

al Laboratory; John P. McTague, physical chemist, vice president for research at Ford Motor Co and former deputy director of OSTP, 1983-86; Daniel Nathans, geneticist, professor of molecular biology and genetics at The Johns Hopkins University Medical School; David Packard, electrical engineer, chairman of the board at Hewlett-Packard Co and former deputy secretary of defense, 1969-71, and Harold T. Shapiro, economist, president of Princeton University.

The committee is the first scientific advisory group since the President's Science Advisory Committee, known familiarly as PSAC, to report directly to the President. PSAC was created by President Eisenhower and advised principally on defense matters until 1973, when President Nixon scuttled his entire science advisory operation after the science adviser, Edward E. David Jr., and members of the committee publicly stated their disagreements with the Administration's plans to push ahead with an antiballistic missile system and a supersonic transport plane. Though the science adviser's job was restored by President Ford, the advisory committee didn't return until Reagan's first year—and then it was as the White House Science Council, reporting to the science adviser, George A. Keyworth II, not to the President.

An inner-circle meeting

The day after PCAST members were sworn in, Bush made good on his promise to meet with them. All 12 of them attended their first meeting at Camp David with the President, Bromley and a White House inner circle: John H. Sununu, Bush's chief

of staff, a former three-term governor of New Hampshire; David G. Darman, director of the White House Office of Management and Budget; Michael J. Boskin, chairman of the Council of Economic Advisers; and Michael R. Deland, chairman of the Council on Environmental Quality. Though invited to the meeting, Vice President Quayle was unable to attend because his helicopter was grounded by fog.

Considering the makeup of the officials and the committee, the discussion was not at all surprising. There was virtually no small talk. Three topics dominated the three-hour meeting: global climate change and its economic implications; education in science, mathematics and technology, particularly of workers in high-technology companies; and consequences for the nation's economic growth of R&D support by government and industry.

At least one topic of conversation anticipated Bush's speech on 5 February to the International Panel on Climate Change, organized by the United Nations Environmental Program. In it, Bush emphasized the need to balance environmental projects with economic policies, which he said "need not be contradictory." Bush acknowledged a "broad spectrum of views" on the issues and called for more accurate computer models of prospective climate changes. In committing the US to put up \$1 billion for new studies on global warming, he paraphrased a remark made during the PCAST session: "Where politics and opinion have outpaced the science, we are working to bridge the gap."

A few days after the speech, *The*

Washington Post reported that Sununu had edited out statements prepared at the request of William K. Reilly, administrator of the Environmental Protection Agency, on global warming issues. In a letter to Bush on 21 February, leaders of eight national environmental organizations protested Sununu's rewrite, complaining that the President had pledged to use "the White House effect" on "the greenhouse effect," but that his chief of staff had broken that promise. Sununu, a mechanical engineer with a DSc from MIT, has been skeptical of apocalyptic views by Earth scientists and government officials on environmental problems. In fact, Bush's address agreed with the predominant opinions on climate change and clean air expressed at the PCAST meeting. Members of PCAST sought to avoid "alarmist" views, favoring what one member termed "sound science and responsible economics."

But all was not sweetness and light at the meeting. Proving that he is possibly the most outspoken member of PCAST, as he was on the old White House Science Council, Packard questioned two science and technology items in Bush's budget for fiscal 1991. He asked for a "coherent explanation" of NASA's Space Station Freedom and a "rational budget" for both the space station and the Superconducting Super Collider. Discussion was cut short, and Bromley assured the panel that it would take up these issues in full at one of the future monthly meetings. Bromley proposes that some parts of each PCAST discussion be open to the public.

—IRWIN GOODWIN

DESPITE AUSTERITY UNDER PERESTROIKA, FUNDING OF SOVIET SCIENCE INCREASES

"Science is the only section of Soviet society that did not suffer from the government program of economic austerity," Guriy I. Marchuk, president of the Soviet Academy of Sciences, boasted during his hour-long informal talk on 30 January at the National Academy of Sciences in Washington. In 1989, he said, the Soviet Academy received an extra 500 million rubles (about \$820 million at the artificially fixed official exchange rate) on top of the 1.2 billion rubles (almost \$2 billion) it customarily gets each year. The extra funds were designated for technological innovations, which, as leaders in every industrialized society know,

are largely dependent on scientific research.

Among Mikhail S. Gorbachev's sweeping reforms under *perestroika* is the stimulation of a dynamic scientific-industrial complex. The Soviet Union possesses the world's largest scientific enterprise and endows its scientists with great respect, high pay and such privileges as big cars and vacation dachas. It was Peter the Great, at the turn of the 18th century, who sought to thrust Russia into the mainstream of Europe's rapidly spreading scientific and industrial revolution. Under Stalin, huge dams were constructed for electric power and heavy industries were built

throughout the land. In the 1960s, Khrushchev bragged that the Soviet Union would soon "bury" the US militarily and economically. It sent a man into space before the Americans, but any notion that the Soviet Union is a modern technological society is fiction.

