

USSR official attacks Soviet science

Thirty years after Sputnik shot upward and sent U.S. scientists scrambling, a key adviser to Soviet General Secretary Mikhail Gorbachev has delivered a biting criticism of his country's system of research.

Roald Z. Sagdeev, director of the Soviet Space Research Institute in Moscow and a member of the Soviet Academy of Sciences, filled five pages of this summer's *ISSUES IN SCIENCE AND TECHNOLOGY* needling the Soviet science program from the inside out. "During the past half century, Soviet science has suffered deep, and still bleeding, wounds from ill-conceived government policies," he writes. "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."

One problem, according to Sagdeev, is that "bureaucratic dinosaurs" bog down virtually every facet of the scientific community. "With departmental barriers separating academic science from higher education, the country's best researchers were prevented from teaching the next generation of scientists. . . ." he says. "The majority of academic institutes grew too large and lost sight of their original function as a flexible, manageable team of scientists sharing common goals."

He calls the guarantee of lifetime tenure for institute directors "ill-conceived" and laments the lack of mobility for scientists. Shortsightedness and over-caution, he adds, have rippled through the scientific community.

"Little if any money is allocated for research into emerging areas of science," Sagdeev writes. "Yet, such research often leads to breakthrough discoveries and unexpected results. Not only are these important to scientific progress, they are what make being a scientist so wonderful."

The article was submitted at the invitation of the National Academy of Sciences, one of *ISSUES'* publishers, and resembles a piece by Sagdeev that ran in the Soviet newspaper *Izvestia* last April.

"We didn't ask him to write a critique, just something on the Soviet science program," says Kevin Finneran, associate editor of the journal. "I figured it would be something like 'Yes, we have problems, but. . .' I was very surprised when we got something that was all criticism."

Harley Balzer, director of the Russian Area Studies program at Georgetown University in Washington, D.C., says although Sagdeev's charges are not new ideas, it is significant that they come from a top Soviet official. "Those of us that have been critical now feel that our judgments have been founded," remarks Balzer, author of a similar *ISSUES* analysis three years ago.

Stanford physicist Sidney Drell says he believes the article is part of Sagdeev's effort to accelerate reform of the Soviet science program and to free it from chronic overmanagement. "He's also been pushing hard for rapid turnover of top positions," says Drell, who calls Sagdeev a friend.

"He's said a person shouldn't be head of an institute for more than 10 years," Drell adds. "His commitment is so great, he's saying he wants to step down, too."

Research in the Soviet Union stagnates, Balzer says, when individual creative thought is discouraged. "There, the game for a researcher is to become a disciple of an established scientist," he explains. "Here, our system is almost parasitic. The big thing is to prove your mentor wrong."

A successful scientist in Moscow is not a bold iconoclast, observes James Head,

a planetary geologist at Brown University in Providence, R.I., and a longtime collaborator with Soviet space scientists. "But here I tell my graduate students, 'If you want to survive, the last thing you should do is accept everything I say,'" says Head, who returned from Moscow last week.

In his article, Sagdeev complains that block funding of mammoth institutions makes scientists too comfortable with their positions. Money is poured into major centers rather than to individuals who must regularly justify their work. "You often hear [U.S.] researchers saying, 'I could have written a paper if I didn't have to justify [the research grant] every year,'" says Head. "I complain, and I don't like to rewrite our proposals every year, but I can sure see why it's a good idea."

As one of his final points, Sagdeev maintains that Soviet research now burdened by military secrecy should come out of hiding. International cooperation, he says, maintains the vitality of scientific advancement worldwide. — *L. Beil*

Failing phagocytes become fighters

For the first three years of Brian Simpkins' life, masses of inflamed tissue called granulomas filled his esophagus, causing him to vomit whenever he ate solid foods. Doctors at Children's Hospital in Boston recently began treating Brian — the victim of a genetic disorder called chronic granulomatous disease (CGD) — with an experimental drug called gamma interferon. The granulomas disappeared within five weeks.

Brian's treatment was prompted by two studies, reported this month, showing that gamma interferon can remedy defective immune activity in CGD patients. Although CGD is rare, the findings may also benefit victims of other immunodeficiencies and inflammatory diseases, says John Gallin of the National Institute of Allergy and Infectious Diseases (NIAID), a coauthor of one of the articles.

CGD patients cannot produce superoxide anions, molecular fragments responsible for killing bacteria, fungi and other intruders. About two-thirds of CGD patients have a defect in a gene lying on the X chromosome and appear to lack cytochrome b, a membrane protein necessary for superoxide production. Others have a defect on a non-sex-linked, or autosomal, chromosome.

Normally, when a microorganism infects a person, white blood cells called phagocytes engulf it, destroying it with a toxic soup of enzymes, chlorine and superoxides. The phagocytes of CGD patients, lacking superoxides, can engulf but cannot destroy. Infections occur frequently and inflammation persists. Scientists reported last year that they used a genetically engineered gamma interferon to activate abnormal phagocytes in culture to make superoxide. Gamma inter-

feron is normally produced by immune cells called T-lymphocytes.

Researchers then moved from the test tube to the human body. Alan Ezekowitz, Stuart Orkin and their co-workers at Children's Hospital in Boston gave low doses of gamma interferon to four patients with X-linked CGD on two consecutive days, they report in the July 21 *NEW ENGLAND JOURNAL OF MEDICINE*. In all four patients the phagocytes' ability to produce superoxides and to kill bacteria increased, reaching normal levels in two patients, and remained raised for more than two weeks. The scientists also observed an increase in cytochrome b levels, which implies the interferon somehow boosted the genes coding for this critical protein.

In the July *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES* (Vol.85, No.13), Gallin, Harry Malech and their colleagues at NIAID report they administered gamma interferon to 30 patients representing both forms of CGD. About one-third of the X-linked patients and almost all of the autosomal patients improved. Curiously, they found the improvement in bacterial killing was greater than the superoxide improvement. They speculate that gamma interferon enhances cytochrome b and additional genes.

Both research teams plan to participate in a test of gamma interferon involving 100 CGD patients worldwide. They say the treatment looks promising, with no serious side effects. "In research, it's so seldom that you do anything with direct utility for people," says Ezekowitz. Brian, he reports, can now eat a hearty meal of hamburgers and french fries.

— *M. Hendricks*