

POLITICAL FALLOUT

What Fate Awaits Chernobyl in the New World Order?

by JESSE H. AUSUBEL



Victoria Ivleva, Chernobyl Five Years After, 1991

ANATOLY CHERNYAYEV was baffled. The personal assistant to President Mikhail S. Gorbachev feared to imagine why such an impressive collection of top Soviet officials had come, unannounced, to interrupt his employer's Crimean vacation. When the delegation arrived at five o'clock in the afternoon last August 19, Chernyayev rejected as something out of a bad movie the idea that he was witnessing the opening scene of a coup d'état. Yet he knew that only the gravest crisis would bring most of the emergency authority in the U.S.S.R. from Moscow to a small town near the Black Sea. Chernyayev thought back five years to the worst week in the life of the nation since Gorbachev had

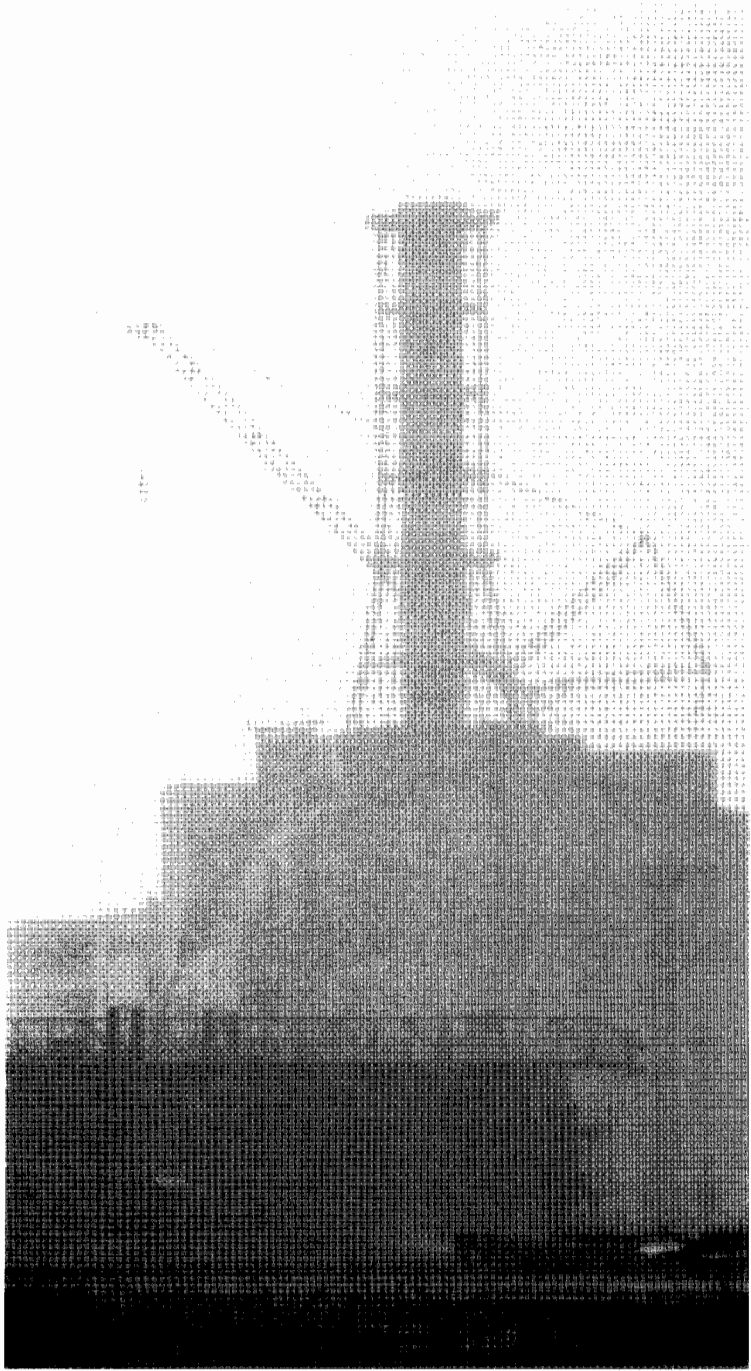
become its chief: perhaps there had been another disaster at Chernobyl.

