

PHYSICS COMMUNITY

New Minister Is Unlikely to Resuscitate Russian Science

As the impoverishment of Russian science deepens, the country's economic woes, as well as an evident lack of respect for science in the highest echelons of government, are overshadowing the science community's expectations of Vladimir Bulgak, the new science and technology minister.

Bulgak took up his post on 30 April, about a month after Russia's most recent government shake-up. A career bureaucrat, he first became minister of communications 15 years ago under Mikhail Gorbachev, and then continued in a similar position after the Soviet Union collapsed in December 1991. So, although a broken leg prevented him from assuming his duties before the start of this month, at least some of his politics and priorities are known, such as his zeal for commercializing technology. Mostly though, any talk of new programs is dismissed by Russia's science community. As Vladimir Agranovich, who heads the Institute of Spectroscopy's theoretical department in Troitsk and is currently a visiting professor in Pisa, Italy, puts it, "All such discussion is nonserious as long as money is absent."

Decay and dismay

Since Soviet times, funding for science has plummeted to one-tenth to one-twentieth of former levels (such statistics can vary greatly, depending on the source). About 1.1% of the total budget is tagged for science, down from about 3.9% in 1991, says political refugee Valery Soyfer, who is now a molecular biologist at George Mason University in Virginia, adding that even these amounts are not delivered in full. "They say they have no money. But they have money to build new churches, new dachas and new government buildings."

Research institutes have steadily deteriorated, with conditions at those outside the Russian Academy of Sciences—mostly former centers for military research, where about 85% of all scientists used to work—generally worse than those inside. Even academy institutes are often unable to pay for electricity or buy new equipment,

▶ Saving Russian science will take an internal overhaul, more interaction with the world's scientific communities and cash.

some have leased out space to businesses and many people are leaving either science or the country. Salaries are delayed or go unpaid, and researchers often supplement their pay (typically \$100 a month) by working as translators, tutors or cab drivers, says one scientist now in the US. "Many good scientists suffer," says Agranovich. "I think all the time, How can I help?"

"It's disastrous," agrees Loren Graham, a science historian and Russia specialist at MIT and Harvard University. "The winnowing has gone much beyond healthy." Graham notes that the number of scientists "on the books" at the academy institutes—where the bulk of basic research is done—is down 20–25% from 1991, but that the actual loss is closer to 80–90%. Institute directors may pad the num-



VLADIMIR BULGAK

bers to get a bigger share of the budget, and scientists who have found work elsewhere often keep their academy affiliation in the hope of better times.

Russian scientists are protesting their dire situation. In a 19 June open letter to President Boris Yeltsin, 37 scientists and cultural leaders warn that "the most valuable moral and intellectual resources in our nation—science and education—face mortal danger." The situation could lead to "social upheaval," they argue. "Unprecedented disparity [and] inadequacy of financing dooms [Russia's] science and education . . . to absolute degradation and annihilation. We express our absolute disagreement with the government's policies regarding science, education and culture in Russia as a whole."

Salvaging science

Russia's science funding cannot be stretched to support the same number of institutes as in flusher times. There is broad agreement that the best ones should stay open, and that "cuts cannot

be done in darkness or behind closed doors," as Soyfer says. But opinions are divided as to whether reform should come from within or without, and there is resistance to change. Says Boris Saltykov, who served as science minister from 1992 to 1996, "We really need to make hard decisions about which instruments and institutes we may support in full strength. We didn't close any big physics institutes in 1992–93, but maybe we need to now."

The government is currently evaluating scientific institutes to determine which ones to keep open. But, says Michael Danilov, who heads the Institute of Theoretical and Experimental Physics in Moscow, "I was involved in discussions on how to do this, but I don't know how it will be done." His own proposal for assessing institutes, which was not adopted—"probably because it was possible to implement," he notes wryly—included considering the number of paper citations and the numbers of world-class scientists and young scientists, including PhD students, at a given institute. "Young people understand which places are alive," he says.

To save Russian science, it's crucial that young people enter the field, continues Danilov. And to attract them, stronger links between research institutes and universities should be forged. Specifically, Danilov says, more researchers should teach courses for university students "directly at the research centers. We have shown this to be extremely effective. The number of physics students at [my institute] is growing very fast. And one needs special funds for young scientists." In addition, he says, more grants should go directly to individual researchers, rather than to their institutes.

Others, such as Zhores Alferov, who heads St. Petersburg's A. F. Ioffe Physical-Technical Institute—which currently gets one-third of its meager funding from abroad—say that strengthening ties with the international scientific community is key to salvaging Russian science, "for both material and moral support."

A career bureaucrat

The science community hopes that Bulgak will use his political savvy and his influence as a member of Prime Min-

ister Sergei Kiriyenko's presidium, or inner circle, to obtain more money for science—despite the fact that he was forced right off to cut science funding by about 40%. At the same time, there is deep concern that the minister, who studied electrical engineering and holds a PhD in economics, will stress applied science at the expense of basic research. Says Eugene Velikhov, president of the I. V. Kurchatov Institute of Atomic Energy, "Bulgak's understanding of the importance of building business opportunities for science is good. But I hope it does not lead to diminished funding for fundamental science."

