# Soviet Science: A Struggle for Survival

***As the Union collapses, food, not science, has become the preoccupation of Soviet researchers; responsibility for supporting most scientific institutions has fallen to the Russian Republic***

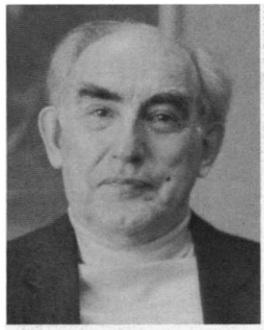
*Moscow*—FOR MORE THAN HALF A CENTURY, the Lebedev Physics Institute in Moscow has represented the best that Soviet science has to offer: It has produced five Nobel Prize–winners and provided a famous weekly open forum where the Soviet Union's top physicists met the younger generation. Even in the dark era of Stalinism and, later, in the gray Brezhnevian 1970s, it offered a safe haven for Jewish physicists like Evgenii Feinberg, Yifim Fradkin, and Alexander Gurevich. "The conditions in our country were very bad," recalls Vitaly Ginzburg, at 74 one of the most famous of the institute's theoreticians, "but in our institute the conditions were very good indeed." No longer. As the old Soviet Union breaks up, Ginzburg simply says, "We are dying."

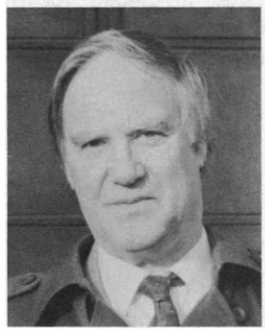
A 7-day visit last month to a dozen laboratories—famous and not so famous—in what was once the Soviet Union revealed an atmosphere of almost unmitigated gloom. As winter approaches, a sad lament is pervasive: Salaries aren't being paid on time despite the government's mad rush to print rubles; and food, not science, is becoming the preoccupation for researchers.

The hard facts are that the essentials for doing science—such as subscriptions to international journals—are now unaffordable luxuries. Deliveries of radiolabeled nucleotides—a basic tool of molecular biologists—have been reduced in quantity and quality since locals took over the factory in Tashkent, Uzbekistan, a former Soviet republic in Central Asia. Researchers lament that expensive Western equipment sits idle because there is no hard currency to purchase spare parts. Until the economic situation improves, purchasing new equipment on institute budgets is out of the question.

Besides all this, working conditions are disastrous. Although the rooms are often large, decay and neglect is obvious: peeling linoleum, stairwell lights that do not work, and broken-down furniture. There is no one to carry out routine maintenance. "We have to have someone in the lab almost round-the-clock," says Sergei Nedospasov, a 39-year-old molecular biologist at the Engelhardt Institute of Molecular Biology in Moscow, "just in case the electricity goes off or the heating pipes burst." Both, he says, are frequent occurrences.

Worse yet, there's less time to do research: Anyone who is trying to live on a paltry ruble salary—and this includes all but the most prominent scientists—has to spend increasing amounts of time lining up for food on the way home. Only those Muscovites with relatives in the countryside can even dream of such luxuries as chicken, sausage, or eggs. "We haven't seen rice in a year," says Alexander Tatosyan, a biochemist at the All-Union Cancer Center in the Moscow suburbs. At the well-known Institute for Protein Research at Pushchino, 2 hours from Moscow, administrators are fighting to arrange shipments of basic foodstuffs for their employees. "The stores are absolutely empty here," says deputy director Lev Ovchinnikov. "We are trying to barter for sugar," he says, "but we have nothing to offer."





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**Concerned physicists.** *Ginzburg* (top), *Kapitsa.*

And the runaway inflation of the ruble is making it difficult even for those with lots of rubles to purchase enough to live on— hence the temptation to take a second job. Evgenii Volkov, deputy director of the Lebedev Institute, says some of his best physicists have turned entrepreneur and are selling dried powdered chicken dung for fertilizer. "By next year," says Volkov, "all our scientists will have to have two jobs."

Or they'll be gone. In reaction to increasing deprivation, the best Soviet scientists are voting with their feet, fleeing overseas to the United States, to Israel, and to Europe. Twenty percent of the Lebedev Institute's theoretical physicists have already gone, either temporarily or permanently. No one knows for certain how many scientists are among the half-million people said to be leaving the Soviet Union each year, but of the approximately 300,000 Soviet immigrants Israel has expected to take in, so far an estimated 6000 are basic researchers.

