
Degradation of Science and Technology in Russia at the Dawn of the 21st Century ¹

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Abstract

Throughout most of the 20th century science and technology in Russia were developing at a very fast rate. The main reason for that was that the Communist rulers of Russia were preparing for war, and promoted science and technology because they were essential for manufacturing the most reliable military tools for gaining supremacy over the entire world. When the Communist regime collapsed the new capitalist rulers of Russia were no longer interested in military dominance and even in the economic development of the nation and sharply reduced governmental funding of science. The economic, political, and moral crisis in Russia resulted in a 50% drop in the GDP while the decrease in funding of science and technology was disproportionately greater.

The prestige of science and technology in Russian society experienced a corresponding collapse. One result of this has been a considerable and ever increasing decline of the proportion of men employed in science and technology. Another result is a reduced respect for science and a growing distrust of scientific methods among the general public and even in the ruling class. The consequences of such trends and attitudes spreading in society appear to be discouraging.

1. Feminisation of science as a symptom

1.1 Women as teachers and researchers in technical sciences in universities and in industry in the 20th century in Russia

1.1.1 Communist period

In the Soviet Union women were encouraged to strive for higher education, especially in sciences and technology, and in the early

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1980s there were more women university graduates than men in Russia. Indeed, in the late 1980s women accounted for about 40% of engineers with higher education diplomas. Both men and women regarded engineering and science as quite natural careers for a woman. In fact, there were 20% more women qualified as medical doctors than men. The Russian Valentina Tereshkova was the first woman in space, which is a combined engineering and scientific job. Despite the ever-present glass ceiling for women in all spheres, Russian women engineers and scientists were generally satisfied with their position on the job market and their prospects. This is why the dramatic changes that resulted from the collapse of the Soviet Empire had especially painful consequences for the community of engineers and scientists (especially women). This community traditionally included the best educated intellectuals who were least contaminated with Communist ideology. They can be regarded as the main component of the middle class in the USSR. During the period of perestroika they were at the forefront of the struggle for democratic reforms. They feel now that they have been cheated and betrayed by the so-called “democratic” governments and their robber-capitalism reforms. The roots of many of the current bitter political, moral, and economic problems in Russia can be traced back to the degradation of the middle class, primarily the community of engineers, teachers, and scientists.

1.1.2 Crisis

Official statistics data in Russia are notoriously unreliable but the following figures demonstrate the general trends in science development.

The last year in which government funding of science in the USSR remained relatively stable was 1989. The funds allocated for research and development in 1989 amounted to 1.9% of the GDP (Gross Domestic Product). Of course, about 80% of the funding was allocated to the defence sector although some of this money was spent

on fundamental science projects too. In the year 2000 the government allocated only 0.7% of GDP for research and development activities. Since the GDP of Russia has also decreased by about 50% since 1989 the absolute amount of available funding was correspondingly lower compared to that year. There still is practically no funding for science from non-governmental or private sources in Russia with the exception of some grants from foreign foundations and very few sales of know-how and technologies to foreign corporations. The Minister for Science said at the end of 1999 that the funding of research and technology in Russia had fallen in real terms by a factor of 17 compared to 1990.

Similarly, government funding for education was about 2% of the GDP in 1989 and by 2000 it had plunged to 0.60% of GDP, while a further decrease to 0.59% of GDP is planned for 2001.

The resulting degradation of the research and technology sector was, perhaps, greater than that in other sectors of Russian economy. For instance, the output in the energy sector decreased by about 30% while the output of the electronics industry decreased by 87%.

Paradoxically, the number of people officially employed in the research and development sector decreased only by about 50%. One explanation is that a large proportion of these people are on extended unpaid leave. Another is that the average salary of a person with a higher technical education in the sector is now significantly lower (about 60%) than the average wage of an industrial worker.

Women scientists accounted for 54% of all scientists in 1999 compared to 53% in 1990. The proportion of women in top jobs, such as department heads, however, is only 11%. This is one reason why women's earnings are on average 40% lower than those of their male colleagues. Another reason for the huge discrepancy in the earnings is that in the absence of coherent regulations or controls, managers (who are typically men) are now free to award themselves fat salaries while paying their employees meagre wages. Furthermore there are often defaults in the payment of these wages over several months or even years.

The employees are afraid to protest because managers can dismiss any employee without giving any reason. Legal job protection for employees no longer exists. The trade unions no longer protect the rights of employees as they did to some extent before 1991. Women are especially afraid of losing their jobs because the welfare of their families generally depends on them. In Moscow about 80% of the registered unemployed have an university education and about 70% of them are women.

