

salesman-performer, better known for his work on television than at a factory's design board.

Phillips, moreover, has his prior accomplishments blocking his way. Who is going to make the case against the new economic royalists? The carriers of the bad news are those very "Big Media" Phillips worked to discredit in his Nixon-Agnew days (and in his 1975

book, *Mediacracy*). Reregulating the malefactors of great wealth would involve use of governmental instruments he subjected to ridicule. A Democratic resurgence is hard to imagine after the reduction of the parties' ideological content that Nixon (not to mention Wallace) stood for.

Phillips has shown signs of mellowing over the years. He called for the healing

of national divisions in *Post-Conservative America* (1982) and for a bipartisan industrial policy in *Staying On Top* (1984). Now, baffled by his lack of success in that gentler mode, he has returned to Erle's vein, preaching a new politics of grievance, this time on the Democrats' side. It would be ironic if the master of knowing who should hate whom finds hatred lacking when we

need it most. A nation that cannot get angry at its official betrayers has lost a resource more important than any trade advantage. Without intending it, Phillips may just have described in this new book his citizens' limitless horn-swogglability. On the other hand, strange things are still possible in a world that sees Kevin Phillips advancing Jesse Jackson's program. □

# The Catastrophe and After

David Holloway

**The Legacy of Chernobyl**  
by Zhores A. Medvedev.  
Norton, 352 pp., \$24.95

The worst nuclear accident ever to take place began with a safety test. At 1:23 AM on Saturday, April 26, 1986, the operator of Reactor No. 4 at the Chernobyl nuclear power station started an experiment to see how long a spinning turbine could provide electricity in the event of a loss of power to the plant. If the power supply failed, it would take more than thirty seconds for the backup generators to come into play. The purpose of the test was to see whether the turbine could provide enough power to pump cooling water over the uranium fuel until the emergency generators took over.

The test was to be conducted just before the reactor was shut down for routine maintenance. At midday on April 25 reactor power was reduced to about 50 percent. The next step was to reduce power to about 30 percent, but this was delayed until 11:10 that night because of unexpectedly high demand for electricity in the Kiev region. As a result, the test was conducted by the night shift which, unlike the day shift, had not been instructed in advance about it and was, besides, less experienced.

The test called for operating the reactor at 30 percent of power, so that if the test failed the first time it could be repeated. When permission was given to reduce power at 11:10 PM, the operator made a mistake in setting the controls, and power fell to 1 percent, too low for the experiment. This caused a buildup of xenon in the uranium fuel and threatened to shut down the reactor completely.

In order to prevent this, the operator pulled out almost all the control rods, bringing the reactor up to about 7 percent of power. This was very dangerous, because some of the control rods are used for emergency shutdown. The reactor was now unstable: the xenon buildup was acting as a brake, pushing the reactor toward shutdown, while the operator was trying to drive up the power by removing the control rods. An automatic system should have shut down the reactor at this point, but the operator wanted to ensure that the test could be carried out, and he therefore blocked a number of the emergency shutdown signals.

At 1:23:04 AM the test began. The turbine was disconnected and its energy was fed to four of the eight main pumps. As the turbine slowed down, so too did the pumps and the flow of cooling water

over the fuel elements. Power began to rise, and at 1:23:40 the operator pressed the button for an immediate shutdown of the reactor. The shutdown rods moved down too slowly to prevent a runaway increase in power (and they may even have contributed to it, because of faulty design).<sup>1</sup> In any event, power rose to about one hundred times its normal full level within four seconds. The fuel disintegrated and caused a rapid boiling of the cooling water.

At 1:24, twenty seconds after the emergency shutdown button had been

pressed, a steam explosion destroyed the roof of the reactor building; two or three seconds later another explosion threw out lumps of uranium and graphite, starting fires on the roof of the turbine hall. The firemen who soon arrived extinguished these by 5 AM, but many of the firefighters died shortly afterward from exposure to radiation. The explosions released millions of curies of radioactive particles into the atmosphere, and the reactor continued to spew out radioactive materials over the next ten days. A graphite fire in the reactor core drew in air, which reacted with the uranium fuel and caused it to release radioactive particles. The local population was evacuated on Sunday, April 27; and everyone except emergency workers was later excluded from a zone within a radius of thirty kilometers.