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**Home of the elite.** *Moscow State University, a top scientific institution.*

The effects of the exodus are apparent in every academy institute in Moscow. In the Lebedev Institute, there seem to be hardly any researchers left in the prime of their careers. "If just a few more prominent people were to leave now," warns Nedospasov, "a whole generation of scientists would be lost." The brain drain "may succeed where Lysenko failed at destroying genetics in the Soviet Union," says biochemist Vladimir Skulachev.

Some fields are already close to extinction. "Three-quarters of the best mathematicians are already abroad," says Vladimir Gelfand, whose father, Israil, now at Rutgers University, is one of the world's top mathematicians. Both Gelfand, who trained as a mathematician but switched to cell biology, and Nedospasov say they sense that in their fields an important milestone has already been passed: the loss of a "critical mass" of researchers whose work stimulates the work of others. "You no longer hear about results before they are published," says Gelfand. Adds Nedospasov, "In my field (the molecular biology of cytokines), there is almost no one here to talk to any more."

Less obvious, but just as harmful to science, is the internal brain drain: scientists

are leaving en masse to professions like banking and finance that did not exist in the Soviet Union. "Maybe 90% of the most successful businessmen in the Soviet Union are former scientists," says Sergei Bendookidze, a Georgian who left a career in molecular biology 4 years ago.

Bendookidze sits in a cramped second-story office in a decrepit building on a dark alleyway close to the former official Communist Party hotel. His business, Bioprocess Corp., started out trying to sell biotechnology products to the West and has now diversified, in a pattern typical of Moscow's early stage of capitalism, trading in everything from medical equipment and cosmetics to shipping and insurance.

Bendookidze says he knows of "dozens of cases" of scientists succeeding in business. Even the Moscow Commodities Exchange is run by a former theoretical physicist, he says. Given the economic situation, Bendookidze stresses that it is "totally normal" for active scientists and young people to move into business. "In our country," he says, "bright people never had a choice between science or business." Now that the choice exists, he says, they are rushing to fill the vacuum.

For those scientists who decide, for whatever reason, to stay home and do science, it is not even clear at the moment who will pay their salaries next year or even next month. As *Science* went to press, a "Commonwealth of Independent States," including the Russian, Byelorussian, and Ukrainian republics, had suddenly appeared, leaving the remaining nine republics at least temporarily on the sidelines. No one can hope to predict the future of the whole of Soviet

# The Academy Under Siege

To hear some leading Russian scientists tell it, the most serious threat to science in their newborn country comes not from the economic crisis but from a band of mediocre, upstart researchers and their opportunistic political allies who are threatening to hijack the All-Union (now Russian) Academy of Sciences. The academy has guided Soviet science for more than 50 years and membership in it was the ultimate honor in the Soviet science community.

At the heart of this savage dispute is a second, newly formed Russian Academy of Sciences, whose members demand "fusion" with the old academy, giving them instant access to power and prestige without any of the normal selection procedures. The move would be "one of the most dangerous developments for science in the Soviet Union," complains a furious Evgenii Sverdlov, a corresponding member of the All-Union Academy who directs its Institute for Molecular Genetics. It's the "real danger to science" in the Soviet Union, agrees corresponding member Vladimir Smirnov, a biochemist at the All-Union Cardiology Center in Moscow, who fears an influx into the academy of "gray men" without scientific credentials. The plan was hatched against the will and without the advice of "a majority of serious scientists," protests physicist Vitaly Ginzburg, a full member of the academy from the Lebedev Institute in Moscow.


**New name, new building.** *The All-Union (now Russian) Academy of Sciences' old quarters* (right), *and new home.*

The idea took shape quite innocently. Last summer, the Russian Republic decided that it was time to form its own science academy. All the other republics already had academies, and the only reason Russia had none was that it had not seemed necessary—95% of the members of the All-Union Academy are Russian. But with nationalism in the air, enough supporters were found for a Russian academy.

At first, the new academy ruffled few feathers: It was set up with the declared purpose of serving only as an honor society for Russian scientists, it had no research funds or institutes of its own, and it didn't encroach on the turf of the All-Union Academy, which represented the whole of the Soviet Union. But then came the August coup attempt. As the Soviet Union broke up into its constituent republics, the All-Union Academy found itself with an identity crisis—it was part of a political entity that was on the verge of dissolution. In an October vote its members voted to become the "Russian Academy of Sciences," leaving Russia with two separate academies with the same name.