Others are more pessimistic. Says Roald Sagdeev, a Russian émigré now on the physics faculty at the University of Maryland, College Park, "Bulgak will be a real disaster for basic science. I would expect him to be a yes-man for the government." Some physicists in Russia declined to comment on Bulgak, saying that the topic is "sensitive" or that it's too early to make predictions.

Apathy regarding what the minister may accomplish is also common. Explains George Fursey, who heads the surface physics and electronics center at St. Petersburg State University of Telecommunications and is vice president of the International League for the Protection of Culture, "No science minister can protect science, however strong his wish. This can be done only at the level of the highest leadership of the country." Alferov agrees, and adds that what was interest in Bulgak is due partly to the country's high turnover of politicians—over the past seven years, the average time in office for all ministers has been seven months.

According to a Russian government source, Bulgak plans to adopt the priorities for science and technology that were approved two years ago. In the next few months, the source adds, the science and technology ministry will solicit the science community's views on the program—which includes broad categories such as "basic research," "new materials and chemical production," "information technology and electronics" and "ecology and rational use of nature."

Bulgak also reportedly plans to set up a \$180 million supercomputing initiative to develop algorithms and networking, and he may divert some of his ministry's funds to provide venture capital for new technology-oriented businesses—moves that would jibe with his known interest in tightening ties between science and industry. (Some scientists joke that Bulgak will try to turn the Russian Academy of Sciences into a joint stock company—something he suggested last year

should be done with the Russian Foundation for Basic Research.)

Not surprisingly, Russian scientists urgently want to save their enterprise—"one of the very beautiful diamonds on the necklace of world science," as Alferov calls it. And most

agree that doing so will require state support. But, having seen many promises broken, people are skeptical that money or reforms will be forthcoming. A common attitude is expressed by the Russian proverb, "We'll live. We'll see."

TONI FEDER

Neutrino Experiment's Gallium Remains under Siege

Uncertainty persists over the fate of the 60 tons of gallium held by the Russian-American Gallium Experiment (SAGE) in southern Russia. The Russian government has repeatedly threatened to sell the gallium, which is used to detect low-energy solar neutrinos. Last fall, for example, when the Institute of Nuclear Research, which runs the neutrino observatory, refused the government's demand to hand over 7 tons of gallium for sale, it was slapped with a \$5 million fine, more than ten times the observatory's annual budget. SAGE scientists have also had to fend off attempts by common thieves to steal the gallium, which could fetch about \$400 a kilogram on the world market. Meanwhile, they've continued to press the government to transfer the title to the gallium from the state to the Russian Academy of Sciences. (See PHYSICS TODAY, June 1997, page 73.)

The recurring threats to dismantle SAGE have led to international protests on behalf of the experiment. For example, in a letter last December to then Prime Minister Victor Chernomyrdin, 15 American physicists, in-

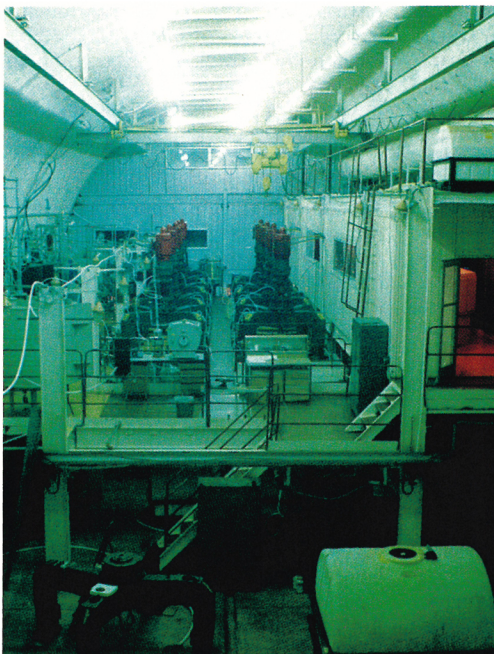
cluding 12 Nobel laureates, urged that the gallium be saved for science: "The investigation of solar neutrinos by SAGE has been one of the most successful research efforts in the past decade, and is now giving very promising indications of new physics. . . . [Reserving the gallium for science] will contribute extensively to world progress in fundamental research and will consolidate the belief in the reliability of Russia as a partner in large joint scientific projects."

"It is astounding," says the Institute for Advanced Study's John Bahcall, who organized the Americans' letter, "that the Russians have been able to do an experiment at the highest level of international achievement under conditions that to westerners look impossible."

SAGE director Vladimir Gavrin believes that the letter and other such efforts led Chernomyrdin to state that "the gallium problem has been solved" when Vice President Al Gore brought up the topic at a meeting of the two leaders this past March. The following week, however, Chernomyrdin and his government were ousted, and the fate of the gallium was plunged back into uncertainty.

Last fall's fine has been dropped for now. And on 15 May, government officials petitioned the new prime minister, Sergei Kiriyenko, and the new science and technology minister, Vladimir Bulgak, to rescind the demand that SAGE hand over the gallium. But the petition, which ignored the issue of title, and thereby tacitly recommended that the gallium re-

SAGE COLLABORATION



SAGE's 60 tons of gallium are held in these eight underground chemical reactors. The incident neutrino flux is measured by extracting radioactive germanium atoms, which are produced when neutrinos interact with gallium.