Chernobyl, 1990

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<sup>1</sup>Victor G. Snell, "The Cause of the Chernobyl Accident," in David R. Marples, ed., *The Social Impact of the Chernobyl Disaster* (St. Martin's, 1988), p. 16. Snell provides a particularly clear summary of the sequence of events that led to the accident, and I have drawn on it here.

was poured into them in order to freeze the ground.

The emission of radioactive materials from the reactor core dropped sharply, from about eight million curies on May 4 to 150,000 on May 5. The "battle of Chernobyl," as the Soviet press called it, was now over, but the consequences of the accident will be with us for many years to come. The radioactive materials emitted only on May 5 were still more than the total release of radioactive particles in either the Windscale accident in Britain in 1957, or in the Three Mile Island accident in 1979. Only in October, when the reactor was finally entombed in a special "sarcophagus" of reinforced concrete, did it stop contaminating the environment.

The consequences of the accident for public health remain a matter of controversy. The official figure for the number of deaths is thirty-one, but the figure of three hundred has recently been mentioned in the Soviet press. Large areas of the countryside in the Ukraine and Byelorussia received heavy doses of radioactive fallout, with the result that

many people have eaten contaminated food. About 600,000 people received significant exposure to radiation. The radioactive cloud spread across the whole of Europe. Estimates of the number of cancer deaths that may result from the Chernobyl accident range from 10,000 to 100,000.

Most accounts of the Chernobyl accident have explained it as a consequence of human error and faulty reactor design. The director of the power station and other senior managers have been tried for criminal negligence and sentenced to prison. The Soviet government has tightened safety regulations and improved the training of plant operators. It has also acknowledged that the design of the Chernobyl-type reactor, which is one of two main types in use in the USSR, is flawed. It immediately improved the emergency shutdown mechanism in existing reactors, and in 1988 decided not to build any more plants of this type.

The importance of human error in causing the accident cannot be denied; nor can the contribution of design faults in the reactor. But this explanation, while correct as far as it goes, is not ultimately satisfying: we still need to ask why the operators behaved as they did, and why the reactors were poorly designed. In *The Legacy of Chernobyl* the Soviet biochemist Zhores Medvedev seeks the causes of the accident not in the failings of individual men, but rather in the social structures in which they worked.

In the 1960s Medvedev wrote a study of the destruction of Soviet genetics that brought him into conflict with the Soviet authorities.<sup>2</sup> He was later forced into emigration when he was deprived of his Soviet citizenship during a visit to Britain. During the late 1970s he drew the attention of Western public opinion to the large nuclear accident in the Urals. When officials in the British nuclear industry questioned whether there had been any such accident, Medvedev wrote a book, *Nuclear Disaster in the Urals*, which proved that a major accident had indeed taken place in the late 1950s at Kyshtym, the site of a secret installation for the production of plutonium.<sup>3</sup> Medvedev's new book is a worthy successor to his earlier works, and provides a clear and well-informed analysis not only of the causes of the Cher-

<sup>2</sup>See David Joravsky's review of Medvedev's *The Rise and Fall of T. D. Lyсенko*, in *The New York Review* (January 29, 1970).

<sup>3</sup>Zhores A. Medvedev, *Nuclear Disaster in the Urals* (Norton, 1979).

nobyl accident, but also of its consequences for public health and the environment in the Soviet Union and the world. Medvedev uses evidence not only from official Soviet reports but from the many accounts of the disaster that have appeared in the Soviet press as well as in the West.

Medvedev argues that the Chernobyl accident can be understood only as an example of the *modus operandi* of Soviet bureaucracy. It was revealed at the trial of senior managers in 1987 that the power station director had signed a document in December 1983 certifying that the reactor, presumably including its safety systems, was in proper order, even though the safety systems had not been properly tested. Medvedev suggests that the safety test planned for April 1986 was one that should have been carried out before the reactor was certified. That might help to explain why the operators felt under pressure to perform the test, especially since the next reactor shutdown was not scheduled to take place for another year.

This is certainly a plausible argument. In the Soviet system targets are set at the top and pressure is exerted on those below to meet them. Those who meet the targets are rewarded, those who fail are punished. Although it has often been effective in a crude and brutal fashion, this system—the “command-administrative system,” as it has become known—encourages people to take shortcuts and to report false information to their superiors.