It was in the early morning hours of Saturday, April 26, 1986, that reactor number four at the Chernobyl nuclear plant, in the northeastern Ukraine, had exploded, scattering radioactive fallout over most of Europe. Today millions of people in the U.S.S.R. and northern Europe live with contamination and the fears it engendered. In the areas near Chernobyl it remains forbidden to harvest and eat the fish, field crops, mushrooms, cherries and pears for which the area is known. In some regions near the plant, increases in childhood leukemia and other illnesses have been reported, although the medical effects of Chernobyl are a matter of intense debate.

Indeed it will be many years before the health and environmental consequences of the accident at Chernobyl are fully understood. The political fallout has been a good deal easier to gauge and arguably as great. Chernobyl exposed the painful vulnerabilities of a society that rejected freedom of information. It linked the inflexibility of the command economy to matters of life and death. And it gave an inadvertent, but perhaps major, boost to glasnost and perestroika, Mikhail Gorbachev's programs of openness and economic restructuring.

Last December I visited Chernobyl. I was invited there because I study climatic change and the energy systems that may cause or prevent it. When I began this work in 1977, the fraternity of interested scientists fit comfortably into one conference hall, and there were almost as many of them who thought the world was entering a new ice age as there were who thought the climate was warming. Because such issues are global questions, the group included several capable Soviet scientists. At the time, one of the best places to study global climate was the International Institute for Applied Systems Analysis (IIASA), an American-Soviet think tank near Vienna. I spent two years there, and my first supervisor was a Soviet hydrodynamicist from Siberia. In those years there was some suspense for an American in having a Soviet boss. Andrei Sakharov, the dissident physicist, was confined to Gorki, and I was working at IIASA while the Red Army moved into Afghanistan. Brezhnev was in power. During the cold war a kind of bond could be forged between Soviet and American scientists working together fruitfully that may now be harder to achieve, and those bonds have tended to last. My visit to Kiev and the nearby Chernobyl site last year can be traced through those international links, which antedate glasnost and perestroika as well as the April 1986 accident.

My invitation came in the spring of 1990, when reports showed that patches of radiation effects, somewhat resembling the pattern of Swiss cheese, persisted around Chernobyl. The pattern was discovered by members of a group of scientists in Kiev; one of them visited me in April 1990 at Rockefeller University and said he would ask me to come to Kiev and nearby Chernobyl. In June his letter arrived, saying, "Come discuss matters of mutual interest whenever the time is good for you." The prompt arrival of the letter and its informal tone indicated the different world that we have come to enjoy, and that was threatened, if briefly, by the August coup. A scientist directly invited a scientist: there was no delegation, no special international workshop, no approval from Moscow. I won a visa without any problems and in short order was on my way.



A little time and much history have passed since my trip to Chernobyl: with the failure of the coup, the former U.S.S.R. has embarked on a stormy, uncertain path toward reinventing itself. Amid all the changes, a blasted nuclear reactor and its fallout remain. Even last December, months before the upheavals of the past summer, it was clear that glasnost and perestroika had exerted a complex influence over decontamination, management and planning efforts at Chernobyl. How the Soviet political metamorphosis, coupled with the continuing deterioration of the nation's economy, will bear on one of the world's most important environmental sites will be a critical scientific question of the new century.

THE EASIEST ROUTE from America to Kiev is still via Moscow. And as it turned out, what I saw in Moscow helped me understand some of the current and potential problems at Chernobyl. I had visited Moscow before, but this time I was struck most by the absence of authority: I encountered virtually no passport control or customs inspection. Formerly, if you were lucky enough to be designated an important scientist, someone from the U.S.S.R. Academy of Sciences might meet you and whisk you through a special side channel. Normal channels meant long delays. But last year I passed through without an escort in minutes.