1.2 Changes in career opportunities

1.2.1 Traditional career paths in science

Under the Communist regime science and technology were regarded as the most prestigious career paths for talented young men and women. Boys and girls were encouraged to take additional mathematics and science courses in secondary school and then to select technical courses at one of the many technical universities. It was understood that the best graduates would be rewarded with research jobs at the many research and development laboratories and institutions that were run by the defence industries. The very best graduates were allowed to take post-graduate courses which opened the way to obtaining the prestigious candidate of science academic degree which is roughly equivalent or even slightly higher than the PhD degree. Those who received the degree had a choice of two superior career paths if they were not satisfied with working in applied science. One was to take a teaching position at one of the many universities and another was to find a job at one of the laboratories of the Academy of Sciences, which were concerned with fundamental research problems. It was typical for most talented women scientists to be satisfied with staying at this level. The most ambitious and successful researchers and teachers typically attempted to proceed higher to professorship and habilitation degrees, holders of

which could qualify for management positions. A career in science generally ensured a better-than-average standard of living and a measure of spiritual gratification and self-esteem, which was always important for Russians.

Under the current situation of wild capitalism things have changed dramatically. The situation also varies greatly across the country. There are several major centres of science and technology – in such large metropolitan areas as Moscow, St. Petersburg, Yekaterinburg in the Urals, and Novosibirsk and Tomsk in Siberia. There are also about 20 towns specifically built as research and development facilities for the defence industries over the past 50 years. The conditions in these communities are especially bad because of a complete lack of alternative employment opportunities. Average earnings of scientists and engineers are about 50% lower than average industrial earnings. The social status of scientists, university teachers and engineers has declined accordingly. The most active and talented scientists (typically men) who did not want to leave science for ever but were not satisfied to live below the poverty line in Russia decided to emigrate. The most enterprising scientists (mostly men but some women, too) who were not dedicated to pure science went into business, in Russia this frequently means involvement in highly dangerous, often criminal activities bringing substantial financial rewards to the most aggressive participants. Women who remained in science typically uphold the traditional Russian feminine values – patience, tenacity, dependability.

1.3 Feminisation of Russian science

Feminisation here is understood as the trend to an increasing proportion of women employed in science, which is observed to a varying degree in many countries. In Russia the feminisation trend of the past ten years is determined by the specific economic and social factors, which are entirely different from those that were in effect in

the preceding period both in Russia and in the West. The principal factor was the overall increase of women's involvement in economic and social activities. The proportion of women employed in the research and development sector in Russia was steadily increasing from 37.3% to 40.3% in the period between 1961 and 1988. The changes that started in the late 1980s and were caused by dramatic political and economic reforms were much more radical and quite unexpected. The data on newly awarded academic degrees presented in Tables 1 and 2 illustrate the feminisation trends. The total number of scientists has decreased considerably since the late eighties but at the same time the proportion of women increased noticeably. The statistical data exhibit also another unusual trend – the younger the age group, the higher the proportion of women in it (see Table 3). Accordingly, the proportion of women among pre-doctoral graduate students increased from 35% to 47% in the period from 1990 to 1993. This trend is typical of all economic regions of Russia (European, Far Eastern, etc.) where other important social and economic indicators differ significantly.

We see that the total number of scientists decreased at all levels. The proportion of women increased significantly for lower academic degrees and not so greatly or not at all for higher degrees. This means that as the average earnings decrease the men are leaving lower-paid jobs to the women while they themselves continue to occupy the higher-paid jobs. The glass ceiling has, in fact, moved down to a certain extent.

1.4 Ageing of the academic community

Another important development of the recent period is the fact that the academic community is steadily growing older. In 1988 the average age of the researchers employed by the Russian Academy of Sciences was 42.2 years while in 1996 it was 46.5 years. This means that the Russian academic community faces a steady erosion of its

potential for self-reproduction. If the current trend persists for more than 5 years there will be no human resources left to support a genuine revival of science and technology in Russia.

1.5 Women's academic networks

Under the Communist regime any initiatives independent of the authorities were not encouraged and often suppressed with a varying degree of brutality. This is why Russian men and women typically lack the skills required for successful networking and establishing and managing independent community associations. Indeed, Russians tend to have an instinctive dislike and even fear of any collective efforts as they had lived under the unnatural and harmful conditions of enforced collectivism for over 70 years. That bad experience is one explanation for the lack of the will to cooperate, which is often noted by foreign observers of Russian society. Russian women and especially men find it difficult to establish even mutually profitable relations with people with whom they do not have close personal attachments. This is especially true for the academic community where individualism and rivalry are especially strongly pronounced.