In one of the best Soviet accounts of Chernobyl, Grigorii Medvedev (no relation to Zhores) describes an exchange between Boris Shcherbina, the deputy premier with responsibility for energy,

and R.G. Khenokh, director of the Zaporozhe nuclear power station, which took place at a meeting in the Kremlin two months before the Chernobyl accident. When Khenokh said that one of the units at his power station would not be ready in time because of delays in the delivery of equipment, Shcherbina exploded: “You see, what a hero! He sets his own deadlines.” And then he shouted, “Who gave you the right, comrade Khenokh, to establish your own deadlines in place of the government’s?” After the meeting, Khenokh remarked sadly to Medvedev, “We ourselves tell lies and teach our subordinates to lie. A lie even with a noble purpose is still a lie. And no good will come of it.”

This attitude at the top naturally affected attitudes lower down in the hierarchy. Zhores Medvedev quotes one of the day-shift operators at Chernobyl who explained that, under the same circumstances, he too might have violated regulations, as the night-shift operator had done:

Why? Let me try to explain....

Firstly, we often don't see the need to observe our laws to the letter because these laws are broken all around us before our eyes—and quite often!... Can it really be that the Government Commission that accepted block 4 as ready for operation did not know that it was accepting it incomplete? Of course they knew.... If you look more deeply, then the accident started not at 1.23 on 26 April 1986, but in December 1983, when the director of the AES, Bryukhanov, put his

\*Grigorii Medvedev, *Chernobyl'skaia Khronika* (Moscow: Sovremennik, 1989), p. 23.

signature on the document of the Government Commission... without seeing the necessity of insisting that the run-down unit of the turbo-generator was tested.... And our Moscow comrades needed that run-down unit even less. They said, “The fourth block has been put into operation and will go into the report for this year. That's good.”

Seen in this light, the Chernobyl accident is an indictment not only of individual plant operators, but also of the Soviet bureaucratic system.

Secrecy is characteristic of Soviet administration as a whole, but it has been especially pervasive in the nuclear power industry, which had its origins in, and still has links to, the nuclear weapons program. The Soviet nuclear industry before Chernobyl was extremely sensitive to any public criticism of nuclear power, and unwilling to admit either that accidents had taken place, or that they were even conceivable. When Peter Kapitsa wrote an article in 1976 warning in general terms of the possibility of catastrophic accidents at nuclear power plants, the editor of the popular science journal to which he submitted it rejected it with the words, “Why frighten people?” Anatolii Aleksandrov, the president of the Academy of Sciences and a major architect of the nuclear power program, told Kapitsa that “such accidents can't happen here.”

Secrecy had harmful consequences within the industry. According to Grigorii Medvedev, it became common prac-

\*P. L. Kapitsa, *Pis'ma o nauke* (Moscow: Moskovskii rabochii, 1989), pp. 361-362.

tice to hide accidents not only from public opinion and the government, but also from the power station workers themselves. And this, he writes, is “especially dangerous because the absence of openness (*glasnost*) about negative experience is always fraught with unpredictable consequences. It breeds carelessness and thoughtlessness.” The people within the nuclear industry who tried to draw attention to safety problems or to faults in the design of the Chernobyl-type reactor were ignored, and until recently any attempt to take specific issues to the public would have landed the whistleblower in jail.

Secrecy reinforced the harmful effects of pressure to meet the targets set at the top. “Operators and local engineers,” Zhores Medvedev writes,

concealed small mishaps from their superiors. Often they were not even recorded in the operational log books. More serious accidents and shutdowns were covered up by nuclear plant administrators, because their bonuses and rewards depended upon good records. Construction and design faults were covered by the ministerial and atomic energy bureaucracies, which had vested interests in the good image of the nuclear industry. Really major accidents, like the Kyshtym nuclear disaster in the Urals in 1957, which led to a contaminated exclusion zone as large as that of Chernobyl, the fire at the Beloyarsk station in 1979 or the 1983 *Atomnash* accident, were concealed by the government.

\*Grigorii Medvedev, *Chernobyl'skaia Khronika*, p. 20.