The disappearance of authority had been accompanied by the disappearance of goods. Moscow had no butter, no beer, no cooking oil, hardly a children's toy. Store shelves were genuinely empty, and people seemed to spend all their time foraging. Indeed, if in the Brezhnev era the main impression in the U.S.S.R. was tyranny, now it is poverty. Beggars meet you on the streets, and there are shantytowns in Moscow—one of which was bulldozed early last year to some outcry. Popular religious shrines are set up in public squares. Prostitution is less subtle than it was in the past. The black market exchange rate sets the monthly Russian salary at about ten or twenty dollars, an income as low as in poor, developing countries.

In Kiev, the capital of the Ukraine, things are somewhat better. One reason is that the Ukraine effectively has its own currency. Coupons are required to purchase most mobile goods other than bread or milk, and almost anything that costs more than a ruble. On one occasion I was trying to buy a record, but I was not succeeding. Finally someone in the line spoke up in English and explained that I had to have a Ukrainian coupon as well as my rubles. The coupon system, instituted in October 1990 to keep goods inside the Ukraine, appears to be working, but it emphasizes what an artificial economy is in place.

The revitalized Ukrainian parliament was in session day and night while I was there, debating and sometimes passing laws on all kinds of matters, from environmental protection to private property. The sessions, broadcast as a cable network might carry them in the U.S., were watched with interest and pride. Ukrainians repeatedly stressed to me that they were Europeans, gesturing about Moscow as if to suggest the partly Asiatic origin of Russia. The mood is certainly to look west rather than northeast.

The Ukrainians' desire to distance themselves from Russia and bring about change seemed the general tone both in public and within family circles—especially among women, who have the hardest lot. Scientists have

a somewhat more complicated perspective, because they are worried about the future of science in their country. Science in the Soviet Union has been funded, as it has been in the United States, mostly on an all-union or national basis. With diminished national funding of research, most institutes face large layoffs, and the country may suffer what amounts to a brain drain. Scientific organizations are thus trying to diversify their sources of support, seeking assistance outside the U.S.S.R. The alternative is local money—but economic activity is shrinking and changing in the republics, at least for the time being, and so it will be difficult for the Ukraine or the other republics to provide support from local tax revenues.



A grant or a contract for research from former state enterprises will be equally hard to secure. The Soviet equivalents of IBM or General Electric are likely to be restructured dramatically or go out of business in the next few years. In eastern Germany only a few of the old enterprises appear to be surviving. Thus academic research can look for little help from the nascent Russian or Ukrainian private sector. For comparison, imagine the turmoil if California proposed to secede from the U.S. How would Lawrence Livermore National Laboratory maintain itself? Almost 100 percent of its support is federal tax money.

Thus many Soviet scientists seem little impressed by nationalistic arguments. They know that for seventy-five

years the U.S.S.R. has set up a national system of research with large institutional units. For example, in the Ukraine there are large centers for computer science and cybernetics in Kiev and for materials research in Kharkov. Those centers will shrink if they are supported only by the Ukrainian Republic. Political fragmentation runs counter in practical ways to the scale and integration that are themes of modern research; nationalist tendencies can also run counter to the universalist ethic of science.

The complex political circumstances exert a powerful influence on the environmental issues raised by Chernobyl. In the three days of meetings and briefings in Kiev that preceded my day in the so-called restricted zone sur-

rounding the plant, my hosts shared a great deal of good science with me. The modeling of regional ecosystems, especially the integrated ecological modeling of soils, forests, atmosphere and hydrology, was impressive. Such studies have benefited greatly from data about the Chernobyl accident that were made available to local scientists. Until recently Soviet scientists, even in their own numerical models, often had to use data from western Europe or North America—in their studies of acid rain, for example. In many instances there were no Soviet data to be had; sometimes the scientists did not have access to the data that did exist; or, if they did have access, the scientists could not share the information openly. The urgency of

