Piecemeal Rescue for Soviet Science

Sensing urgent needs and untapped opportunities, some groups in the West are investing in science in the former Soviet Union. Will their individual efforts be enough?

ONE MAN'S DISASTER IS ANOTHER MAN'S opportunity, says an old business maxim—and nowhere is that more true today than in the research establishments of the former Soviet Union. The chaotic wave of political and economic reform that has swept the country since last August's failed coup has prompted many former Soviet scientists to flee their homeland and has left others living a hand-to-mouth existence, uncertain when, or if, they will be able to return to their research. Now a handful of Western organizations and companies have begun to step into this turmoil and are busy signing up scientists and even entire laboratories for a song, hoping to capitalize on the enormous intellectual resources and cheap labor costs of the former superpower's scientific and technological infrastructure. They are in the happy position of being able to claim the moral high ground while they look out for their own economic interests since most are quick to argue that the investments they are making should also improve the lot of the scientists themselves.

In that respect, these industrialists share common ground with Western governments, foundations, and professional societies. All make the case that the preservation of former Soviet research capabilities, and the conversion of military research to civilian purposes, is of overriding importance to the survival of the former Soviet republics—and will be vital to prevent desperate nuclear weapons scientists from selling their expertise to Third World countries.

EDISON GIRARD

So far, however, these sentiments have not sparked a major relief effort. The only coordinated governmental program to help prevent the collapse of ex-Soviet science—an international "clearinghouse" that would evaluate proposed civilian projects involving researchers in the former Soviet weapons laboratories—is still undefined and potentially hindered by a cumbersome bureaucracy (see box). As a result, the initiative for the time being has passed largely to scientific and philanthropic organizations, individual government laboratories, research funding agencies, and private industry.

The diverse projects these groups are putting together defy easy classification, but they share one essential element: They provide former Soviet scientists with the things they need not just to survive but to keep working—funding, equipment, technical journals, and the like. Isolated they might be, but these efforts have at least begun the slow process of saving former Soviet science.

A Clearinghouse That Could Get Clogged

The most ambitious effort to channel funds to beleaguered scientists in the former Soviet Union is finally taking shape after weeks of international negotiations. Earlier this month, representatives of the European Community, Japan, Russia, and the United States agreed to create the International Science and Technology Center in Moscow with initial funding expected to be at least $50 million. It is intended to be a "clearinghouse" for civilian projects that will keep the former superpower's weapon scientists at home and working on ventures that benefit their countrymen. "What we want is for [these scientists] not to feel that the only way to protect their welfare is to sell weapons abroad or to convince the governments of Russia and Ukraine that their interests lie in continuing to build weapons at a high rate," says Ashton Carter, director of the Center for Science and International Affairs at Harvard University and co-chairman of a National Academy of Sciences panel that recently offered advice to the Bush Administration on how to help ex-Soviet scientists.

The center was first proposed by the United States in February, and so far it is the only country to make a firm financial commitment, pledging $25 million. The European Community has indicated, however, that it will match the U.S. contribution, and Russia has agreed to make an "in-kind" payment by providing facilities and services for the center. Japan has promised "substantial contributions" when plans for the center become clearer, and Canada has also expressed interest in contributing funds.

These international partners have not yet agreed how the center will select scientific projects for funding. But scientists are already complaining about a proposal now under review, under which the center's staff and its governing board, composed of representatives from contributing nations, would first screen technical proposals from within the former Soviet Union or abroad to ensure that the work in question would engage weapons scientists in civil projects of real value. Projects that meet this and other still unspecified criteria would then be forwarded to the sponsoring nations, which would then decide whether or not to fund them, either jointly or alone. The academy panel criticized this potentially unwieldy structure in a report earlier this month, complaining that it threatened to make the center a "needless and powerless middleman between proposers and funders." The panel suggested giving the center the power to fund some projects unilaterally, but the partners have shown no signs of taking this advice. ■ D.P.H.