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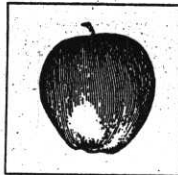
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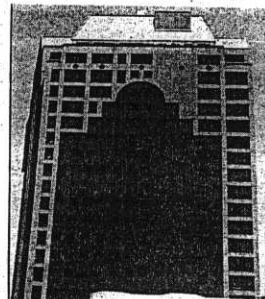
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If previous accidents had been investigated and studied, Medvedev argues, the Chernobyl disaster might not have happened. Managers and operators would not have been so complacent or so careless about safety. "The Chernobyl disaster," he writes, "was born of secrecy and the habit of covering up unpleasant news."

An analysis of the bureaucratic system does not by itself explain individual accidents; the specific chain of events at Chernobyl still has to be taken into account. But the bureaucratic analysis helps to explain why the Chernobyl operators behaved as they did. It leads one also to ask whether there were many other accidents, given the way the administrative system operated. Medvedev explores the evidence of other nuclear accidents, but this is not very extensive. Since the system covers things up, it deprives us of evidence about the accidents that Medvedev's analysis suggests must have taken place. The picture is thus incomplete, and will remain so until the Soviet nuclear industry becomes more open and provides a fuller picture of its safety record. Only when we have better data will it be possible to carry out systematic comparative studies of nuclear accidents and their causes in different societies. An analysis of the Soviet bureaucracy does not, after all, explain why nuclear accidents occur in countries other than the Soviet Union. Nor does it explain why the nuclear power industry in the West has also been secretive.

Secrecy and cover-up were the instinctive reaction of the Soviet authorities to the Chernobyl accident. It was only after prodding by the Swedish government, which had analyzed the radioactive cloud passing over its country, that the Soviet Union issued its first statement, sixty-eight hours after the event. The news broadcast from Moscow at 9 o'clock on Monday evening, April 28, announced that an accident had taken place, and that "measures are being taken to eliminate the consequences of the accident." Satellite pictures of the burning reactor appeared on television screens throughout the world. The Soviet authorities could not cover up this accident, and glasnost received a powerful impetus as a result.

The Soviet authorities have been very much more open about the Chernobyl accident than they were about earlier nuclear accidents, or indeed about accidents in general.<sup>1</sup> (It was only last year, for example, that they even acknowledged that the Kyshtym accident had taken place.) At a meeting organized by the International Atomic Energy Agency (IAEA) in Vienna in August 1986 the Soviet delegation provided a detailed, though not complete, account of what had happened at Chernobyl. The IAEA is to play a supervisory role in the Center for International Research, which is now being set up at the site of the accident.<sup>2</sup>

Soviet policy has been disappointing, however, when measured not against the appalling practices of the past, but against the standards to be hoped for today. Land has been cultivated that by international standards would have been considered too contaminated for food production. As Medvedev comments: "Whatever was saved in the agricultural economy will be lost in future health bills." An All-Union Center for

<sup>1</sup>See James E. Oberg, *Uncovering Soviet Disasters* (Random House, 1988).

<sup>2</sup>David Marples, Radio Liberty, "A Retrospective of a Nuclear Accident," *Report on the USSR* (April 20, 1990), p. 10.

Radiation Medicine was set up in Kiev in October 1986 to monitor the effects of radiation on the population, but it has classified most of the information about the accident and issued only reassuring statements that have steadily lost credibility. While much research appears to have been done on the effects of the accident on health, very little has been published. The center has rejected offers of international collaboration, even though such research could be extremely useful in increasing our understanding of the long-term effects of low-level radiation.

More worrying is the fact that the Soviet authorities have not provided adequate information to the local population about radiation levels and their implications for public health. This reticence has caused great anxiety, and encouraged the spread of rumors and the attribution of every illness or birth defect to the Chernobyl accident. Far from calming public fears, this furtive approach to information—though intended no doubt to avoid causing panic—has increased public disquiet, which has found expression in the press and in election campaigns. The consequences of the accident were an important issue in the Ukraine and in Byelorussia in the March 1989 elections to the Congress of People's Deputies. Although the Party-state bureaucracy has clung to old habits, Gorbachev's reforms have at last created channels through which society can make its opinions public.