The hardships of the past decade made it imperative for the Russian academics to seek new means of mutual support. It is an interesting fact that independent academic organisations set up by women and for women proved to be somewhat more cohesive and effective.

There were quite a few failures, too, of course. Many independent organisations were established with the best of intentions and could not survive under the adverse external conditions. One is tempted to say it is a miracle when such a network keeps on functioning practically in the absence of any support from the increasingly men-dominated hostile environment.

A good example of a fairly successful organisation of women researchers and academics is the Association of Women in Science

and Education. It was established in 1994 and now includes about 800 members in 12 regional branches representing more than forty towns and cities of Russia. The Association regularly holds conferences on different subjects including mathematics and computer science, which attract a wide range of participants – from students to university professors. It is important that the Association does not limit the scope of its interests to purely women's issues and aims at attracting more men scientists as members.

An interdisciplinary Centre of Women Studies was recently established by a group of women scientists in Saint Petersburg. They focus primarily on women's studies, which attract only very limited attention in Russian.

The Society for Support of Women Scientists was recently officially established in Moscow. Its stated aims include assistance in the funding for science projects, that is, providing information on grants available from foreign funds and teaching the new skills required for successful fund-raising. A programme has been started for re-training women scientists to start their own small businesses.

1.6 Successful strategies for women in science and technology

Under the conditions of the persisting economic crisis in Russia it is impossible to identify any universal strategies for women (or, indeed, men) being successful in science or technology. A recent opinion poll of the undergraduates at the departments of physics, chemistry and biology of Moscow State University (the best in Russia) revealed that about 70% of the students do not see any future for themselves in science in Russia. It is estimated that fewer than 10% of university graduates in sciences and engineering get jobs for which they have been trained. One reason for this is that there are not enough vacancies. Another reason is that young people are reluctant to take positions in technology or science where earnings are

much lower than those for manual workers. In Moscow where about 80% of the unemployed have an university education, some 90% of new vacancies are in unskilled or semi-skilled work.

Scientists in older age groups typically have fewer opportunities for getting jobs in other sectors. Their strategies depend primarily on their field of research and its importance for the export industries, which are the only surviving branches of the Russian economy, such as energy, metals, and chemicals.

The government has identified a number of priority research fields that were promised enough funding to ensure their survival. They include life sciences, computer sciences and some other disciplines. Thus there is still some hope left for scientists in these fields although previous experience has shown that government promises are rarely fulfilled.

1.7 Summary and conclusion

Men and women in Russian science are facing equally poor prospects as the colossal structure of Russian science is dismantled, although women as always, have chosen a more difficult job. Those sections of the science structure that still seem intact are held together primarily by the enormous inertia resting in hundreds of thousands of people associated with thousands of universities and laboratories that keep on functioning and slowly approaching a state of ultimate collapse. Symbolically, the new President ordered the Ministry of Science to be liquidated in the year 2000. An obvious metaphor is that science itself is expected to be liquidated or just to disappear by itself in 7-10 years when the current last active generation of 50-odd-year-old scientists goes into retirement. Russian science resembles the Mir space station – the greatest symbol of Russian technology – the immediate plan for which as recently announced by the Russian government is its sinking in the Pacific ocean in late February 2001.

The crew that will be taking care of the ship of Russian science until it is ultimately sunk in the ocean of oblivion will include more women than men.

Table 1

Proportion of women at the medium level of the academic community in Russia

Discipline	Newly awarded doctorates (candidate degrees, PhD equivalent)*			
	1991		1996	
	% of woman	Average age	% of woman	Average age
Physics and mathematics	17.8	34.4	25.1	33.0
Chemistry	45.8	32.9	54.1	32.8
Biology	55.4	34.9	63.9	34.5
Engineering	14.5	36.6	20.7	36.5
Medicine	41.1	34.8	48.3	35.6
Pharmacology	57.7	34.3	62.7	34.8
Veterinary science	32.3	35.3	43.4	36.8
Geology and mineralogy	27.4	37.4	36.9	38.2
Geography	34.7	36.3	46.2	35.5
Economics	40.2	34.6	48.2	35.4
Agricultural science	29.2	35.7	49.1	37.8
Psychology	57.2	35.2	65.2	35.1
Philology	69.7	34.6	80.2	33.3
History	31.3	36.0	40.2	34.2
Sociology	46.1	36.2	54.2	36.7

* The total number of newly awarded doctorates was 15 542 in 1991 and 11 929 in 1996 (a decrease of 23.3%).

