More on Bottom-Up Funding of FSU Science: Another Ongoing Program, a Plea for Reform

In his article "Science Funding in the Former Soviet Union Needs the Bottom-Up Approach" (PHYSICS TODAY, April, page 24), Maurice Jacob fails to include another major support program for scientists in the former Soviet Union (FSU), or so-called newly independent states (NIS), that is funded by the US Department of Energy (DOE). Called the Initiative for Proliferation Prevention (IPP), the program has been ongoing since 1994, with the principal goal of stabilizing personnel and resources in the NIS that represent a potential risk of nuclear proliferation.

IPP engages scientists—and also engineers and technicians—formerly employed in Soviet weapons and weapons-support institutes, and is redirecting their activities into commercially viable, nonweapons-related projects on which they are collaborating with scientists at most of the DOE national laboratories. These projects are intended to lead to commercial and economic benefits for both the NIS and the US. At present, some 400 such projects are being worked on at a total of 180 institutes in Russia, Ukraine, Kazakhstan, and Belarus. Employing over 6000 NIS scientists, engineers, and technicians, the projects cover technologies in such fields as accelerators, biotechnology, energy, environment, advanced materials, and manufacturing techniques.

The IPP program differs from the International Science and Technology Center (ISTC) discussed in Jacob's article in two significant ways. First, it is being funded solely by the US government. Second, it is a truly collaborative effort in which ten DOE national laboratories plus AlliedSignal Corp's Kansas City plant work jointly with their counterparts in the NIS institutes. The participating US national labs are Argonne, Brookhaven, Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge, Pacific Northwest, and Sandia National Laboratories; the Idaho National Engineering Laboratory; and the National Renewable Energy Laboratory.

IPP projects are also distinctive in being set up so that each project goes through three phases, or thrusts. Thrust 1 is basic research. Thrust 2 is development toward a commercial product, and it engages US industry as the third party between the US national lab and the NIS institute. Thrust 3 involves full commercial production, with the industry partner taking the product to market and thus providing a steady income for the NIS institute, as well as for itself. DOE funds only the first two phases. In the second phase, industry provides matching funds equal to or more than the amount provided by DOE.

The total IPP budget for the current fiscal year is $30 million, with 50% going to the NIS institutes and the other 50% being used to support the principal investigators in the DOE national labs who are collaborating with the NIS scientists and to cover project management and administrative costs at the NIS institutes. By the end of this fiscal year, though, this ratio will be changed to 65% for the NIS institutes and 35% for the DOE labs.

DOE's Office of Nonproliferation and National Security administers the IPP program, and technical oversight is provided by a board consisting of representatives (mostly physicists and engineers) from each of the national labs plus the Kansas City plant.

From my vantage point—I chair the oversight board and am responsible for coordinating the efforts of the DOE labs and their NIS partners—the IPP program certainly has the potential for success. Given that, in the US, the process of commercializing technologies developed in national labs takes an average of five to seven years after the completion of the research phase, it is understandable that we are only now beginning to see several of the IPP projects enter the third phase. Among the most promising of them are a novel technology for charge storage in ultracapacitors (from the Idaho lab); a device that uses compressed nitrogen and small volume of water to produce a large volume of mist particles to extinguish fires in aircraft cabins (Argonne); a smart video for comprehensive asset tracking (Brookhaven); and the use of superplastic technologies developed in Russia for aerospace applications (Lawrence Livermore).

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Maurice Jacob calls the physics community's attention to the current plight of both the scientists and science in the former Soviet Union (FSU) and advocates that more funding and other support be provided by the West under a "bottom-up approach." He wisely notes that the bottom-up approach "deserves greater recognition," and that is certainly true of my country, Ukraine.

At present, all Western help—whatever its origin—is funneled to the Ukrainian physics community exclusively through Ukrainian government committees or the presidium (executive committee) of the Ukrainian National Academy of Sciences. Not only has the Ukrainian bureaucracy insisted on the top-down approach, but it has been accommodated in this practice by both the Western Europe–based International Association for the Promotion of Cooperation with Scientists from the New Independent States of the Former Soviet Union (INTAS) and the US Civilian Research and Development Foundation for the Independent States of the Former Soviet Union (CRDF).

Although I agree with Jacob about the basic activities involved in the bottom-up approach, I do take exception to his stating that peer review should involve both the granting and receiving sides. He does not elaborate, but the implication is that the receiving side should consist of, or at least include, independent researchers. However, that is not the actual situation in Ukraine, at least with respect to INTAS-funded projects. Although the fact is not publicly acknowledged, the individuals representing the receiving

continued on page 81

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side are chosen by academy insiders to defend the academy's own interests and promote its members and protégés. In other words, top-down science funding is the rule in Ukraine—and it does not reach very far down from the top either.