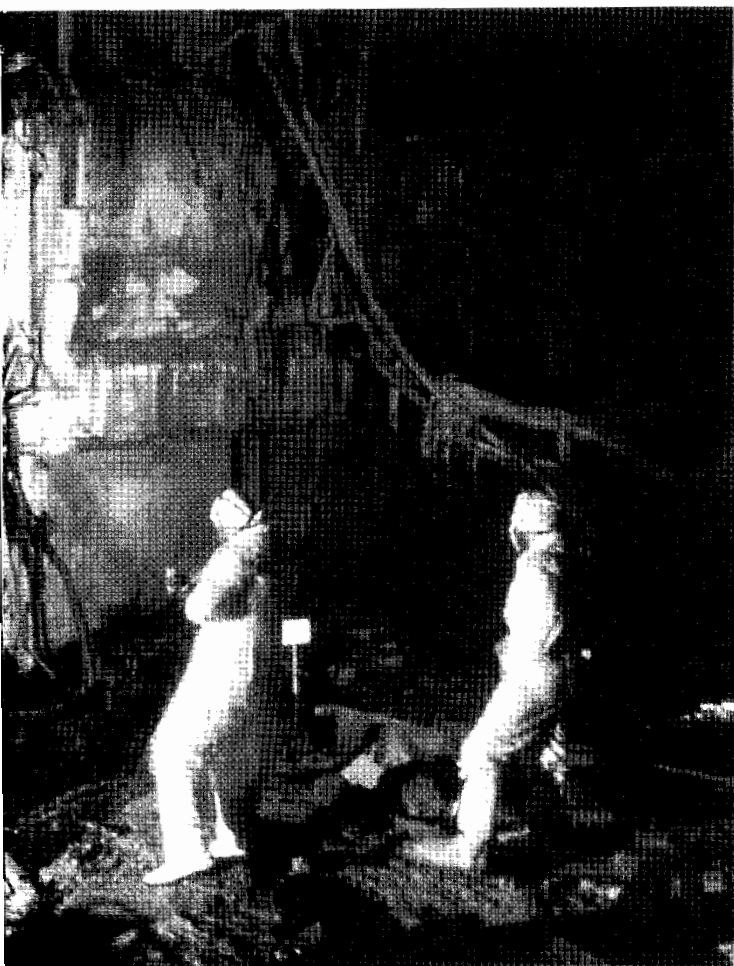
the Chernobyl accident, however, led to the collection and release of many data. The models I saw were running on actual data, a welcome break with the past and more motivating for everyone concerned.

THE HUGE CONCRETE sarcophagus encasing the damaged Chernobyl reactor stands amid the beet fields and the mud and marshes of the Ukraine. The gloomy drama of the scene is heightened in December; certainly the winter landscape is nothing like the golden wheat fields in the warm Ukrainian summer. The area around Chernobyl has the ecological appeal of flat wetlands, the low, quiet mystery of marshes. But it is not a wealthy agricultural region or a spectacular, panoramic landscape. Although grains grow, the impression to an American is more like rural Maine than the expanse of Kansas or Iowa. Poor, now abandoned villages look much as they did 100 years ago, except that electricity runs to them, and the main road is paved. The larger towns feature the typical eastern bloc style of concrete buildings, six, eight or ten stories tall, built shabbily and without ornament. And in the evacuated zone the buildings are cracking and crumbling, reverting to nature in a weedy, uneven way. At times Chernobyl evokes the 1959 film of Neville Shute's novel *On the Beach*: it has the look and feel of desolation after nuclear war, without the blast damage.

Once some 125,000 people lived in the main restricted zone around the four reactors of the Chernobyl power station. Some subsidiary zones in Byelorussia and in the Russian Republic are also restricted. The main restricted zone extends roughly to a thirty-kilometer radius around the damaged plant and, it is estimated, will require special management for 100 to 150 years. At the restricted zone, a two-hour drive north of Kiev, visitors are stopped by a roadblock, where they must transfer into cars used only in the contaminated area. My colleague from Kiev and I were given a car for the day, a large black limousine that reportedly had belonged to former Soviet Prime Minister Nikolai Ryzhkov. Several months before my visit Ryzhkov had been down to tour the site and evidently had not been warned that once he drove around the area, the car would be contaminated and its use restricted to the site. So the Pripyat Research Industrial Association, which now manages decontamination and research at the site, has one more property besides the sarcophagus.