All would have been well if the upstart Russian Academy had simply stepped aside, but by then it had attracted considerable political support. Its "President-Organizer" is none other than Yuri Osipov, a mathematician and mechanical engineer from Boris Yeltsin's hometown of Sverdlovsk and Yeltsin's closest scientific adviser. The upstart academy has picked up popular support too. Only about 300 scientists are full members of the All-Union Academy (another 600 are "corresponding members"), and when the word got out that there was a new academy to join, applications flooded in—enough to fill three pages of a newspaper.

The situation is beginning to look like a "free-for-all," says Smirnov, who is afraid that the ability of the former All-Union Academy to distribute research grants and administer institutes could be destroyed if hordes of "mediocre professors" are allowed to pour in as a result of fusion with the Russian Academy. Even more disturbing to Sverdlov and Ginzburg is that the Russian Academy is planning to grant membership to senior politicians, including the speaker of the Russian parliament, economist Ruslan Hizbullatov. The inclusion of Hizbullatov, says Sverdlov, "gives the impression that the academy is the plaything of powerful politicians."

With even the most outspoken opponents of the new academy, like Ginzburg, saying that they are virtually certain that the fusion of the academies is unavoidable, members of the All-Union Academy are trying to forge a compromise. Evgenii Velikhov, vice president for physical sciences of the All-Union Academy, is suggesting that the academy abolish its division into full members (who are mostly established scientists, many of them retired, whose average age is over 70, he says) and the corresponding members, who are for the most part active scientists. That would boost full academy membership to 900, which would mean that the academy could let in a considerable number of new members without fearing a takeover. The important thing would be the ability to reject some of the new applicants, says Velikhov. Whether this will satisfy the politicians remains to be seen. ■ **S.D.**

science, but for now it seems certain that scientists will be dependent on their own republics, and not some central body, for support. Given that the Russian Republic has inherited most of the country's scientific potential, that places most responsibility for science in the hands of the Russian Republic and its president, Boris Yeltsin. In the old Soviet Union, almost all basic research had been concentrated in one key organization—the 365 institutes of what until last week was known as the "All-Union Academy of Sciences"—and a few universities, most of them located in Moscow, St. Petersburg (formerly Leningrad), or the Siberian "science city" of Novosibirsk.

The academy, whose headquarters is in Moscow, is a scientific power center with no parallel in the United States. Both a learned society like the U.S. National Academy of Sciences and a centralized source of funds, it employs 66,100 scientists, 95% of them in Russia. Last year it spent half of the total basic science budget of 7 billion rubles (worth perhaps $60 million at the true rate of exchange this November). But, despite its size and past power, the academy—which has just changed its name to the "Russian Academy of Sciences"—now finds itself fighting a partial takeover from another "Russian Academy of Sciences," set up only a few months ago (see box p. 1717).

With no clear policy on the future of science in general and the academy in particular, the Yeltsin government is doing little to ease the fears of researchers. Some cling hopefully to a mid-November speech in which Yeltsin promised to make basic science a priority in the Russian Republic. A spokesman for Yeltsin could offer little in the way of concrete assurances to *Science*. Although Anatoly Rakitov, Yeltsin's adviser on science, technology, and computerization, reiterated Yeltsin's statement pledging support for science, he warns that "the present situation is very difficult. Our country is like a sinking ship, and Yeltsin is not out to save just some of the passengers. He is trying to save the whole ship...it is not just scientists who will need a second job."

Despite the difficulties, a few researchers are still able to sound an occasional note of optimism about the future of Soviet science. Moscow molecular biologist Maxim Frank-Kamenetskii even welcomes the brain drain, on the grounds that, as he wrote in the June issue of *Current Biology*, "sooner or later, many of those who are leaving may return and give new momentum to Russian science."

Optimists also point to one encouraging result of the birth of democracy: The new Russian State Committee on Science and Higher Education, which inherits overall responsibility for the funding of Russian science, including the academy, is considering setting up a science foundation run on Western lines.

"We need to restructure the entire funding system for science," says Igor Nikolaev, secretary of the committee, who has just returned from a 2-week visit to the U.S. National Science Foundation. The Russian Science Foundation would be a nonprofit, nontaxable organization that would distribute money strictly by peer review and would be independent of the academy. "We need to create multiple sources of funding," says Nikolaev. The problem, of course, is where will the money come from? If it comes out of the hyde of the academy, it will meet with "tremendous resistance," says cell biologist Gelfand. All-Union Academy vice president

## SOS: Save Our Science

As Soviet science teeters on the brink, many Soviet researchers believe that their only hope is to turn to the West for help. But some of their colleagues are concerned that the kind of help Western countries are offering could do as much harm as good.

