Innumeracy and the Fires of the Inquisition

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We live in an insane world, in which most governments behave like the pigs under an oak tree in the fable by Krylov, both eating the acorns and digging up its roots, thus destroying the source of their very sustenance.

With the (temporary?) cessation of military confrontation between east and West, the funding of science in Russia has been virtually discontinued. Experts say that during the last 10 years it has decreased seventeen-fold and stands now at one-fourth of the level required for its mere survival. The spending on education decreased from 7% of the GDP in 1970 to 0.6% in 1997 (with further reductions planned for 1998).

These madmen, who are literally chopping off the branch they are sitting on, finance, if at all, only "applied" sciences, whose benefits can be immediately seen. As the President of the Russian Academy of Sciences (RAS) Y. S. Osipov put it, they think it will be easier to gather apples by cutting down the apple tree.

Louis Pasteur (who can hardly be accused of conducting studies of no use to humanity) taught that there is no "applied science", but only applications of science. Experiments with amber and cat fur must have seemed useless to the rulers and military leaders of 18th century. However, precisely these experiments turned our world upside down once Faraday and Maxwell came up with the equations of electromagnetism. These achievements of fundamental science repaid with interest all the expenditure on science for many hundreds of years. Refusing to honour the debt to science is a surprisingly shortsighted policy of modern governments. The punishment for it will be the technological (and hence both economical and military) underdevelopment of countries pursuing this policy.

The damage inflicted on Russia by the destruction of fundamental science which is taking place before our eyes can only be compared with the harm caused by the fires of the Inquisition to Spain and Western civilization as a whole.

Branches of science, which for many years were a source of our pride, such as mathematics, find themselves in a particularly grievous state. According to the calculations of Academician L. D. Faddeev, the Secretary of the Mathematics Section of the RAS, spending per year on the entire mathematical science in the FSU was equal to the cost of a single tank, whereas the current expenditure on mathematics in Russia is about a tenth of the cost of a tank. Fundamental sciences like mathematics require a negligible amount of money and yet there is no allocation for it in the Russian budget.

According to a survey conducted by the RAS Institute of the Social-Economical Problems of Population and paid for by the Central Bank, in October '96 the total savings held by the Russian population were worth more than US $140B. This is approximately 3 times the previous government estimate. That means that nearly US $100B have been generated by crime. Compare these US $100B with the ***RAS*** budget of approximately US $.5B/year (the budget of the Mathematics Section is a small part of that sum).

From the point of view of a mathematician, all people belong to one of two classes: those who like to subtract and divide, or those who prefer to add and multiply. The work of scientists contributes to the growth of national wealth, and the attitude of society towards scientists in other countries is somewhat different from ours. It is impossible for a scientist to survive with the salaries we get here. The salary of a Professor at the Institute of Mathematics of the RAS (such as myself) is less than US $100 per month. This is approximately one hundredth of the salary of my American peers. The Army Research Office and Defense Advanced Research Project in the US have demanded an increase of more than 12% in the mathematics budget in '98 (as compared with '97). A possible reason for that may be the convincing victory of China and Iran at the last International School Mathematics Olympiad. These countries have done better than both the US and Russia. This might have happened because China and Iran have to produce strong mathematicians for their nuclear and missile industries.

The survival of mathematics in Russia (and of other strong scientific schools), and the fact that there still are great scientists and teachers in Russia who refuse to emigrate and are doing all they can to foster the talents of a new generation of students, are a testimony to a form of "heroism" (or, from the point of view of our Western colleagues, of stupidity) long a tradition of the Russian intelligentsia. But this state of things can not continue indefinitely.