PRIA was established after intense turf battles among several organizations. All told, perhaps 100 bodies have participated in the cleanup, the most important of which are the Ministry of Atomic Energy and the Ministry of Machine Building, which are responsible for building and operating reactors in the Soviet Union; the military, which had much of the emergency-response capability, including helicopters, trucks, earth movers and personnel; the Hydrometeorological Service, which had information about where the radiation was going; and the U.S.S.R. Academy of Sciences, which had expertise in materials, health and other matters. Also, immediately after the accident, some special commissions were set up to investigate and advise on various issues.

Apparently chaos ensued. But out of it came the Kombinats, which operates the three enormous 1,000-megawatt reactors that continue to generate electricity at Chernobyl; and PRIA, which had 6,000 employees and some 350 mil-



Victoria Ivleva, Reactor Hall, 20 Meters from Reactor, 1991

lion rubles in 1991, a large organization for environmental cleanup even on the Soviet scale. PRIA points to the first of several lessons I drew from Chernobyl: In the event of a major catastrophe it is unlikely that government, industry or existing organizations will have the competence or the credibility to do what is necessary. A third party is needed to clean up, foster settlements and resolve technical disagreements. The Soviets took three years or so to work out the structure of PRIA. I was impressed with the seriousness and dedication of the people involved in that organization and, more important, PRIA seems satisfactory to all the parties concerned.

PRIA HAS ITS headquarters in the town of Chernobyl, about ten kilometers from the reactor itself. After briefings there by specialists in decontamination, my colleagues and I visited several places in the central restricted zone. First we changed into blue cotton trousers, shirts and jackets as well as green coats and hats that would be collected on our departure. No masks or special gear are required for routine work on the site. The uniforms, in addition to minimizing contamination carried out of the zone, do impart a feeling of safety and solidarity. My own measured radiation exposure for the day, incidentally, was substantially less than what one gets during a chest X ray.

Every part of the restricted zone seemed open to visit. The reactor is impressive for its scale, massive in absolute terms as well as in relation to the surrounding low woods, flatlands and water. We saw the so-called Red Forest, the most damaged ecological zone, as well as several of some 600 temporary waste disposals—shallow trenches dug for storing soils, trees, cars, almost any contaminated objects that needed to be “localized” in the site. And we went to the abandoned city of Pripyat, where the movie theater, restaurants, shops and amusement park, complete with bumper cars and Ferris wheel, are decaying, empty and still. The only signs of human presence are an occasional truck passing through, small and hurriedly built booths to monitor radiation and classical music playing over loudspeakers on the main streets.

The second lesson I draw from my visit is that it is difficult to imagine practical preparation for an accident as serious as the one at Chernobyl. How can one prepare to remove, contain and bury the topsoil from areas extending over hundreds of square kilometers? PRIA estimates that it has moved a million cubic meters of soil. It is hard to envision a plan in the U.S. to scrape up that much earth or to dig 600 trenches. The very act of preparing and publishing a map that would show where 600 trenches would be placed on Long Island or in the Sacramento Valley would almost certainly foreclose the possibility of siting or operating a nuclear plant.

Replacing the water supply is also a huge job. After the Chernobyl accident pulses of radioactive species of several elements, especially cesium 137 and strontium 90, washed down through the entire Dnieper basin, from which tens of millions of people draw their drinking water. Hundreds of artesian wells were drilled, and the water problems continue nonetheless. Equally daunting is the task of recruiting and retaining the many skilled workers needed; altogether, some 600,000 people have participated in the Chernobyl cleanup. I came away from Chernobyl

thinking that the evacuation and other contingency planning now under debate in the U.S. is simply not meaningful. No such measures are likely to encompass the scope of what would need to be done in the event of an accident as serious as the one at Chernobyl. How can you prepare to think about decontaminating every structure in a 2,000-square-kilometer zone? My conclusion is not to abandon emergency preparedness but to concentrate on engineering systems in which the maximum conceivable nuclear accidents do not approach the dimensions of Chernobyl.

Another lesson I took away from Chernobyl concerns longevity. Organizations need to last, both for the safe operation of nuclear reactors and to deal with wastes, accidents and their consequences. How does one design enterprises to operate reliably and robustly for generations and longer? PRIA still faces a massive decontamination job for several more years to handle obvious, acute problems—and then, if it survives, it must turn to chronic, lesser problems and, no doubt, to surprises. A looming question is whether to replace or strengthen the sarcophagus around the damaged reactor in perhaps another twenty years. The sarcophagus was built in haste, and now its walls have begun in places to turn brittle and crack.

