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**Russia**

**Science and Society in Russia from Stalin to Putin:  
A Biography of Zhores Ivanovich Alferov**

**Topic of Research and Countries Visited**

I visited Russia in pursuit of two research topics, one a Scientific Biography of Zhores Alferov, Nobel laureate in physics in 2001, the other contemporary science policy. I will write an accurate and thorough biography in which to develop a better understanding of the importance of large scale multidisciplinary Soviet research institutes in the postwar era. What are their strengths and weaknesses? How do they compare to western institutes of similar profiles? How have they fared since the break-up of the USSR? What is the relationship between the Academy of Sciences today and that in the Khrushchev, Brezhnev and Gorbachev eras?

**Relevance and Contribution to Field**

This research has significance for historians of science and technology, historians, and political scientists. This research project will result in a series of publications that illuminate both those strengths and weaknesses of Soviet science in comparative perspective with the US, and the challenges facing scientists and officials in contemporary Russia as they continue to struggle with the Soviet legacy in basic research and determine how to pursue support of basic research over the next decade.

**Summary of Approach and Research Methodology**

My research centered on archival research and interviews. I worked in the archive of Alferov's institute, the Ioffe Physical Technical Institute. I also conducted a series of interviews with Alferov at his newly-established Scientific-Educational Center (NOTs), a facility created to ensure a steady stream of young talent into physics research.

**Summary of Research Findings and Preliminary Conclusions**

I have reached several preliminary conclusions about the strengths and weaknesses of large scale multidisciplinary physics research institutes. First, institute and laboratory directors were skillful in manipulating the concerns of Party leaders to improve performance in the face of declining economic growth rates from the 1960s onward. Second, like their counterparts in the west, they played on cold war fears and the desire for parity to expand programs for dual use technologies – those with military and civilian possibilities – to establish branch institutes and new laboratories as spin-offs of existing centers. Soviet science rapidly expanded in terms of numbers of institutes, personnel and research direction so that on the eve of the break-up of the USSR the country had one-third of the world's engineers and one-quarter of its physicists.

These strengths had another, albeit negative side. Many observers have noted that institutes grew so massive in scale that they lost their risk-taking, path breaking approaches to new research possibilities. Like all large organizations, they became conservative and plodding. Also, as is well known, there have been cuts in funding to 1/20th the level before the break-up of the USSR, brain drain has hurt a number of fields, both because many specialists have left Russia on contracts or for permanent positions and because young people find such fields as business and the humanities more compelling than science given the lack of support. A serious struggle between the federal government and Academy of Sciences leadership has broken out

over disposition of property, including buildings and other real estate that belong to the Academy but which the government now sees as a source of income and wishes to acquire legally. There is also an unwillingness to fire redundant personnel even with minimal funding that led to cuts in research and equipment budgets.

Party leaders had shown respect for basic research when they removed the technological division from the Academy of Sciences in 1961 and transferred these applied research institutes to the industrial sector of the economy. Yet even protecting basic research in Academy institutes could not stem unrelenting pressure on specialists to focus on short-run results, occasionally at the expense of long-term prospects. Many people have argued that the strength of American science is the autonomy given to specialists to ignore short-term pressures to innovate. Indeed, a major failing of Soviet science was the belief of planners and scientific administrators that you could force innovation in the economy on the back on scientific advance. They sought a series of administrative reforms throughout the 1960s, 1970s and 1980s to accelerate the introduction of scientific advances into the economy. But ordering innovation and encouraging it through formal and informal incentives are quite different things. Soviet leaders remained fearful enough of market mechanisms and the spontaneity of the people that they prevented the formation of broader cultural institutions, including in the scientific sphere that would have embraced and pursued innovation. One example is the absence of computer culture in the USSR in the face of the effort of the Academy of Sciences leadership to force computers into society from the top down.