Especially troublesome is the growing number of young Soviet scientists being invited to work for extended periods in the West. "We know they want to help us," says physicist Vitaly Ginzburg of the invitations, but he argues that if they really want to help Soviet science, Western benefactors should invite people for just 6 months—or even just a couple of weeks to give lectures. "For the same money that they spend on 10 people, they can help hundreds just as effectively," he says. Spreading the money around isn't the only argument: Ginzburg points out that if young researchers are given shorter appointments, that would help stem the brain drain to the West. Otherwise, he says, "it will kill us."

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*Sergei Nedospasov*

At 39, Sergei Nedospasov of the Engelhardt Institute of Molecular Biology is just over half Ginzburg's age, and is the kind of person who could easily move abroad. But he is staying in Moscow and agrees with Ginzburg that regular-length postdoctoral fellowships in the West, though they may be good for the individual and the host, are ultimately harmful to Soviet science. "The current system," says Nedospasov, "indirectly encourages people not to come back." He has an additional suggestion: Let Western labs pair up with Soviet labs, so they can work on joint projects and exchange staff. That way, he says, "if there is really nothing to eat in Moscow," the Soviets can spend more of their time in the West until the situation eases. But they would not cut their ties to home in the way they would on a 2- or 3-year research fellowship.

The idea of joint labs is also backed by Vladimir Skulachev, head of the Belozarsky Institute of Physico-Chemical Biology at Moscow State University. He is trying to set up a "college" with the university biology department to serve as a model for such a scheme and has already entered into preliminary agreements with a few foreign labs that will allow each young researcher to spend a few months abroad. The foreign lab can be sure they are training the very best: His young researchers have all been selected to receive one-on-one instruction inside scientific groups both at the university and at participating academy institutes. Competition to join the group is very intense, with 300 applicants for 40 slots. Now, the program needs more invitations and offers of support from Western labs, he says.

Probably the most welcome of all forms of help would be for Western organizations to set up and fund laboratories inside the Soviet Union. *Science* could learn of only one organization that has gone that far: the Swiss nonprofit organization World Laboratories, which has set up an AIDS research laboratory in St. Petersburg with the help of a $1-million grant from Swiss businessman Bruce Rappaport. The center, headed by epidemiologist Andre Kozlov, will employ 25-30 Soviet scientists. Its advantage, according to World Laboratories Moscow representative Alexander Postnov, is that it bypasses the political system and puts the money directly into science. "We can hire anyone we need because we have our own bank account," he says.

But Postnov admits that setting up the center would have been impossible without the support of the mayor of St. Petersburg, Anatoly Sobchak, who provided housing and other basics. Although World Laboratories does not yet have plans for any other such centers, "We are keeping our ears open for more sponsors," Postnov says. Multimillionaires are welcome to volunteer. ■ **S.D.**

Evgenii Velikhov agrees: "The [academy] institutes will fight to keep their budgets."

Previous attempts to establish granting systems within the academy or universities have almost always been unsuccessful, say Bendookidze and others. "We referees just gave all the money to each other," he confesses. The committee hopes to solve this problem, says Nikolaev, by using as many reviewers as possible from outside Russia. Already, he says, he has been overwhelmed by offers from U.S. professors to help. But he still fears that the foundation, which like the academy has no budget yet for 1992, will remain "just a name on a bank account."

With or without the foundation, recovery for Soviet science will be, at best, slow and painful. Says high-energy physicist Sergei Kapitsa of Moscow's Institute for Physical Problems, "It took the Germans and the Japanese 20 years after the war to begin to build fine motorcars, and 20 years after that to become scientific powers."

Many researchers, however, fear something worse than a decades-long climb out of the morass: a collapse of the democracy movement and a return to totalitarianism. "People who are calling themselves 'democrats' are using the methods of the Bolsheviks," says Smirnov, who has taken to carrying a gas pistol [air gun] since receiving anonymous threats to stay out of Russian politics. Freedom, Skulachev adds, may turn out to be a dangerous commodity, primarily because in a country with no history of liberal, constitutional government, people do not know how to use it. "In a sense," says Skulachev, "we are still slaves in our mentality despite our new freedom. This is why the wrong people may come to power very easily." But for scientists, there is at the moment no choice but to tie their fortunes to those of Yeltsin and Russia and hope for the best. Should Yeltsin falter, the present problems of science may seem small indeed. ■ STEVEN DICKMAN

*Steven Dickman is a free-lance science writer based in Munich, Germany.*

### AAAS to Explore Assistance

At a meeting last week, the AAAS board of directors decided to explore ways the association could assist researchers in the former Soviet Union. As a first step, the board is hoping to collect data on the status of research institutes and individual scientists, perhaps with a view to sending teams to the various republics over the next year or so. Information from any contacts within the former USSR will be coordinated by Sandra Burns, at the AAAS USSR Program.