Rent a Russian, utilize a Ukrainian

The most enthusiastic of the would-be saviors are generally the representatives of commercial firms who see tremendous business opportunities in the laboratories of the former Soviet republics. Take, for instance, Ray Decker, a materials scientist who now runs University Science Partners, a technology transfer firm in Ann Arbor, Michigan. "It's all very exciting," he says of his firm's partnerships with several research institutes in Ukraine. "We've seen about 25 different projects, which we sorted through, and now we have at least 10 that are very interesting and validated as cutting-edge work." Decker rattles off the technologies his firm is ready to bring to U.S. companies: wear- and corrosion-resistant coatings for steel, plastic, or ceramic components such as turbines; engineered porous materials with high strength-to-weight ratios, made by what Decker calls a "revolutionary" process; diamond tools for fabricating materials. And he's just warming up.

The cornerstone of Decker's strategy is the formation of joint venture companies half owned by the former Soviet scientists in the institutes, an arrangement that gives the researchers royalties and an equity stake in the commercial applications of their work. If all goes according to plan, these firms will eventually license their proprietary technologies as well as take material orders from industrial customers. In the meantime, he says, he and his partners have begun funding the former Soviet researchers directly, although he is unwilling to say how much he is paying. "Our basic philosophy is to make [the scientists] entrepreneurs, to keep them in place where they can do the best for Ukraine, and to continue to do work for U.S. companies," he says.

Not all the industrial investors in former Soviet science are so innovative. Most companies that have announced such programs have restricted themselves to contracting with groups of scientists or laboratories for specific research projects. A big incentive for such arrangements is the bargain-basement cost of funding a major research program. In a venture announced 3 weeks ago, for instance, General Atomics plans to pay a total of $90,000 to 116 scientists at the Kurchatov Institute of Atomic Energy in Moscow in exchange for a year's worth of tokamak experiments that will aid the U.S. fusion program. Similarly, Sun Microsystems recently paid an undisclosed sum to hire a top supercomputer researcher and 50 of his associates at the Institute for Precision Mechanics and Computing Equipment in Moscow to work on microprocessor improvements.

Even some federal laboratories—not normally known for their quick reactions—have begun to make entrepreneurial investments. Next month, the Stanford Linear Accelerator Laboratory (SLAC) expects delivery of 10 high-precision magnets from the Institute for Nuclear Physics in Novosibirsk, Russia. It's the second half of a nearly $1.5 million magnet order SLAC placed with the Russian lab in early 1990. The Superconducting Super Collider Laboratory (SSCL) is following suit, having signed an agreement with the Novosibirsk laboratory for magnets that will be used in the accelerator's low and medium-energy booster rings. The magnets for these rings are only the first two of 20 items that the Russians may eventually manufacture for the SSC at a total cost savings for the United States of $100 million to $150 million, says Eddie Duek, the laboratory's head of international coordination. Duek adds that the SSC is exploring similar cooperative activities with four to five other former Soviet labs, although none is likely to contribute quite as much.

Both the SSCL and SLAC treat the work by the Russian laboratory as scientific "contributions" to their research instead of work-for-hire. But the SSC is also paying Novosibirsk scientists hard currency for parts and material—perhaps as much as 35% to 40% of the total cost of the magnets, Duek says. Getting such work done cheaply is obviously a big plus for a project that will have a tough time getting its budget approved by Congress this year, but an SSC spokesman takes pains to emphasize the altruistic side of the investment, pointing out that the collaborations were deliberately set up to "help the [former Soviet] labs and strengthen them." He might have added that the program has one other benefit: The magnets are manufactured at the Berdsk Electromechanical Factory in Siberia, a critical military facility that used to produce rocket parts for Soviet ballistic missiles. (One SLAC scientist says the Russians have joked that the magnet work is old hat for Berdsk, since the factory has always manufactured products for "delivery" to the United States.)

