

SOVIET SCIENTISTS TELL IT LIKE IT IS, URGING REFORMS OF RESEARCH INSTITUTES

A specter is haunting the Soviet Union—the modernization of virtually every part of Soviet society. The Russian catchword for this is *perestroika*, which translates as “restructuring” or “reform.” The concept has been described in recent books and statements by General Secretary Mikhail S. Gorbachev and by his favorite economist, Abel G. Aganbegyan, who is director of the economics section of the Soviet Academy of Sciences. Its implications for science and technology in the Soviet Union, observes Loren Graham, a longtime MIT history of science professor, “are as sweeping as anything undertaken by Peter the Great or Lenin. Like those historic figures, Gorbachev hungers to improve the country’s science and technology. All of them realized that if significant advances weren’t made, the country would be left permanently behind.”

Gorbachev’s program, which combines *perestroika* with *glasnost*, or “openness,” already has gone further than the revisions another Soviet leader, Nikita Khrushchev, tried to introduce 30 years ago. But in the Soviet Union, says Vitaly Korotych, editor of the weekly magazine *Ogonyok*, “reform is more difficult than revolution. We are struggling against the people who stole yesterday.”

If Korotych meant to include science in his criticism, he is only partly right. Signs of *glasnost* are appearing in Soviet science, though some of the scientific mandarins publicly proclaim that the troubles are so pervasive that only total *perestroika* can make a difference. In an effort to set a salutary example Roald Z. Sagdeev, director of the Soviet Space Research Institute and an adviser to Gorbachev on space matters, assembled some 800 scientists and others interested in space issues, about half from outside the Soviet Union, to attend a forum in Moscow last October on future research projects, in observance of the 30th anniversary of the first Sputnik. The conference marked the entry of Soviet science into a bold new era, as secrecy was

swept aside in the interest of furthering international collaboration (PHYSICS TODAY, February 1988, page 69).

Pride and prestige

The event, planned and promoted by Sagdeev, a plasma physicist who is highly regarded in Western scientific circles, celebrated a field in which the Soviet Union can rightly claim both pride and prestige. It also enabled Western scientists to hobnob with their counterparts in the fields in which Soviet scientists excel—physics and mathematics. In the circumstance, it allowed the Soviets to flourish *perestroika* and *glasnost*. As host, Sagdeev eased the way for foreign participants to visit some research institutes that had been closed heretofore to non-Soviets, some ostensibly for reasons of military security.

Indeed, since Gorbachev and President Reagan signed the INF Treaty last December and met amid great amity at the Moscow summit in June (PHYSICS TODAY, July, page 47), there has been some progress in reducing military secrecy between the Soviet Union and Western nations and in lifting a few restrictions on emigration for Soviet scientists whose work had once contributed or could still add to military systems. Soviet and US teams of inspectors are now observing the dismantling and destruction of intermediate-range nuclear missiles. In addition a group of Soviet scientists was allowed an unprecedented glimpse of the US nuclear weapons program on 17 August when they monitored the explosion of a thermonuclear device, possessing a force roughly equivalent to 150 000 tons of TNT, in a hole 2020 feet deep at the US test site near Mercury, Nevada. The experiment, culminating years of fractious negotiations between the US and the Soviet Union, is the first of two underground tests that are preliminary to reaching agreement on a top priority in nuclear testing: the development of methods to verify two arms control treaties signed in 1974 and 1976, which the two nations have pledged to observe but have



Roald Sagdeev: Pushing perestroika

never ratified. This month US scientists will take part in the second test, using a different detection technique, in the Semipalatinsk region of the Soviet Union.

Another sign of change is that some prominent refusenik scientists, including Aleksandr Lerner, Aleksandr Ioffe and Irina and Viktor Brailovsky, have been granted permission to leave the country—though Gorbachev has stated publicly that decisions on emigration would be made on a case-by-case basis and that an across-the-board new policy is not contemplated.