Table 2
Proportion of women at the highest stratum of the academic community in Russia

Discipline	% of women researchers & teachers with university education (in 1996)	Newly awarded doctorates of science (habilitation or full professorship equivalent)*			
		1991		1996	
		% of woman	Average age	% of woman	Average age
Physics and mathematics	35.5	5.8	46.5	4.8	47.0
Chemistry	59.7	15.2	48	23.6	49.1
Biology	61.8	29.0	49.2	32.4	49.5
Engineering	50.4	3.5	51.5	5.0	51.1
Medicine	51.7	22.8	47.5	27.5	46.2
Pharmacology	68.6	25.0	50.9	22.2	48.4
Veterinary science	41	6.5	51.6	9.1	50.6
Geology and mineralogy	39	15.9	54.0	4.2	53.4
Geography	50.0	14.5	54.2	0.0	50.7
Economics	62.5	9.4	50.5	19.1	47.5
Agricultural science		8.4	54.2	15.3	52.7
Psychology	60.2	10.0	46.2	44.0	48.3
Philology	62.4	32.6	51.6	80.2	55.3
History	51.4	17.4	51.5	24.8	48.3
Sociology	42	12.5	48.0	19.0	47.9

* The total number of newly awarded habilitation degrees was 4 603 in 1991 and 2 788 in 1996 (a decrease of 39.5%).

Table 3

Proportion of women in different age groups of the research and development community and universities in Russia

Age group	Below 30 yrs	30 - 39 yrs	40 - 49 yrs	50 - 59 yrs	60 - 69 yrs	Over 69 yrs
% of women	55.7	55.6	53.5	43.2	23.7	21.2

2. Space science and technology: changing attitudes in the Russian society

It was a (some now say mad) Russian scientist Konstantin Tsiolokovsky who in the late 19th century proclaimed the advent of the era of space exploration saying: “Earth is the cradle of humanity but humans cannot stay for ever in the cradle”.

The Communist rulers of the USSR always boasted of the great (and quite real) achievements in space as proof of the superiority of the Communist regime over the West. They admitted that common people in the West generally had an easier life, were better fed, housed, and clothed than the Russian people. But they said that the Russian people made a conscious sacrifice and dedicated most of their resources to the development of science and technology, in particular space technology, for the ultimate benefit of all mankind. Russian progress in space was indeed phenomenal. The first artificial earth satellite known to the world by its Russian name as Sputnik was launched in 1957, the first man to orbit the Earth in space was the Russian Yuri Gagarin in 1961. The first woman in space was the Russian Valentina Tereshkova. The Americans with their far superior economy as demonstrated by the GDP and other economic and social indicators were alarmed. A nation much poorer

than theirs proved to be well ahead of them in the space race. One obvious reason was that Russian students were better motivated in taking advanced science and technology courses. Another reason was that the Russian government could concentrate enormous resources for completion of the projects they believed to be most prestigious and therefore urgent and significant.

The psychological factor was also important. Hundreds of thousands of men and women who worked as engineers and scientists for the Russian space effort from the 1950s through to the 1980s were confident that they were doing a great job for their nation and for humanity as a whole. Young people were taught to believe that they could ensure the brightest of futures for themselves by taking up careers as space engineers and scientists, fields that brought tangible material as well as spiritual rewards.

This state of affairs, which many now would call self-delusion, persisted until the very end of the Soviet Empire in 1991. For instance, in 1989 when the signs of the imminent economic collapse of the nation were in evidence the government allocated a total of 19 billion roubles (1.9% of the GDP) to the funding of all research and development projects and of this 11 billion (or more than half!) went to the Buran project (the Russian analogue of the American Space Shuttle). This project had to be discontinued in 1990 because of the economic crisis that had begun at the time and had brought the USSR to the brink of collapse. The only Buran shuttle to have gone into production and to have flown once in space was finally sold to an amusement park in Moscow.

The recent controversy about the Mir space station is a good illustration of the radically changed attitudes to science and technology in Russian society. The Mir station was launched almost 15 years ago and was proclaimed to be the greatest human achievement in space as, indeed, it was. Until the launch of the International Space Station (ISS) last October it was the only vehicle for long-term

space flights. Over the past few years it was maintained to a large extent at the expense of the USA and other international partners in the ISS project who were busily absorbing and exploiting the invaluable Russian experience in long-term manned space exploration.

