–86].
17. The program is jointly supported by American foundations (the MacArthur Foundation and the Carnegie Corporation of New York) and Russian federal and local institutions.
18. A. Spirin, paper presented at (*5*).

References and Notes

[1] **R & D Employment in the U.S.S.R.**
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