To be sure, changes within the Soviet scientific establishment are slow. For instance, the Soviet Academy of Sciences decided last year to adopt some modest reforms, including requiring academicians to retire from administrative positions at its research institutes upon reaching the age of 70. The academy operates more than 250 institutes, which are staffed by about 200 000 scientists and technicians. But when push came to shove during the Soviet Academy’s election process in December, the compulsory retirement rule was postponed until 1990 and another new rule—that nominees to fill the vacancies among the fixed number of

250 academicians must be no older than 60—was disregarded. The new age limits were designed to force out the old fogies, some of whom had been appointed as political favors, with little regard for scientific accomplishment. Under the academy's *perestroika* principles, not only would youth be served but lab directors would be elected by scientists working at the institutes.

Quantum leap into commerce

"Few nations cherish science as much as Soviet Russia," says Loren Graham, "and few have as many practitioners who have earned the respect of colleagues around the world. The country has an enormous scientific enterprise, the largest in the world, yet the achievements are a curious mixture of success and failure. The enterprise can create lasers, tokomaks, nuclear weapons and space rockets that reliably send satellites into orbit, but it can't seem to do the same for commercial products that will satisfy consumers at home and buyers abroad. What the Soviets are trying to do is become the equal of the rest of the scientific and industrial world by taking a quantum leap."

Accordingly, say US observers of Soviet science such as MIT's Graham, the obvious aim of *perestroika* is to remove the heavy hand of the bureaucratic old guard, to "democratize" the scientific establishment and to restructure basic research by strengthening a diversity of disciplines and making these more relevant to industry. This is also the message delivered in Sagdeev's essay in the current *Issues in Science and Technology*, a quarterly journal published by the US National Academies of Sciences and of Engineering. In it, Sagdeev calls for breaking up many of the research institutes that he labels "bureaucratic dinosaurs" into smaller, more flexible and more responsive operations, declassifying much of the research that the Kremlin still considers militarily significant and relaxing restrictions on international scientific cooperation.

"During the past half century," writes Sagdeev, "Soviet science has suffered deep and still bleeding wounds from ill-conceived government policies. Today, although the Soviet Union has one of the world's largest scientific work forces, it has only a modest record of achievements and is contributing too little to the world's scientific knowledge. We ... have for years been castigating ourselves for our failure to apply fundamental research findings to improve industrial productivity. We

have revised policies to strengthen the connection between science and practice; but although such reforms may be necessary, we have not faced up to the real problem: Soviet fundamental science is too weak to contribute much to practical applications. ...

"The shortcomings of Soviet science are apparent from the subatomic world of physics to the boundless world of astronomy. Of the dozen fundamental elementary particles discovered by our generation, Soviet physics contributed none. ... As astronomy has opened new windows on our understanding of the origin and development of the universe, Soviet scientists have added little of value. In the biological sciences, the enduring influence of Trofim Lysenko's stubborn rejection of mainstream science severely damaged Soviet life science, and the consequences are felt even now."

These statements, harsh as they are, were only the beginning for Sagdeev. "For too long," his essay continues, "Soviet science has hidden its inadequacies behind official panegyrics to its success. In academic and political forums alike, exaggerated claims have been made for the achievements of Soviet science. Science has its own criteria for success, and Soviet achievements have not measured up to them."

Stifled and stultified

He dates the start of the Soviet scientific decline to World War II, when military needs forced a shift to "big science," with its requirements for expensive equipment and massive teams of researchers. With this shift came a bureaucracy, which Sagdeev argues has stifled and stultified Soviet science. He compares the current situation, in which the typical research institute has a staff of thousands, with the institutes of the 1920s and 1930s under Nikolai Semenov and Petr Kapitsa, who headed research teams of 100 to 200. (See Paul R. Josephson's article on page 54.) "Bureaucracy was minimal at these institutes," Sagdeev asserts. "The director had time to engage in research and to train students."

