

IDEAS

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Innovation behind the Iron Curtain: the problems and promise of Soviet R&D

While continuity of research is a plus for Soviets, applied technology lags

GENE LANGLEY — STAFF

By Scott Armstrong

Staff writer of The Christian Science Monitor

By almost any estimate, the Soviet Union is a Siberia-size scientific power. It maintains the largest scientific establishment in the world. It has outpaced the United States in R&D spending (as measured by a share of GNP) for several decades. Moscow probably bristles with more top-notch mathematicians than any other city in the world.

But numbers are no measure of know-how: Whether it be Nobel Prizes, scientific breakthroughs, or turning ideas into products, US researchers generally outstrip their Soviet counterparts.

Why the discrepancy?

Many of the barriers to innovation and scientific productivity behind the Iron Curtain — a fossilized bureaucracy and poor equipment — are well known. But Soviet-watchers over the past two decades have only begun to understand some of the strengths and shortcomings of Russian science and technology.

Two recent studies, based on information gleaned from Soviet scientists and engineers who have emigrated to the West, are filling in some details. By themselves, the reports — one a survey of some 200 émigrés conducted out of Harvard University and the other a Ford Foundation-sponsored project based on a series of seminars with Soviet and US

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scientists at the Massachusetts Institute of Technology (MIT) — don't necessarily yield any startling new information. But they do offer some insights into Soviet science from an unusual viewpoint — participants themselves — at a time when technological innovation is becoming central to economic growth and military might.

Some of the émigrés think Soviet education is superior to that in the US at the elementary and high school levels. In a few areas, particularly math and physics, that may hold true at the university level as well. In general, the Soviets are considered strong in theoretical research areas that require few tools other than books and chalk. In applied areas, or where sophisticated instruments and close ties with industry are involved, they lag behind.

More recently, however, émigrés and Western experts point to a general decline in Soviet technical education. This is attributed to the freezing out of some minorities (particularly Jews) from the system, the increased politicization of scientific research, and a general decline in academic standards.

Enhancing Soviet science and technology is the stress on continuity of research. Unlike in the US, Russian scientists don't always have to look over their shoulders to see if money will be there for a long-term project. Once set up, Soviet research institutions and projects aren't likely to be shut down. "It is easier to discover a new chemical element than to close down a chemical laboratory in the Soviet Union," says Harley Balzer, a Georgetown University historian who co-directed the émigré survey, with backing from the National Council for Soviet and East European Studies in Washington.

US researchers, on the other hand, often pursue areas that are "hot" and may be financial winners. There are pros and cons to both approaches: The Soviets' "mission oriented" path can lead to the necessary incremental advances needed in a field. But the freewheeling US style is more conducive to innovation.

The Soviets also have a penchant for pinpointing certain high-priority areas and funneling large quantities of rubles and researchers into them. One other Soviet strength: a reverence for science. Scientists are virtually held up as cultural heroes. Full members of the Academy of Sciences are among the most prestigious members of society. In the US, by contrast, a degree of skepticism — or worse — usually exists about scientists' actions and motives.

There are plenty of impediments to innovation in the So-



viet Union, though. These, according to émigrés, stem from several things:

- **Lack of incentives.** The often-cited one here is economic. There is little financial incentive for researchers to turn ideas into widgets, only bureaucratic push. Little thought is given to potential industrial applications of scientific work. Hence weighty reports, instead of handy products, often result.

- **Poor communication.** Soviet scientists are often isolated from Western scientific developments. Russian journals are slow to pick up Western discoveries. Some reports are censored. Communication problems extend to within the country, too: A Soviet scientist toiling in one area may not be aware of a countryman doing similar work elsewhere.

- **Dearth of supplies.** This includes a lack of sophisticated equipment and scientific instruments — as well as shortages of simple supplies like nuts, bolts, and photographic plates. Trivial though this may seem, Dr. Loren Graham, an MIT expert on Soviet science who was involved with both studies,

termed the supply and distribution problem one of "the most significant drawbacks in Soviet science and technology" in a recent paper.

- **"Spiritual exhaustion."** During the Marxist-industrialization days of the 1930s, science and technology flourished. But, says Dr. Mark Kuchment, a Soviet émigré and co-director of both studies, there is nothing to stir such enthusiasm now. "They [Soviet scientists] still take high pride in their professional abilities, and there is an enormous drive to excel," he said in an interview in his office at Harvard. "But there is no idealism or revolutionary fervor."

None of this is to say that the Soviet Union should be underestimated as a technological power. Soviets have proved to have the ability to catch up in the past, particularly in weapons systems. They are focusing heavily on such areas as superconductivity, fusion research, and biotechnology (including its use in weapons systems). They are also pushing computers. But here, according to Dr. Graham, the US continues to have at least one leg up: Computer use seems to flourish best in a culture of entrepreneurship, free information flow, and private ownership. The Soviets, for obvious political reasons, cannot permit unrestrained development of such a powerful information tool.