There is no question that the science environment in Ukraine could—and should—be improved by setting up an effective bottom-up funding system. The kind of system that I and like-minded colleagues envision differs from the one Jacob describes in that both the peer review process and the distribution of grants and equipment would be kept free of links between the Western funders and the national government (including the national academy). Accordingly, the reviewers would be selected by the funders, and the national government reviewers would be excluded from the process. Furthermore, the funders would make distribution directly to the individual awardees, and care would be taken to ensure that the national government could not interfere. In addition, it would be left to the funded project leaders in Ukraine to determine what proportion of the grant money should go to their institutions to help cover administrative costs.

Furthermore, if such a system is to work, certain other and really quite modest obligations would have to be imposed on the national government. For example, arrangements would need to be made to ensure that the punitive government tax levied on foreign scientific grants (the current rate is about 50%) would be rescinded, that the national academy would be prevented from surrendering any more of its property to private interests, and that we government scientists would get our monthly salaries regularly and without delay.

Under this kind of bottom-up system, I suggest, the science base in Ukraine would be rebuilt, Ukrainian scientists would be better able to compete on an equal footing and the younger ones more likely to remain in science, there would be less corruption and misuse of funds, and our ties with Western scientists would be further developed and strengthened.

To make such a system a reality in Ukraine, what are now needed above all else are the active support and involvement of Western institutions.

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Jacob replies: I am thankful to Kenell Touryan for presenting in detail the working operations and activities of the US-funded Initiative for Proliferation Prevention. It is indeed a very important and promising program that deserves to be more widely known in the physics community. I recognize that my article, whose aim was to promote the bottom-up approach, was biased in favor of physics research and also in favor of some European activities in which I have been personally involved. Therefore, I am pleased that Touryan has added this other important example of efficient collaboration to those discussed in the article.

I much appreciate the comments of Alexander Gabovich about the situation in Ukraine. He stresses certain difficulties that Western funding agencies need to be more fully aware of when they occur. With respect to INTAS, though, his remarks seem to apply more to the "joint calls" for proposals than to the "open calls," which operate directly at the research group level and account for a greater part of the funding granted by INTAS (see page 26 of my article).

One change has already taken place in the direction suggested by Gabovich and may lead to an improved situation in Ukraine. Some joint-call proposals that are rated as excellent by INTAS but not considered as deserving priority by the partner country or organization are being shifted to the open-call category so that they can qualify for a second chance to be funded.

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The Vacuum Field Is Real—and the Most Ethereal of Fields

It was good to see Frank Wilczek's essay (Physics Today, January, page 11) in which he discusses the ether theory as a notion that just won't go away. Of course, as Wilczek so rightly points out, Albert Einstein wound up with a theory of spacetime that looked very much like an ether theory, but without actually calling it such. Einstein's web of spacetime was later joined by the web of quantum fields of quantum electrodynamics as developed by Paul Dirac and Richard Feynman, with virtual particles being created out of the vacuum—and so space did not seem so empty after all.

This vacuum field has had an interesting history, with Einstein originally invoking it as a source of opposition to gravity in his cosmological equation of the universe before Dirac and Feynman used it as a source of virtual particles, but its reality was never taken very seriously. More recently, we had the proposal made by Andrei Sakharov[1]—and subsequently by Harold Puthoff and others[2]—that the quantum fluctuations of the vacuum could be used as a source of such physical quantities as gravity, mass, and inertia.

Now we have experimental results that provide evidence that the vacuum field is real, or at least produces real effects—namely, the Casimir effect on plates in a vacuum[3] and the cosmological effect of the pressure of the vacuum on the expansion rate of the universe (an indication that the rate is speeding up with time, as discussed in the lead "Search and Discovery" story in your June 1998 issue, page 17). Therefore, Einstein's cosmological constant exists after all as a nonzero entity. Thus, this most ethereal of fields not only exists but seems to exist everywhere, with visible effects. It should be an interesting field of study in years to come, especially as it relates to quantum effects in the universe.

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Standard Model of Particle Physics Has Charge Quantization

In reporting on the important search for millicharged particles at the Stanford linear Accelerator Center (Physics Today, September 1998, page 18), Bertram Schwarzschild states that the quantization of the electric charge is something of a mystery in the standard model of particle physics (SM) and that no established theory excludes millicharged particles. I would like to point out that these statements are not correct.

It is true that for a long time people thought that the SM could not explain charge quantization. One of the main motivations for invoking grand unification theories (GUTs) was precisely this fact. However, as was demonstrated in 1989–90, the complete structure of the SM is such that the