Among the consequences of the bureaucratization of science, Sagdeev claims, is "the erosion of scientific standards." He cites as a case history the physicists in Novosibirsk during the 1960s "who had to promise to achieve a specific amount of progress within a designated period." Although they recognized the absurdity of the exercise, he notes, they "pledged to make one discovery of worldwide importance, two discover-

ies of all-Union importance and three discoveries of Siberian importance to please political leaders at all levels. While a scientist would immediately see this as nonsense, political leaders can be comically obtuse to the unpredictability of science as well as to its inherently global nature."

So far, writes Sagdeev, *perestroika* has had only marginal effects on science. One reason, he contends, is the age of the research chiefs. "Practices in the rest of the world make it clear that the Soviet practice is not a model for good science. In France, research institute directors can serve no more than 12 years. In the Federal Republic of Germany, the Max Planck Society, which plays the same role as the USSR Academy of Sciences, has a system of collective leadership in which three or four codirectors rotate in and out of the executive director's responsibilities according to a planned schedule. The US has no formal tenure rules because none are necessary. US scientists have always moved frequently and first-rate scientific research is done at numerous national laboratories, institutes and universities throughout the country."

By contrast, the immobility of Soviet scientists is notorious, Sagdeev argues. His litany of complaints also includes mismanagement and myopia, which lead to scientists "scrambling feverishly to change already approved plans under the pressure of unforeseen circumstances" and to the underfunding of research in emerging fields. Thus, he states, Soviet scientists, lacking powerful computers and advanced equipment, "resemble soldiers attempting to fight a modern war with crossbows."

The article is no isolated accusation. That Soviet science is too often mediocre and mismanaged is now openly discussed in the USSR. Sagdeev's grievances appeared on 28 April in *Izvestiia*, where he lamented that Soviet science has "lost its momentum, surrendering its leadership in several fields and descending in some to the role of outsider." When he attended the annual meeting of the US Academy of Sciences in April, Sagdeev handed a copy of his *Izvestiia* article to Frank Press, the academy's president.

Time is pressing

The subject of scientific backwardness also was on the agenda at the special Communist Party conference called in Moscow at the end of June—the first such conclave since 1941. At it, Gorbachev told the 4991 delegates, "Time is pressing us, comrades, and this should be stated bluntly." In his

three-hour address at the conference, Gorbachev characterized the scientific enterprise as "the backbone of our economic development."

By way of consolidating Gorbachev's ambitious plans, the delegates adopted a revealing resolution. While *perestroika* is "already transforming the life of Soviet society," a key section of the resolution states, "severe problems" need to be solved: "The economic structure remains, on the whole, cost intensive. Scientific and technological progress is still slow. The plans for increasing the national income and productivity are not fulfilled. There is no noticeable improvement in product quality. The country's finances are in a bad state. Tensions exist between the supply of foodstuffs and consumer goods and the demand for these things. The housing problem remains acute."

"At all stages of public, state and economic activity there are many people who are unwilling or unable to abandon bureaucratic management methods. Many react painfully to everything new. They are frightened by the scope and depth of *perestroika* and would prefer to stop halfway and limit the revolutionary content of *perestroika* by half measures."

The words seem to come right out of Gorbachev's speech last year on the 70th anniversary of the October Revolution. Neither Gorbachev's address on that occasion nor the conference resolution sought to place blame on scientific research for the nation's economic failings, but both suggest the scientific system is mired in malaise, essentially because it is mismanaged from the top.

Thus one key paragraph of the resolution asserts that *perestroika* cannot be achieved "without invigorating in every way the intellectual and cultural potential of society, without advancing science and technology, without stimulating greater contributions by scientists, engineers and other technical workers, without raising their prestige and improving their working conditions and without elevating the entire educational system." To attain these ends the party favors "democratizing" the organization and management of Soviet science. One way is to "eliminate the vestiges of bureaucracy."

