

U.S. idea: Pay doctoral students to take over some of those duties. The benefits, says the society, would outweigh the drawback of students' taking longer to complete their Ph.D.s than the current 3 years.

But to those who would like to see Britain copy U.S. funding mechanisms as well, the Royal Society is discouraging. Under Britain's "dual support" system, the indirect costs of research are funded through block grants to the universities that are only loosely linked to grants awarded by the research councils. To improve accountability, the government has recently taken steps to tie this money more closely to universities' grant income—and some advocate moving further toward the U.S. practice, where indirect costs are met through overheads awarded according to the value of government grants won by each university. But the Royal Society comes down in favor of the present system—which it says provides flexibility, as the block grants are also used to support speculative projects overlooked by granting agencies. If there's a problem, the society says, it's that block grants haven't kept pace with research council spending—forcing universities to pare back direct research support to meet their indirect costs.

The report takes a similarly conservative line when it comes to the UK government's science agencies. Although William Waldegrave, who was appointed cabinet minister for science in April, is now preparing a new science policy—and is reportedly open to radical suggestions such as merging some of the research councils to improve coordination—the Royal Society doesn't call for a major reorganization.

One small change the Royal Society does support, however, is giving the newly formed Office of Science and Technology (OST) some added responsibilities. OST already oversees the research councils' spending, but the society wants it to have an extra few tens of million dollars a year to support universities conducting European Community (EC) research projects. EC grants don't include funds for overhead, and universities complain that they currently lose money by taking them on. The society also wants OST to pay the UK subscription to international organizations like CERN from a budget protected against varying currency exchange rates. These dues are now mostly paid by the research councils—and if the pound plummets in value, they can be forced to cut other projects to keep up the payments.

Similar suggestions have been made by the lobby group Save British Science, but the Royal Society's stamp of approval may improve their chances of appearing in Waldegrave's policy document, due next summer. Don't expect the Royal Society to play the role of lobbyist, however, Atiyah warns: "Other people can fight it out."

—Peter Aldhous

SOVIET BREAKUP

Cut Off From the Mainstream, Ukrainian Science Drifts

KIEV—Ever since the Soviet Union collapsed last year, a constant stream of senior Western scientists and government officials has passed through Moscow to assess what the West can do to help researchers struggling to make a living. That's all very welcome to researchers in Russia. But viewed from Kiev, capital of Ukraine, there's a bitter side to this outpouring of assistance: Ukraine is the second largest of the states that made up the former Soviet Union and it boasted a large and active community of scientists, but researchers here now protest that no one—including their former scientific colleagues in Moscow—is taking any notice of their plight.

"Criminal negligence," is how Oleg Krishtal, a membrane biologist at the Institute of Physiology in Kiev and one of the most cited scientists of the former Soviet Union, describes the way Ukraine has been forgotten. Without help, he says, his country is on the way to becoming an "intellectual desert."

Strong words, but a 2-week trip by *Science* across Ukraine reveals that Krishtal is not exaggerating. Ukraine has economic problems just as deep as those in Russia and a political old guard that is proving much more skillful at self-preservation than were the conservatives in Moscow. And, on top of its traditional isolation from the West, Ukraine is now more cut off from Moscow than it used to be. That puts Ukrainian researchers even further out of the mainstream of scientific ideas.

Located to the south of Russia and bordering on Poland, Czechoslovakia, Hungary, and Romania, Ukraine is almost as populous as the United States west of the Rockies and about the size of California and Oregon together. Economic difficulties are obvious to the visitor: The cities are crowded and dirty. Much of the countryside, in which two-thirds of the population lives, is missing the most rudimentary trappings of modern life, including paved roads, sewers, and piped water. Food is in plentiful supply—Ukraine was the "breadbasket of the Soviet Union"—but anything from outside Ukraine is almost impossible to obtain.

Amid these problems, science has sunk to the bottom of the political agenda. "Now is not the time for science. It will have to wait," says physicist Ihor Yukhnovsky, who as head of

the Permanent Parliamentary Committee on Education and Science is Ukraine's most senior scientific official. Sky-rocketing prices have left Ukraine's basic researchers with little time but to look for the necessities of everyday life. Salaries are "just enough to keep people from starving," says Krishtal. Most basic researchers are among the 40,000

scientific employees of the Ukrainian Academy of Sciences. Even though the Ukrainian government still provides the academy with a budget equivalent to about 85% of what it used to receive, explains the academy vice president, physi-

cist Victor Baryakhtar, prices have risen more than 400% since independence last August.