How must organizations be designed to perform such tasks amid the breakdown of government? Americans have had the same political system since 1790 and take stable governance for granted. A handful of countries can say the same: Switzerland, Sweden (allowing for the separation of Norway), the United Kingdom (allowing for the Irish troubles) and perhaps a few others. Experts have speculated at length about improbable threats to nuclear reactors, such as earthquakes and terrorism. Those factors are less serious, it seems, than normal political and economic threats. Looking back over the past 100 years, the area encompassed by the Soviet Union has suffered two world wars, a civil war in the Ukraine during the 1920s and two or three great depressions. How can one build and maintain organizations that will endure competently through long periods of economic and political fluctuations that take place in virtually all parts of the world? Suppose Moscow collapses and there is a lapse or decline in the money going to Chernobyl. If the 350 million rubles is not there for 1992 or 1993, what is to be done?

THE INITIAL RESPONSE to the Chernobyl accident was the heroism, communitarian behavior and sacrifice characteristic of many disasters. Now that some years have gone by, the pendulum is swinging, and one hears recriminations and accusations, which are tied to the national political and economic climate as well as to shortcomings of PRIA and other responsible groups. In the Ukraine and elsewhere in the U.S.S.R. there is a strong local desire to find people to blame for everything that is wrong, and the most convenient targets are the people from Moscow. There is an effort to move the management of the Chernobyl site from Moscow, where it is still headquartered, down to Kiev. The Ukrainian nationalists have a slogan, “no inch of soil to Moscow,” which is commonly written as graffiti. But for Chernobyl what local responsibility is appropriate? Are decontamination and protection of the site not all-union or even global responsibilities?

It is expected that for the next few years the major eco-

logical consequence of Chernobyl will continue to be that of radioactive materials in the soils near the plant. As I mentioned earlier, the area is wet, the soils are sandy and porous and the basin holds numerous large reservoirs and rivers. It was considered a good site for a power center partly because of the availability of cooling water. In the spring the ground thaws, the snow melts and the water floods into the Pripjat River and down into the Dnieper, carrying contaminants with it. Debates go on about whether building underwater dams on the bottom of the reservoirs and the rivers will stop the sediments, but whether proposals of that kind will improve matters is unclear.

Chronic as well as acute problems are being monitored. Every ache and pain in the Ukraine is now attributed to Chernobyl. For example, several hundred kilometers away, in the city of Chernowitz, some 200 children reportedly began losing their hair a couple of years back, and the loss was blamed on Chernobyl. It might have been associated with the accident or with other, possibly local factors. PRIA, the Ukrainian Academy of Sciences and others are trying to sustain research to examine health and environmental consequences of the accident.