After prolonged hesitation the Russian government has just made the fateful decision to stop funding the flight of the Mir space station and destroy it in the Pacific Ocean. Only scientists and a very few ordinary people supported continuation of funding because they do not see any immediate benefits in the continuation of the space effort. The position of the average person is: "I am very poor, I can hardly feed, let alone clothe, my children. We do not expect to be able to get even the most basic medical treatment when we are sick. I worked for the state all my life but when I grow old I will not receive a pension. Why should the government spend all that money for space science? My family never saw any benefits from science." Scientists whose families are not better off cannot provide convincing arguments in favour of space research. The wasteful abandonment of the 20th century technological miracle – the Mir station – will be an appropriate symbol for the end of the 20th-century infatuation with science and technological progress that marked the period of the Communist rule.

It is the final end of the era for those numerous Russian scientists and engineers who suffered greatly in the past decade because of a sudden deprivation of their assured standard of living coupled with a steadily eroding social standing, indeed, loss of any meaning in their lives.

I know a young woman named Marina whose grandfather was one of the top managers of the entire space effort in the early 1950s, her father was also employed in space exploration. It was understood from her kindergarten days that the only way to live for a clever girl is to seek a life-long job as a space engineer. She was married to a young engineering undergraduate who expected to grow into a bril-

liant space scientist. When the situation developed that a scientist, however brilliant, earns much less than a manual worker he reluctantly took a job as a fitter. Marina was disgusted but resigned herself to the situation. Her husband now supports the family while she earns a pittance working in the Mission Control Centre at Korolev. Sometimes, after a strenuous 24-hour duty shift she asks herself whether her family traditions are worth preserving. She asks: 217 “What’s the good of all that science when my husband who is a highly qualified engineer has to work hard at a very low-skilled job just to feed me and our child. We cannot even afford another child now and definitely not in future.”

A troubling sign of the recent period of Russian degradation is the rising wave of mysticism, occultism and widespread anti-science attitudes. Such attitudes are not surprising among the uneducated masses who do not seek the cold truths and hard work solutions suggested by science but the solace and easy gratification supplied by numerous quasi-religious gurus. The ruling class of Russia is now aiming for something it refers to as “controlled democracy”. It is not surprising that the rulers hate exact scientific analysis and are suspicious of scientists who tend to ask straight questions and expect clear answers. This is why science finds little support from the government while the Russian Orthodox Church enjoys unprecedented benefits. The Church doctrine is based on strict obedience of the believers to the Church hierarchy and to the rulers of the country. The Church is known for its anti-science dogmas and persistent objection to any attempts to modernise Russia. It may be a fitting illustration of the current extremely confused state of minds in Russia when one sees a priest of the Orthodox Church dressed in magnificent medieval robes proclaiming ancient ritualistic formulas of blessing over the symbol of modern technology – the sleek Soyuz rocket launcher standing at the Baikonur launch pad ready to deliver the Russian-US crew to the International Space Station.

Looking back one sees a spectacular contrast between popular feelings at the turn of the millennium and in most of the 20th century in Russia when scientists, engineers and cosmonauts were idols, heroes known to the general public better than sports and entertainment stars are now. Despite many obvious objections one is tempted to call most of the 20th century “the Age of Reason” in Russia when people almost religiously believed in scientific progress and the ultimate happiness it will bring to humanity. What now seems to be coming is “the Age of Darkness” when everybody will be concerned only with his/her own immediate survival/gratification without any interest in higher things such as progress and destiny of humanity.

Interestingly, the still lingering (even subconscious) public respect for science is taken into account by the clever sellers of mystical goods (or entertainment for instant gratification) as shown by the quasi-scientific language they often employ for advertising their merchandise. Apparently, they think that the public expects the terminology of science and reason even when the subject is totally senseless and unreasonable. They are advertising and selling “quantum Tsar’s pills” that can cure 666 deadly diseases. One reads of the “cosmic sources of spiritual power” that can promise immortality for humans through the use of “ultra-fine torsion fields” and so on. Many more examples can be given all showing that the Russian public can be very easily deceived with a pseudo-science jargon.

Optimists believe that this leaves room for the hope that improvements in education will help to return science to its proper central position in society. Pessimists say that some aspects of the current situation in Russia indicate a possible return to the obscurantism of a medieval type.