The sudden severance of links with Moscow has brought special problems for Ukraine. Moscow, it turns out, was a lynchpin for everything science in Ukraine needed and still needs: access to journals, contacts with the West, and—especially—money. Nearly half the overall science budget in Ukraine was provided by Soviet military contracts, an amount in the millions of dollars that Ukraine is wholly unable to make up out of its own budget. Moscow also used to provide hard currency so that Ukrainian scientists could purchase both Western equipment and journals. But hard currency has disappeared.

While Russia used to help, it now competes for foreign resources, according to some Ukrainian scientists, monopolizing contacts between the former Soviet Union and the West. According to one of Ukraine's best-known scientists, director Platon Kostyuk of the Academy Institute of Physiology, Moscow was offered the chance to send 60 young scientists from the former Soviet Union to the meeting of the International Physiology Society in Edinburgh next year. "So we prepared a list of 20 people from Ukraine who should attend," says Kostyuk with detectable bitterness. "But when we called Moscow, they told us we could only send one or two people."

Researchers who have spent time abroad argue forcibly that reform is urgently needed to help save Ukrainian science. Alexander Demchenko, a biochemist who works at the Academy of Sciences Institute of Biochemistry in Kiev, worked at Florida State University and publishes in Western journals. His complaint, gradually becoming more and

"The little money that is available is distributed with no regard for scientific merit."
—Alexander Demchenko

A Lifetime of Struggle to Do Good Science

To comprehend just how difficult it has been to do science in Ukraine over the past 70 years, consider the career of Sergei Gershenson. Gershenson, now 86 years old, had two strikes against him: He has a Jewish name (his father was Jewish, but Gershenson says he has never practiced the religion) and he is a geneticist. These two facts more than once nearly cut short his scientific career. Yet Western Nobel laureates have acknowledged that he may twice have come close to winning the Nobel Prize.

Receiving a visitor in his neat Kiev apartment, which he shares with his two daughters, Gershenson offers a surprisingly firm handshake given his apparently frail condition. He gave up laboratory work 2 years ago but still writes papers—and his memoirs—in a book-lined study that doubles as his bedroom. His library contains scientific works in German, Russian, and English as well as history and literature. For a long time in Ukraine, as in the rest of the Soviet Union, the possession of such books—especially Western works on genetics—constituted grounds for denunciation, if not imprisonment.

In this context, it is hard to remember that the Soviet Union—especially Moscow—was a cradle for modern genetics, where many of the most significant early discoveries were made both by local researchers and visiting Westerners. For instance, Gershenson, who was “one of the first people to be a geneticist from the beginning” (the previous generation had started out as botanists and zoologists), worked in the Moscow laboratory of visiting U.S. geneticist Hermann J. Muller, who in 1946 won the Nobel Prize for his discovery that x-rays cause mutations.

The circle of geneticists with whom Gershenson collaborated as a student and a young researcher included the most famous of the Moscow geneticists, such as N. I. Vavilov, who determined the wild origins of cultivated plants all over the world, and S. S. Chetverikov, who was one of the founders of the field of population genetics. Some of these people died or were imprisoned during the Stalin era, in part for their refusal to give up their “belief” in Mendelian genetics, while others, like Gershenson, were forced into other fields of research.

Gershenson flourished in the famed Vavilov Institute in Moscow until 1937, when he moved to a chair at the Ukrainian Academy of Sciences in Kiev. Before 1937, says Gershenson, he hardly encountered any discrimination. “Anti-Semitism among the intelligentsia was at that time practically absent,” he recalls. But that was soon to change. Just as Gershenson was preparing to make his first major contribution to modern genetics, with a paper demonstrating the importance of DNA in genetics, war broke out between Germany and the Soviet Union. Gershenson and his family had to flee the Nazis, who overran Kiev in 1941 and killed 34,000 Jews within 48 hours on 29 and 30 September, and most of the remaining Jewish population soon afterward. He spent the rest of the war in the Urals developing insect repellents for use against the flies that bore typhus.

Gershenson’s DNA paper, which was finally published in 1948, showed that introducing DNA from calf thymus into the fruit fly *Drosophila* causes a dramatic increase in the number of mutations. At the time he did the research, most biologists laughed

at his hypothesis that DNA must carry the genetic information; the prevailing wisdom at that time was that genes were made of protein. “My paper prophesied a lot of modern molecular biology,” recalls Gershenson wistfully. The paper—which appeared only in Russian—was largely ignored by Western scientists, who independently duplicated its results and went beyond them.