Modifying the military

Such conversion of military facilities to civilian work has, in fact, been a major objective of Western governments since the August coup. It's the driving force behind an agreement reached earlier this month between the United States, the European Community, Japan, and Russia to establish the International Science and Technology Center in Moscow to channel funds to former Soviet weapons scientists for work on worthwhile civilian projects. It could be weeks before the center hands out its first grants,

A Profusion of Projects

Proposals to assist (or hire) former Soviet scientists are proliferating. Here are a few examples of projects in various stages of discussion:

Under way:

- Creation of the International Science and Technology Center to select and fund civilian projects for former weapons scientists (see box).
- Additional funding for National Institutes of Health and National Science Foundation grants involving collaborations with former Soviet scientists.
- Collaboration between the Department of Energy, General Atomics, and the Kurchatov Institute on magnetic fusion work.
- Joint ventures in materials science between U.S. firms and several Ukrainian institutes.
- Sun Microsystems' hire of 51 researchers at the Institute for Precision Mechanics and Computing Equipment in Moscow to work on microprocessor improvements.

Under consideration:

- Purchase by NASA of Soyuz TM space capsule and hire of tracking and data services for planetary mission control.
- Investment by Merck and Co. Inc. to convert former biological warfare facilities to vaccine production.
- Interest by private industry in former Soviet launch services and space power systems such as the Topaz reactor.
- Joint ventures between Department of Energy weapons laboratories and former Soviet counterparts in environmental cleanup, inertial confinement fusion, etc.
- Manufacture of high-performance magnets for Superconducting Super Collider by the Institute for Nuclear Physics in Novosibirsk.
- Direct support from U.S. foundations for individual researchers.
- Provision of journals, obsolete lab equipment, personal computers, and electronic mail connections to former Soviet labs.

Blue-sky ideas

- Construction of a dedicated high-energy physics B factory at the UNK laboratory near Moscow.
- Use of peaceful nuclear explosions to destroy chemical weapons at weapons lab Arzamas-16.

however, and when it does it will find plenty of claimants: Robert Gallucci, a senior coordinator in the State Department with responsibility for the center, testified before Congress last week that he has already received more than 100 proposals from federal agencies and the private sector for collaborative projects with researchers at Chelyabinsk-70 and Arzamas-16, the former Soviet weapons laboratories.

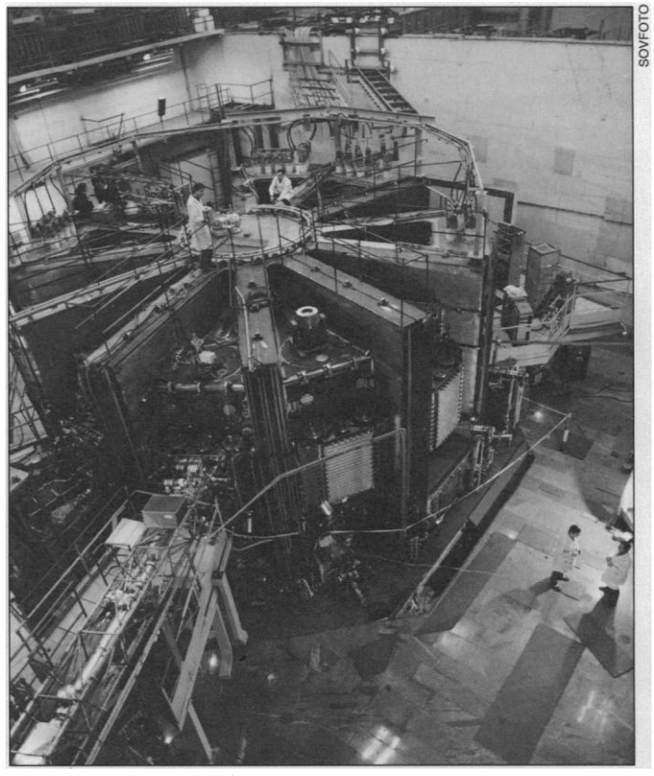
Some U.S. government officials may not wait for the center to get off the ground. The directors of two U.S. weapons labs—Siegfried Hecker of Los Alamos and John Nuckolls of Lawrence Livermore—returned from a visit to Chelyabinsk and Arzamas last week with several ideas for cooperative projects with their former competitors that they are eager to launch, possibly on their own. For instance, Hecker would like to tap expertise developed by former Soviet researchers in explosive-driven high magnetic fields for a collaboration between Los Alamos and the national magnet lab being established at Florida State University. Other possible joint projects between former Soviet and U.S. weapons labs include the development of environmental cleanup technologies, high-energy lasers, and inertial confinement fusion. Hecker says such collaborations will strengthen the hand of researchers in budget negotiations with their own government. "They say specifically they're not looking for handouts," he says.