Stanford assistant provost Cecilia Burciaga

Remembering the 'ones not there'

By Lois Colt
Special to The Christian Science Monitor

Stanford, Calif.

Cecilia Burciaga frequently finds herself worrying about the people who aren't there.

At her college graduation in 1972 she was one of four Hispanics in a class of nearly 1,000. "Where are all the others?" she asked herself. At a high school graduation this year she found herself looking at the audience and recalling that only 4 of every 10 Hispanic teen-agers graduate from high school.

"I say to myself, 'Four of you made it. Six of you didn't.' I have to see the faces to remember the ones not there."

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It is, in fact, one of Ms. Burciaga's official tasks at Stanford University to remember the people who aren't there and try her best to get them there. As an assistant provost she handles Stanford's faculty affirmative-action program. It is her job to keep alive the university's efforts to diversify its faculty at a time interest in such goals is dying.

"There is a yawn now on those issues," she said. "The civil rights era is over." But the struggle is not over, according to Ms. Burciaga, either at the university or elsewhere. And so she keeps working, looking for new ways to get the outsiders in.

Her job at Stanford has made her one of the top-ranking Hispanic women in higher education, and that distinction, in turn, has extended her influence beyond the red-tiled roofs of Stanford.

The position is "a burden and a blessing," Ms. Burciaga said. The prestige of Stanford gets her invitations to speak and to serve on committees and boards to represent the Hispanic community and to talk about the concerns of women and minorities.

All of those opportunities, however, come at a personal cost. They take her away from her job at Stanford and from her family more than she would like. They make her a public figure.

"It is never easy to be the one and only thing," she said. "It's exhausting." But as interest in equal access and opportunity fades with the years, Ms. Burciaga is taking advantage of every opportunity she can fit on her crowded calendar.

She has worked with the Educational Testing Service, been a consultant to the federal government and several major foundations, and served as a presidential appointee to the

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National Advisory Committee on Women. And she is on boards from Bronx Community College to the Palo Alto Red Cross.

"You can do it as long as you have realistic and flexible expectations of what it means to be a professional person, a mother, and a wife," she said.

Although she questions the effect of her work at times and worries about the effect on her own two children, she doesn't quit. The work is too important, and there's so much of it to do. She can rattle off statistics to demonstrate just how much.

At Stanford, for example, there are just under 1,200 faculty members. One hundred of them are women. And this year the university lost one of its minority faculty members, bringing their number to 50. "And that took a decade," said Ms. Burciaga, throwing her hands up in a gesture that combined both amazement and frustration.

Getting more women, blacks, Hispanics, and American Indians into the faculty at Stanford means doing more than distributing résumés and saying please. "It is

the faculty that hire faculty," she said. "They know best how to find their own animals. That means faculty members have got to want it."

Although there is no open resistance to affirmative action among the Stanford faculty, there is apathy, she said. And there is often an attitude that there are no qualified candidates.

"You begin by talking," she said.

When she talks she encourages departments to find out who the talented people in their fields are early in their careers and to cultivate a relationship with those potential candidates by bringing them to Stanford for postdoctoral work or for the summer.

Ms. Burciaga also talks to departments about the ways they might take advantage of Stanford's Affirmative Action Fund. The \$100,000 fund helps departments create positions for women and minority members. If, for example, a department finds an American Indian who would be perfect for a part-time opening, but who can't afford to work part time, the fund can be used to make that position full time.

And she talks about Stanford's obligation to help edu-

cate the ever-increasing Hispanic population of California. "Stanford is an institution in California and it has a responsibility to educate the people who live here," she said. "It will continue to be in the state of California, and by 1990, 25 percent of the population of California will be Hispanic. The connection between the university and the community goes beyond Palo Alto."

A Stanford education is a valuable asset, she said, especially for minorities who don't have access to other routes to success. "I am not convinced you get a better education," said Ms. Burciaga, who attended the University of California. "I am sure you have been anointed given a network that gives you, for right or wrong, some special access."

Perhaps one of Ms. Burciaga's most important points concerns the need for diversity — how Stanford benefits from adding women and minority members to its faculty.

A mix of different kinds of people brings different perspectives to scholarship and teaching, Ms. Burciaga said. It is not just the female and minority students who benefit from seeing people like themselves in roles of authority and competence, she said. "It is as important for the men in industrial engineering courses to be answering to Prof. Mary Somebody," she said. "With minority faculty, oftentimes the statement is more profound for the white population."

She said her goal is to decentralize the school's efforts to add diversity, to make it a faculty, not an administrative, function. When faculty members say they want to do something about the lack of diversity, the affirmative action program will be over, she said.

"The question now is how do you get this process rooted," Ms. Burciaga said.

According to Provost Hastorf, Burciaga is effective and he credits her hard work and her ability to negotiate. "She brings to it assiduous attention to keeping people's attention focused on [the affirmative-action program]," he said. "She has made herself a central person. People know about her."

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