Publication of Gershenson’s paper came just as Trofim Lysenko had achieved a stranglehold on Soviet genetics. “I couldn’t even get any reprints,” Gershenson recalls. But worse was yet to come.

In 1948, Lysenko made his famous speech before the All-Union Agricultural Academy in Moscow and turned Soviet genetics away from the Darwinian and Mendelian ideas. Gershenson became one of the prime targets of the Lysenkoists, many of whom were also anti-Semites. “They expelled me from the Soviet Academy four separate times,” he recalls, but each time he was reinstated with the help of powerful friends. “First they sacked me as a ‘Morganist-Mendelist,’ and when that didn’t work, they sacked me because I was a ‘cosmopolite’ (Stalinist code for a Jew).”

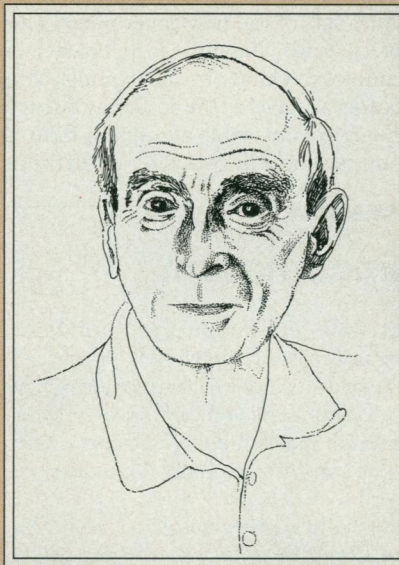
The last time, Gershenson recalls, his enemies also attacked him as a traitor for publishing a paper in English in 1945 (in the U.S. journal *Genetics*) at a time when patriotic Soviets were supposed to be working for the fatherland. “The only thing that saved me was that I had kept the letter from the president of the Soviet Academy, begging me to write something in English so he could prove to his American colleagues that science in the Ukraine was not dead.”

Since they couldn’t destroy him directly, Gershenson’s enemies tried to make him irrelevant by shunting him into a field they considered a backwater: the study of insect viruses. It turned out that they did him a favor. “Viruses could serve as a good genetic model,” Gershenson recalls, his eyes shining with pleasure. By the mid-1960s, working with the nucleopolydrosis virus in silkworms, Gershenson discovered the activity of a curious enzyme that could transcribe RNA to DNA, in just the opposite direction from “normal” genetic transcription. But Gershenson was unable to isolate the enzyme responsible for this unusual process since he did not have the proper reagents. “If they gave Nobel Prizes just for having the right idea,” says Yuri Gleba, a Ukrainian biologist now working in the United States, “Gershenson would have won one.”

At about the same time, some Western researchers, including David Baltimore and Howard Temin, were pursuing similar studies in other viruses. Their discovery of the activity and subsequent isolation of the enzyme now known as reverse transcriptase won Baltimore and Temin a Nobel Prize in 1975. Gershenson’s only consolation is a letter from Baltimore, dated 15 March 1972, which he has carefully kept in his voluminous files. Baltimore apologizes for not referring earlier to Gershenson’s work: “My excuse,” wrote Baltimore, “...is that I was not aware of it.”

The breakup of the Soviet Union last year may finally have closed one chapter on the history of science in Ukraine. But, as Gershenson and his Ukrainian colleagues have discovered, scientists in the West still seem largely unaware of their work.

—S.D.



Nobel quality? Sergei Gershenson's two key papers were little known in the West.

MERRILL GASON

more impassioned as his voice grows louder, is echoed by many of his internationally minded colleagues: "We understand that the country is poor, so we cannot ask for too much," he says. "But the little money that is available is distributed with no regard for scientific merit—that is really frustrating."

Under the Soviet system, Moscow used to decide who got money, and personal contacts were always important. But now the Ukrainian Academy of Sciences is in charge and has "taken over the role of imperial power, with just a few small changes," complains Krishtal. Under the old system, explains Demchenko, "you had to live like Faust, and sell your soul for a few privileges."

One radical suggestion to give a boost to Ukrainian science is to persuade some scientists at the academy to leave in order to provide resources for the few who do good work.