Some companies are also keen to get in the act. Take the pharmaceutical giant Merck. Company spokeswoman Pamela Adkins says three company representatives recently returned from a week-long trip to the former Soviet republics, sponsored by the State Department, to assess vaccine production capabilities. Although details won't be available for another week or two, Adkins says they visited a former biological weapons factory with an eye to converting it to vaccine production.

It's not just physical facilities that would have to be converted for such projects, however: Weapons scientists will have to go through a conversion process themselves to adjust to what is politically feasible in the West. At a meeting last month in Washington to float possible collaborative projects, for example, scientists from Arzamas suggested using nuclear explosives to destroy chemical weapon stockpiles. That idea met with a "very mixed response," says Kurt Gottfried, chairman of the physics department at Cornell, who took part in the meeting.

Saving the scientists

The big deals involving whole institutions or laboratories that have made headlines recently make some former Soviet scientists uncomfortable. "I would like to see more competition for Western scientific aid," says Alexander Zemtsov, a volcanologist at the Pacific Oceanological Institute in Vladivostok, who argues that big projects are likely to be conducted through the same authoritarian channels that governed science under the communist bureaucracy. Loren Graham, a science historian and policy analyst at the Massachusetts Institute of Technology, concurs: "If money goes directly into the hands of directors, it might be slowing the process of reform and enforcing the authoritarian character of the Soviet science establishment that we've criticized in the past."



A bargain. *For $90,000, General Atomics may buy a year's experiments on this tokamak at the Kurchatov Institute.*

In the United States, two agencies—the National Science Foundation (NSF) and the National Institutes of Health (NIH)—are at least trying to put money directly into the hands of former Soviet scientists. NSF has recently decided to supplement existing grants to U.S. researchers who have collaborators in the former Soviet republics, while NIH has launched a modest program of 3-year grants to collaborations of U.S. and former Soviet scientists. (An older and smaller NIH program provides 1 year of funding for former Soviet collaborators of NIH intramural scientists.) "Our hope is that these grants will prop up the research being conducted by these individuals and help carry them though difficult times," says Phil Schambra, director of NIH's Fogarty International Center, which is managing the new program. But the sums and the number of grants involved—NIH made seven awards totaling $460,000 last October, while NSF is spending a similar amount—are a drop in the bucket compared to the scope of the problems confronting former Soviet science.

That's why some NSF officials are pushing for more. At a meeting of the National Science Board last week, member Peter Raven, director of the Missouri Botanical Gardens, argued for immediate action to preserve archived research data, establish electronic mail links with former Soviet labs, and provide "in kind" assistance—journals, surplus personal computers, technically obsolete laboratory equipment—to as many scientists as possible. "We can't take any more time to develop the responsible programs that we would like to do," he said. "We have simply got to make the best of developing responsible programs for the immediate future." NSF director Walter Massey agreed: "If we can demonstrate how it's done on a small level, then maybe we can show the way for other agencies." The board unanimously approved a resolution directing NSF to provide "emergency assistance."

It's clear from all this ferment that virtually everybody sees enormous benefits in helping science survive in the former Soviet republics. But so far what has emerged is somewhat akin to President Bush's "thousand points of light." And just as critics have assailed Bush's emphasis on volunteerism as a cure for solving U.S. social problems, this piecemeal approach will be unlikely to stave off the collapse of the former Soviet science infrastructure. Authorities ranging from former President Richard Nixon to the National Academy of Sciences have recently issued urgent pleas for stepped up assistance. But so far, in an election year dominated by domestic issues and the state of the U.S. economy, there's little political enthusiasm for a Marshall Plan for Soviet science. ■ DAVID P. HAMILTON

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