Amazingly, the RAS, Moscow State University and society as a whole manage to find funds for anti-scientific nonsense such as parapsychology, and to support the publication of works by people of a "nonstandard historical orientation" tending toward fascism. Ignoramuses are regaled with pearls such as: "Cancer, incurable psychiatric illnesses and other chronic diseases of children and adults arise as a result of placement of beds at the nodes of intersections of pathogenic zones" of geological origin, that allegedly cover the Earth with grids of the size of 2.5m, 3.75m and 7.5m, respectively (Vestnik RAN, 1996 #6, pp. 713-719). The powers that be always have money for nonsense like that. It is significant that Hitler also encouraged pseudo-science.

The traditionally high level of Russian mathematics has always had its foundation in a solid high school education. It even withstood the attempt to introduce the formal, axiomatic-scholastic approach into schools in the late 60s.

Unfortunately, the level of numeracy of the country as a whole is now falling catastrophically. The "humanization" and "humanitarization" of education being planned by the Russian Ministry of Education involves a drastic reduction of the mathematics curriculum and the transfer of the resulting extra class hours to new subjects such as macramé and horse-breeding.

It seems that the Ministry is trying to bring our traditionally good mathematical education down to the level (a traditionally low one) of the mathematical education in the US, exactly at a time when the Americans are beginning to adopt our experience to improve radically their mathematical education, with the intention of making it the best in the world.

It is somehow ridiculous to have to prove that every civilized person needs to be numerate: only savages think that bread comes down from the sky, that cars have always existed, and that there are no benefits from having airplanes.

A numerate person immediately understands the meaning of the statement that life expectancy for males in Germany is now over 80 years, while in Russia it is close to 60 years. The 10 year drop of life expectancy in the countries of the former Soviet Union is equivalent to the simultaneous execution of approximately 80 million people (in terms of loss of man-years); in Russia alone the number is about 40 million. (Lemma: when communists put you to death, you lose on the average a half of your expected lifetime.)

Even more important than the ability to add fractions is the fact that a basic acquaintance with mathematics allows one to distinguish a correct argument from a faulty one. Without this ability, a society turns into a herd, easily manipulated by demagogues. According to Western experts, in the current situation in Russia, the assumption of power by a Hitler is even more likely than it was in Germany in the 1920s.

It is worth mentioning that a mathematical education by itself is not a panacea. It will not cure political sloppiness and indiscrimination, nor will it protect from the virus of arrièrism. For instance, the anti-Semitic tabloid "Vremya" ("Time"), published by the Union of the Russian People has on its editorial board a "pseudointelligent" (*obrazovanets*, a perjorative word coined by Solzhenitsyn), who is a member of the RAS Mathematics Section and of the US National Academy of Sciences. During the recent elections a glossy special section of this tabloid (#45 '97) was delivered to almost every mail box. Along with a catechism suitable for our times (Q:"What was the name of Berezovski's father?" A: "Abraham"; Q:"Who rules Russia?" A:"the Mafia") in its crossword, it states that 21% of the number 173.3 is 30.4. But even 17*2 equals 34, which is already greater than 30.4. This means that neither the author, nor the editors, nor the proof-reader could manage fractions or percentages.

Whether our next ruler will be the Mafia or a charismatic nationalistic extremist (as is predicted by the head of the Department of Political Science of the MSU, who also calls for a struggle against the US, a struggle which "will require great courage and the ability to take risks", and which will most likely be of a "military-strategic" nature (Vestnik RAN, 1997, p. 1017)), the basics of fractions and percentages are absolutely essential in modern society. The future of a Russia in which the study of fractions is replaced by macramé appears bleak.

Of course, the impact of the destruction of the mathematical culture will not be immediate. But the example of Germany (which, having to repair the damage caused by the Nazis, still lags behind other countries) shows that the preservation of high scientific and educational standards in Russia should be a strategic problem of the utmost urgency.

If this problem is not addressed in the near future, we will find ourselves for decades, if not forever, in the position of a fourth world country, and Russia will be remembered as people remember the once famous and forever lost Empire of Alexander the Great.

In my opinion we should combine a massive increase of the state support with the creation of a system in which investment in science and education is made attractive to entrepreneurs and financiers.