Geneticist Sergei Gershenson, 86 years old and a pioneer of molecular genetics, says that "30% to 50%" of academy scientists should be "fired immediately, especially in biology." Krishtal goes even further: "Three-quarters of the industry in this country would be bankrupt, except they don't have such a concept here yet, so people keep going to work every day. In science, it is exactly the same."

Radical change is unlikely, however. Unlike the East European and Baltic republics, which are already inviting experts from the West to evaluate their science, attempts at reform in Ukraine have so far failed. One of the first acts of the new government was to create a State Committee on Science and Technology, a kind of science ministry that would act as a rival to the academy. But as the academy retains total autonomy from the committee, including its own budget, the new

committee is able to do little.

Attempts to introduce change from below have also failed. A couple of years ago, Demchenko helped organize a "Society of Democratic Scientists," which tried to break the monopoly of power in science held by the academy. But even though several thousand scientists joined the society, its efforts quickly fizzled. The movement lacked money, explains Demchenko, and the academy leaders were just too powerful. "The same people edit the journals, head the academy councils on their fields of science, and award the scientific degrees. If one of them decides you are an undesirable," he continues, "you have had it."

Researchers everywhere in Ukraine said that they are afraid the system will not change soon because of the difficulty in adapting to life in a noncommunist country. "Over the years," says Andre Sibirny, a yeast geneticist at the Ukraine Academy of Sciences in Lvov, "people here were transformed from *Homo sapiens* to *Homo Sovieticus*." Among other things, he says, that means that the first impulse for people who are moved into positions of power is to "take whatever they can get" for themselves.

The difficulty in changing people's perceptions is neatly illustrated by the experience of U.S. high-tech business consultant Dave Ziegler, who spends most of his time in Kiev. Years of living in a system where there were constant shortages has made Ukrainians think that once they have a product, any product, it will sell, explains Ziegler. "I've heard that there are 72,000 researchers at the Ukrainian Academy," says Ziegler, "and I must have heard from 62,000 of them by now, trying to sell me on business proposals. Eighty percent of them have ideas marketable only in their heads because they don't know what's on the market. Of the others, 5% have good ideas, but of them all but 5% are asking for such outrageous terms that they will never be able to make a deal," says Ziegler with exasperation.

Despite all the psychological and other problems, a Western evaluation would still do a lot of good, says Demchenko. It would force people to think about what 'good science' really means. The question is, when reform does eventually come, will there be any competent scientists left in Ukraine?

—Steven Dickman

Steven Dickman is currently a Knight Science Journalism Fellow at MIT.

An Academic Reincarnation

KIEV—Amid the gloom in Ukrainian intellectual circles, one recent event provides at least a glimmer of hope: This month, the "University of the Kiev-Mohyla Academy" reopened—175 years after it was closed down by Czar Alexander III for its humanistic teachings—as the first non-state-run university in Ukraine. Its objective, says director Viatcheslav Brioukhovetsky, is to train people to think independently and try to help recreate a cosmopolitan intellectual culture in a country traditionally dominated by ideology.

Although short of funds and staff, prospects for the new university look good. The new government of the independent Ukraine has given the university the handsome buildings of the Naval Political Academy—until recently used for the ideological training of officers in the Soviet Navy—as well as a rundown hospital, both located in the bohemian Podol district of Kiev. Also promised are startup funds of 50 million rubles (\$400,000) and an annual budget of 60 million rubles (around \$500,000) a year, with no ideological strings attached. Several U.S. and Canadian universities, including Columbia and Rutgers, have also agreed to exchange students, faculty, and administrators.

On the curriculum will be lots of foreign language study, with some courses taught only in English, and students will be given the chance to tackle subjects like international law and theology that were banned under the Soviets. Students—there will be 1500 eventually—will be able to mix offerings from the university's three faculties: Humanities, Philosophy, and Cultural Studies; Social Sciences; and Natural Sciences.



No ideology. The Kiev-Mohyla Academy, now a private university.

Most important, says Brioukhovetsky, is freedom from the ideology that he fears will continue to endanger the quality of education at the state-run universities even though the communists are no longer in power. "The communist ideology is like a corpse now: It may be dead, but we can still smell it everywhere." It will take 10 or 20 years even to begin to teach people to think a different way, he says.

—S.D.

Correction

An article in last week's issue ("Agencies Split on Nutrition Advice," 25 September, p. 1857) incorrectly reported the recommended daily allowance of folic acid as 400 milligrams. The correct unit throughout the article should have been micrograms.