# Breast Cancer: Stalemate In the War on Cancer

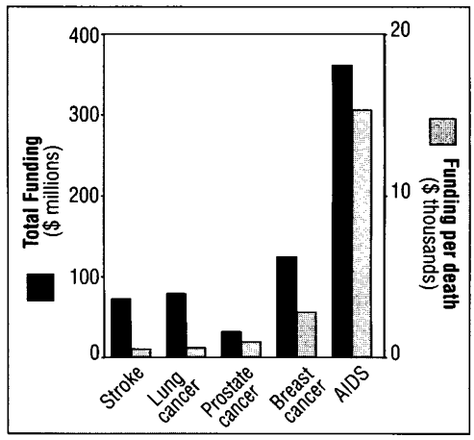
## *A GAO report documents new research and better treatments for breast cancer, but incidence and mortality are rising*

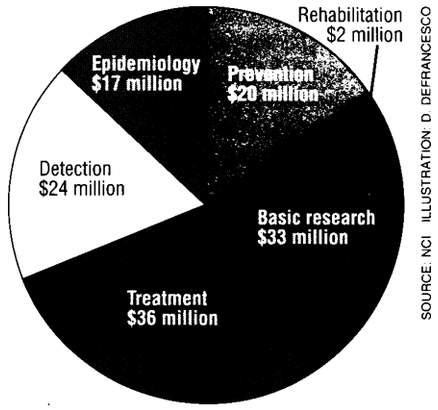
EVEN THE LEADERS OF THE WAR ON CANCER seemed subdued last week as they surveyed the battlefield. Twenty years after the big push to find "magic bullet" cures began with the signing of the National Cancer Act, they were called up to Capitol Hill by Representative Ted Weiss (D–NY) to explain why the incidence of the most common cancer among women, breast cancer, has increased over the past few decades.

What emerged from the hearing was a saga of substantial investments—the National Cancer Institute (NCI) has spent more than $1 billion on breast cancer alone over the past two decades—and spectacular progress at the research level, but limited success in the area that counts most: reducing mortality. According to NCI, 26.9 women out of every 100,000 died of breast cancer in 1973; by 1988, the number had grown to 27.5 per 100,000, and the trend seems to be heading upward. The rising incidence of the disease led several witnesses at the hearing to question NCI's focus on treating the disease rather than finding ways to prevent it.

In many respects, what's happening in breast cancer is an extreme example of the way the War on Cancer is going in general. After spending $22 billion in the past two decades, NCI can point to a wealth of new research findings, better treatments, a dramatic reduction in deaths from less common childhood cancers, and significant improvement in survival times for cancer patients under age 65. But overall death rates from many common cancers remain stubbornly unchanged—or even higher than when the war began. Only a few years ago, NCI leaders were setting super-optimistic goals, such as aiming to reduce the cancer death rate within the next decade by 50%. Now, reflecting a new touch of realism, that target has been dropped from NCI literature.

This represents a "very sharp change from 5 years ago," says John Bailar III, a former NCI biostatistician who was one of the first to challenge what he calls "the cancer establishment" about the slow rate of progress. When he published a statistical analysis in 1986 pointing out that people had been dying of cancer at the same rate for nearly two decades, the response from NCI leaders was "absolute rage," says Bailar. But much, including the leadership, has since changed.




**Funding snapshot.** *Breast cancer ranks below AIDS in 1990 NIH extramural research* (top)*; most 1992 NCI funding for breast cancer will go to treatment.*

Bailar's message got some support from General Accounting Office (GAO) experts who testified at the Weiss hearing on breast cancer last week. In the fifth of a series of reports on the cancer program, GAO found that "the likelihood is increasing that any woman will be diagnosed with breast cancer in her lifetime," and "we must conclude that there has been no progress in preventing the disease." Treatment has improved the chances of surviving, but only slightly. From 1976 to 1983, the 5-year survival rate for breast cancer patients increased from 74% to 77%. NCI's spending on breast cancer has brought some improvement, but "progress is in the eye of the beholder," says George Silberman, one of the authors of the GAO