On April 25, the fourth anniversary of Chernobyl, the USSR Supreme Soviet adopted a decree approving a government program to "eliminate the consequences" of the accident.<sup>3</sup> This decree is very critical of the policy that has been pursued so far, and notes that in the contaminated regions an "extremely tense socio-political situation has arisen." This is a result, it says, of the contradictory recommendations given by specialists and of delays in implementing necessary cleanup measures. Part of the population has "lost trust in the local and central organs of power."

The program approved by the Supreme Soviet provides for further resettlement of people living in contaminated areas, improved medical aid to those affected by radiation, better supplies of uncontaminated food for the affected regions, and more social services, especially for children and for the elderly. Foreign specialists are to be involved in working on the details of the program, which is to be fully drawn up by the end of the year. The Supreme Soviet has also instructed the Council of Ministers to draft a law on the use of atomic energy and nuclear safety, and to present this for discussion at the autumn session of the Supreme Soviet. Whether this decree marks a turning point in Soviet policy remains to be seen, but it does show a clear recognition of the need to take account of public opinion in dealing with the consequences of the Chernobyl disaster.

Just as the number of deaths caused by the Chernobyl accident will not be apparent for many years, so the political consequences too are taking years to unfold. The scale and cost of the accident are much greater than was at first acknowledged by the Soviet authorities. Approximately 11 billion rubles are reported to have been spent on the clean-

<sup>3</sup>*Postanovlenie verkhovogo soveta SSSR* (Decree of the Supreme Soviet of the USSR), *Pravda* (April 28, 1990), p. 1.

up operation so far, and the new government program will cost 16 billion. These two sums together would pay for the construction of fifty-four reactors of the Chernobyl type. The accident, therefore, has probably cost more than the entire Soviet nuclear power program, even if one leaves aside the human suffering.

Some years ago there was a widespread view in the West that the Chernobyl accident would set back nuclear power in the Western democracies, where public opinion had some influence, but leave untouched the ambitious nuclear plans of the Soviet Union, where public opinion carried no weight. But in fact Chernobyl has given the environmental movement in the Soviet Union an enormous impetus and has led to the scaling back of plans for nuclear power. Not only has a decision been taken not to build new reactors of the Chernobyl type, but other plants have been delayed or cancelled because of popular concern about safety.

Moreover, the Soviet environmental movement is even putting pressure on the nuclear weapons program. The "Nevada-Semipalatinsk" movement, which is based in Semipalatinsk near the main Soviet nuclear weapons test site, has protested about the level of radiation in the area, and about the damage that years of nuclear testing have done to public health. There is now a real possibility that all testing will be halted at the site. When it became clear, however, that testing might be transferred to Novaya Zemlya, an island in the Arctic Ocean where some nuclear tests have been carried out, a group was formed there to prevent that from happening.

The growth of the environmental movement in the Soviet Union is one of the clearest indications of the emergence of an autonomous civil society from the shackles of a totalitarian state. The first signs of such a civil society were provided in the 1960s and 1970s by campaigns to stop the pollution of Lake Baikal and to halt plans to divert water from Russia's northern rivers, which flow into the Arctic Ocean, southwards to the Aral and Caspian Seas. Writers and scientists came together to oppose reckless and grandiose state projects. Under Brezhnev these campaigns had to be conducted with circumspection, but glasnost has made it possible to mobilize public opinion on these issues. Cutting down the forests around Lake Baikal has been banned and cellulose production there is to be phased out; and the river diversion project has been halted, though not yet finally cancelled.

By giving a new impetus to the environmental movement, Chernobyl has thus helped to strengthen civil society in its efforts to influence and control the actions of a powerful state. It has also shown that technocratic rule would not be much of an improvement over Party rule. One of the consequences of Chernobyl has been an erosion of what had seemed to be an almost unshakable belief among educated Soviet citizens that science and technology were good things. Chernobyl has helped to inspire a distrust of political authority, which has rubbed off on scientists and experts more generally. Chernobyl must be seen, therefore, not only as a technological disaster and a human tragedy, but also as an important event in the political evolution of Soviet society. Zhores Medvedev has provided a clear and accessible guide to all of these aspects of the Chernobyl nuclear accident. □