Today the Putin Administration and the Academy of Sciences leadership are at loggerheads over a variety of issues. Like their Soviet predecessors, Putin administration officials see science for its economic contributions and little else. They have overriding interest in acquiring the real estate of the Academy. They resent the efforts of the Academy leadership to maintain autonomy, which they see as arrogant, and criticize the Academy's unwillingness to be more accountable to government programs. Academy officials believe the Putin administration has become even more bureaucratic and slow-moving in its dealings with scientists than the Soviet government was. Academician Alferov has been trying for five years to have a project for a new physics university approved. The school would not require government funding, only approval. Alferov spoke with President Putin about the project directly who assured him of his support. But President Putin's support has not enabled Alferov's project to gain final authority.

Academy personnel continue to be deeply disappointed with and disturbed by the Putin administration's policy toward science which they see as misguided. They argue that Russia's great scientific heritage is a key to its future as a world economy during the processes of globalization, while selling such natural resources as oil, gas and timber serves only short-term economic growth.

Much information was gained with the interviews with Alferov, discussing his career, his research including his Nobel discovery, and his position as a leading scientist in late Soviet period. Alferov is a communist parliament deputy, but his communist political leanings consist nearly entirely of an effort to support science, applied research and education at the level to which it was accustomed in the Soviet period. The research, development and educational apparatus must scrape by with support one-tenth or less of 15 years ago. The government, Alferov asserts, sees science strictly in utilitarian terms, or perhaps even as an unnecessary burden.

### **Suggestions for Future Research**

I see four major areas where research would be fruitful for understanding the strengths and weaknesses of Soviet science, and for exploring changes in the funding, administration and conduct of research in the 21st century. These four areas are: 1) nuclear science and technology, given the Ministry of Atomic Energy's ambitious plans for a nuclear future and given the Bush Administration's interest in promoting rejuvenation of nuclear power in the US; 2)

environmental history, science and technology. Russia will face serious environmental problems dating to the 1940s for decades to come. How Russia deals with these problems will no doubt assist other countries, including the US, in tackling similar issues; 3) What is the status and what are the prospects of genomic research in Russia today? And 4) Resource management issues: fish, forest, and water resources under stress in a time of rapid economic and political change.

### **Recommendations for US Policy Community**

I would urge US policy makers to continue to make funding for Russian scientists available through the Civilian Research and Development Foundation, the National Academy of Sciences, and other organizations through joint research with American principal investigators to continue the process of conversion of military research into civilian topics. Additionally, the US will be able to fund world class research of benefit to both societies and their economies in cost effective ways.

My second recommendation concerns the State Bureau of Oceans and International Environmental and Scientific Affairs and the Office of the Science and Technology Advisor, the latter office created during the Clinton Administration to advise the secretary on international science and technology policy. Given Russia's continued importance in issues ranging from proliferation to innovation, and its excellence in a variety of important fields even as the Russian government has not determined what level to support them, it may be possible for US personnel to work more closely with their Russian counterparts in a variety of ways concerning Science and Technology policy.

Another issue is the halting process of many institutes and universities in a conversion to the Bologna standard of course requirements leading toward baccalaureate, masters and PhD degrees. In many cases disputes have broken out in higher educational institutions over the path of reform and the desirability of transforming to a system that more represents European standards and processes. Many individuals, especially administrators, defend the old system even though it is unclear what advantages this system, part a product of the Soviet era, has to offer students. Others recognize that the system of requiring students to take too many courses every semester and demonstrate competence through the arbitrary end-of-the-semester attestation method does not sufficiently train thoughtful, independent, creative graduates capable of addresses the challenges that Russia faces in competition on world markets in the 21st century.

A disturbing trend has been the growing crack-down on NGOs. Very few independent NGOs exist. They face constant surveillance and interference in their activities. In democracies, comprehensive and effective science and technology policy in a variety of areas – public health, the environment, transport, and energy – historically has resulted from the inclusion of the public in decision making processes, and requires access of citizens including independent scientists to those processes. The Putin administration is working to marginalize independent scientific expertise. This crack down on independent expertise and attack on scientific autonomy is not only dangerous for the development of democratic institutions and the formulation of good public policy, but highly curious. It is curious because of the ongoing attacks on independent scientific expertise and ideologization of science occurring in the US. That is, were you to examine the policies of the Bush administration toward climate issues and global warming; AIDS; reproductive health; separation of church and state in public school curricula; and other issues, you would find similar examples of interference.