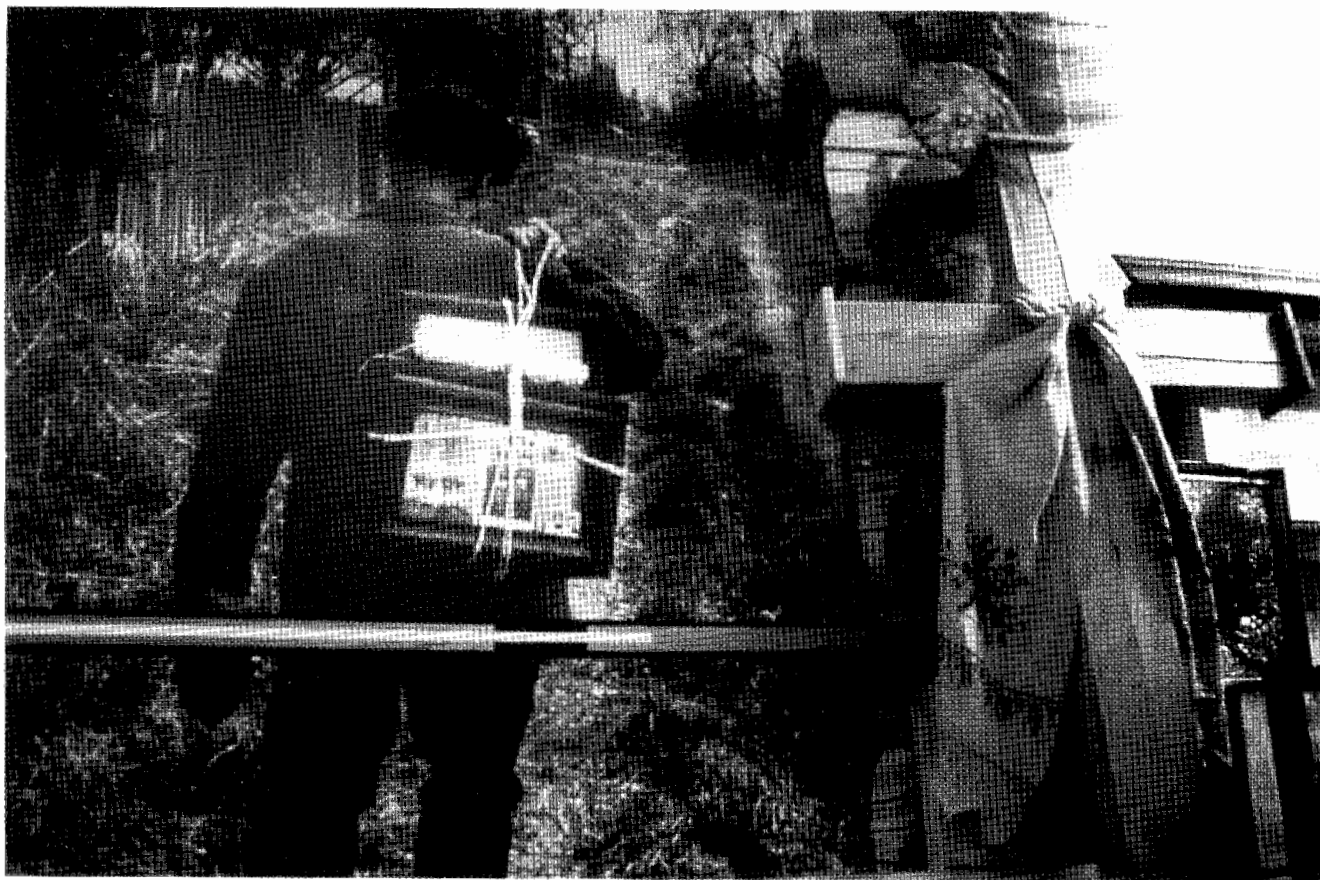
THE EXISTENCE OF such cooperative research ventures leads to the fourth lesson of Chernobyl: that Chernobyl should be turned into an international laboratory, a world heritage site. Governments have accepted the designation of world heritage sites such as the Pyramids of Egypt and biospheric reserves such as the Everglades in Florida. Chernobyl is as

significant an environmental site as exists on the planet. In that sense it does belong to everyone.

PRIA has taken the first steps to set up an international research center, by establishing agreements with the International Atomic Energy Agency. Officials of PRIA reiterate that they no longer need approval from Moscow to invite people and to allow certain kinds of research. The organization wants direct ties with individual scientists and with other organizations around the world. Since such research on sites in the U.S.S.R. has been difficult or impossible for foreign scientists until recently, the new opportunity may be a valuable one. International arrangements have become customary for astronomical observatories and atom smashers. The arrangements for governance, funding and access to the site are worthy of much discussion, and they could well serve as a model for research on technological hazards.

Finally, it must be remembered that the society trying to decontaminate Chernobyl is also trying to learn how to build cars, fix leaky pipes, publish independent newspapers and operate a pluralistic political system. It is a leap. I recall one moment that gave me a sudden, intuitive grasp of the challenge of Chernobyl amid and after perestroika. Trying to relate to the foreign visitor, a Ukrainian villager inquired in simple and striking fashion, "Do you have mud in America?" ●

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Gueorgui Pinkhassov, Zaitomir Oblast, Museum for Victims of Chernobyl, 1991