In an interview following his speech, Marchuk told us that although the Supreme Soviet had decided to reduce the country's budget deficit of 120 billion rubles (nearly \$200 billion) by 50% in 1990 and to do the same in 1991, the academy will again get supplementary funding of 500 million rubles this year. It isn't only the Academy of Sciences that

will benefit from the singular largesse of *perestroika*. Other science academies located in the USSR's constituent republics are also receiving large sums to invigorate research and technology. These academies, which receive a combined total of 1.2 billion rubles per year, are getting 800 million more rubles this year to contract with local industries for new technologies, according to Marchuk. The purpose of the additional funds, he told us, is to promote "interesting new developments in high technology."

The anomaly in such programs is that despite the Soviet Union's scientific elitism, the economy remains backward. Critics argue that the standard Soviet model of an academy does little to advance technology for commerce and industry. Hence the decision to change the priorities of the "big academy" in Moscow and the "lesser academies" in the 16 autonomous republics is significant for the future of scientific research in the USSR. The Kremlin's bold new direction for science reflects a decision to join the major league of technology in which Western Europe, Japan and the US compete.

A 30-year anniversary

Marchuk was in Washington for the twice-yearly meeting of executives of the US and Soviet national academies to discuss bilateral research programs. This meeting marked 30 years of scientific agreements—an occasion that did not go unnoticed by the leaders of both nations. In his message to the academicians, President Bush hailed the "three decades of fruitful cooperation," then added: "The next decade is certain to bring a new round of scientific challenges, including the need for greater environmental protection. Cooperation on such mutual concerns is a sure path to international understanding and a more peaceful world." President Gorbachev's letter, also read to the small invited audience of scientists, government officials and news reporters, expressed his hope that cooperation between scientists of both nations "will continue to grow stronger in the interests of worldwide scientific progress."

In his talk, made without notes, Marchuk stated that "Soviet science is at a critical point right now. We are in the midst of sweeping institutional reforms that are democratizing our research institutes." These are indeed revolutionary times if the scientific ruling class surrenders its prerogatives voluntarily. Managers of the government-run institutes, who have been appointed to their positions

for life, would no longer be selected under the *nomenklatura* system that is controlled by the Communist Party and a centralized bureaucracy. Marchuk claimed the academy has confronted the "difficult question" of retirement for senior scientists and decided that institute directors and department heads must leave their posts by age 65.

This procedure would force out the old fogies, some of whom had been appointed as political favors with little regard for scientific accomplishment. Henceforth, Marchuk seemed to suggest, not only would youth be served, but lab directors would be chosen by scientists working at the institutes, not by officials in Moscow.

Marchuk also noted that many Soviet scientists are now required to compete for grants under a procedure similar to peer review as practiced in the US. But the system has not yet been applied universally. In some fields, though not in physics, at least half of the grants are still awarded according to the "good old boy" rites. Some Soviet physicists argue that peer review is not the best grant-making method, principally because judging proposals is time consuming and cuts into their own research.

The government is considering the creation of several institutes, not connected with the academy, where international scholars can come to work. The first of those, said Marchuk, will be a theoretical mathematics institute in Leningrad. It will be named after the Swiss mathematician Leonhard Euler, who worked in St. Petersburg (now Leningrad) in the 18th century, and it will be modeled on an institute at the University of California at Berkeley.

Ideas for just such departures from old ways were proposed two years ago by Roald Z. Sagdeev in a brutally frank article in *Izvestiia* and in the US Academy's *Issues in Science and Technology*. He followed these up with a stirring address to the Soviet Academy (PHYSICS TODAY, September 1988, page 97), where he pulled no punches: "During the past half-century, Soviet science has suffered from ill-conceived government policies. Today... 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."

A government of academicians

The Soviet Academy's new approach should do much to correct the situation Sagdeev describes. So, too, should the inclusion of 80 members of the academy in the Congress of People's Deputies. Actually, the number is really 77, because one academician has succumbed to death—Andrei D. Sakharov—and two to ill health.

"Now scientists, as never before in Soviet society, are becoming members of the highest echelons of the country's leadership," said Marchuk. Three full members of the academy—Leonid Albakin (director of the Institute of Economics), Nikolai Laverov (chairman of the State Committee for Science and Technology and an academy vice president) and Stepan Sitoran (chairman of the State Commission for Foreign Economic Relations)—are now deputy prime ministers and members of the Presidium. Academicians Evgeniy Primakov (an economist and member of the academy's presidium) is chairman of one of the chambers of the Supreme Soviet. Academicians Yuri Ryzhov (rector of the Moscow Aviation Institute) and Nikolai Karlov (director of the Moscow Physical-Technical Institute) are respectively chairman and cochairman of a Soviet parliamentary commission, and Nicolai Logachev (director of the Institute of Geology), Yuri Israel (chairman of the State Committee of Hydro-meteorology) and Ghenadiy Yagodin (chairman of the State Committee for Secondary and Higher Education) are ministers of the central government.

At their meeting in Washington, the two academies agreed to sponsor four bilateral workshops during 1990, on optical and plasma physics, photosynthesis, remote sensing of oceans and solar-terrestrial physics. In 1991 bilateral workshops are planned on dynamics of proteins and glasses, mechanisms of membrane channels and pumps, ice mechanics and semiconductor lasers. But a proposal by Soviet academicians to undertake a joint research program on global climate change was turned down because the US Academy does little or no research on its own and has no institutes as its USSR counterpart does. Nevertheless, a special Inter-academy Committee on Global Ecology was created to consider future activities on energy development and conservation, biodiversity and other ecological concerns.

—IRWIN GOODWIN