The resolution also calls for meeting the scientific community's urgent need for more and better research equipment and for loosening control on scientists so that they "can proceed with the high purpose of discovery of truth and understanding." At the same conference, Guri I. Marchuk, president of the USSR Academy of

Sciences, told delegates that Gorbachev's analysis of the problem "is absolutely correct." The All-Union Council of Ministers, Marchuk said, was examining proposals to substantially increase the funds for basic research over the next two years—a tacit acknowledgement that even though the Soviet Union has some world-class scientific institutes, the gap between Soviet and Western science is widening. "The fall in our proportional contributions to world science cannot fail to be alarming," said Marchuk. "The desire not to be isolated from world science is a no less important aim than holding on to the lead in a particular area."

Sharing science and technology

This inward look at Soviet science is pivotal for political and economic reasons. Dimitri K. Simes, a Sovietologist at the Carnegie Endowment for International Peace in Washington, points out that "worst-case preoccupations have proved a blessing to Gorbachev" because he believes these

will lead to opportunities to "correct the problems at home while encouraging the West, meaning the US in particular, to share its research from abroad." Before the US provides scientific and technological access, says William R. Graham, President Reagan's science adviser, "there must be something comparable given by the Soviets. We must be extremely cautious about exchange programs. We need to remember that the scientific shortcomings in the Soviet Union have a more serious effect on the military system than on its civilian economy."

Indeed, says another Carnegie Endowment senior analyst, Andrew Nagorski, Soviet science is compartmentalized, "so that military applications get first call and the civilian economy is left to rot. The Soviet Union is a military superpower, but not an economic superpower." It is somewhat ironic, he observes, that in order to save his science establishment, Gorbachev must first buck it.

—IRWIN GOODWIN

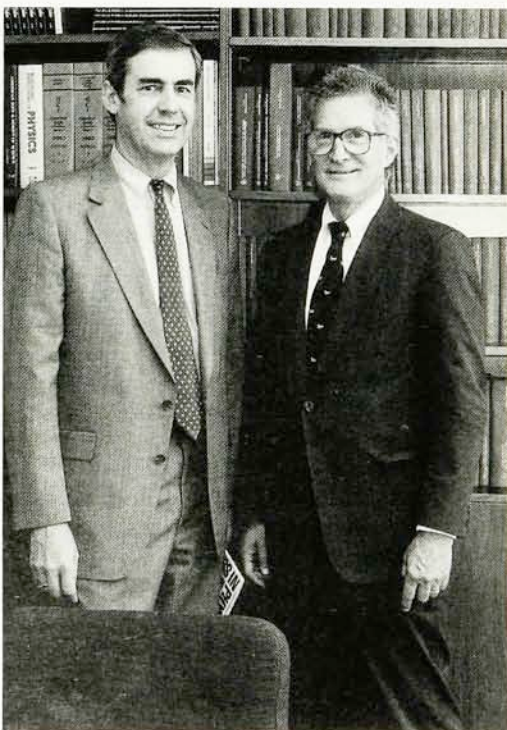
BAENSCH IS AIP'S NEW DIRECTOR OF PUBLISHING

Robert E. Baensch, a publishing executive who has held positions at Macmillan, Springer-Verlag, Harper & Row and McGraw-Hill, took office on 22 August as director of publishing for the American Institute of Physics. Baensch succeeds Robert Marks, who left AIP in April after 18 years as publishing director to join the American Chemical Society in Washington, DC, as director of publications.

At AIP Baensch will preside over the largest physics publishing operation in the United States. He will be responsible for Publishing Branch I, which produces the 6 archival journals owned by AIP, 19 translation journals and 10 journals AIP publishes for various member or affiliated societies, and Publishing Branch II, which produces 7 journals published by The American Physical Society. He also will oversee the book publishing program, the advertising and exhibits division, marketing, and *Computers in Physics*, the bimonthly magazine launched by AIP last year.

Baensch did his undergraduate work at Johns Hopkins University, earning his bachelor's degree in 1957, and he participated in the Stanford Executive Program at Stanford University's Graduate School of Business in 1980. He helps teach the professional publishing course at Stanford

and is a faculty member at New York University's Management Institute



Robert E. Baensch (left), AIP's new director of publishing, and AIP Executive Director Kenneth Ford.