

FROM THE EDITOR

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Everybody knows that the Soviet Union had a great culture of chess. Many outstanding chess players of the 20th century were from the USSR. Much less known, however, is another remarkable cultural tradition, which I will refer to as the “Math Movement,” with capital M’s. Quite different from recreational mathematics in the West, Math Movement mathematics was a unique phenomenon in the social life of the country, if the term “social life” is at all applicable to communist regimes. The tradition was upheld and promoted by a great variety of enthusiasts – from 13-year-old schoolboys and girls, to seasoned mathematics professors. The phenomenon hit every large city of the country that spanned eleven time zones. These enthusiasts were engaged in creating contrived, complex and intellectually challenging math problems which could be solved, in principle, on the basis of elementary mathematics (i.e. “mathematics before calculus”), as it was taught in Soviet schools. They strived to get nonstandard solutions to these problems, and to disseminate knowledge about such problems and their solutions in every school and every class.^a This Math Movement became widespread in the 1930s; and it attracted the best and the brightest. Its basis was formed from so-called *mathematical circles* – groups of school students, math teachers and mathematicians that existed virtually in every school, university, and in many other places. I remember that I myself belonged, at different times, to several such circles: one at my school, another at the Moscow Institute for Physics and Technology, and a third one associated with the Moscow Palace of Pioneers. They held regular meetings, once or twice a week, where advanced problems were discussed in classes and offered for personal analysis on one’s own time. I looked forward to

^aSome idea of the character of these problems can be inferred from a selection *Mathematical Circles* published by the American Mathematical Society.¹

and enjoyed every meeting – they provided me with brain gymnastics, which were otherwise so scarce and so discouraged, to put it mildly, in every other aspect of Soviet life.

The Math Movement had its Grandmasters, who were highly esteemed. Most of them were research mathematicians and university professors who had drawn experience from years spent within the same mathematical circles. Their books, which contained selections of problems with commentaries, or thorough analyses of selected topics from “elementary mathematics,” were in high demand. Many of these books were superb and unparalleled in their quality and depth. Remarkably, they were swept from the bookstore shelves, immediately upon arrival. These books were a captivating read, and I hunted for some of them in secondhand bookstores for weeks and even months.

Mathematical circles were just one element of the Math Movement. *Olympiads* (or math competitions) presented another pillar. They were organized on a regular basis and at every level, beginning in school districts, through city competitions, and finally at the national level. The highest achievers at every level were admired. National prize winners were praised by the media just as winners of the national spelling-bee competitions are praised in the US.

Finally, the third pillar of the Math Movement was a network of special “mathematical schools.” Every city had at least one, and large cities, such as Moscow and Leningrad, had, perhaps, a dozen. Even small towns tended to arrange a “mathematical class” in a school. At age 13 or so, mathematically and scientifically gifted students were selected for such schools through a competitive process – usually a skillfully tailored entrance examination. What made these schools really special was a unique academic and social environment. They were run by enthusiastic teachers who worked not for money – salaries were meager, as they were everywhere else in the USSR – but for the excitement and joy that naturally emerged in the creative atmosphere produced by enthusiastic students united by a common appreciation for the beauty of math and science. Classes often continued far into the night. Students and teachers often went on weekend trips, summer retreats and hiking expeditions. My daughter was a student at one of the best Moscow

math schools, # 57, and I remember many events of this type, and so does she – fifteen years after graduation.

The Math Movement was an element of culture scarcely mentioned in the literature accessible to the western reader. One of my goals in this book is to familiarize the western reader with elementary math problems, of various levels of complexity, which constituted a fertile ground, the very basis of the Math Movement. The core of this book, two excellent essays written by Dr. Ilan Vardi, serve this purpose.

There is another goal, however, which is as important to me as the first one. This second objective is explained below.

Mathematics at the service of ideology of “real socialism”

“All students are treated equally,
but some more equally than others...”

Achievements of Real Socialism
(Moscow University Press, 1982)
Vol. 1982, p. 1982.

“Don’t worry, we will flunk them all...”
*From an overheard conversation of
a mathematics professor with
the Chairman of an Admission Committee.*

An important part of this book is devoted to a bizarre and, I would say, unique page in the history of science. It tells a story of how high-school mathematics was used as a weapon of racism in the USSR – a country which gave to the world many brilliant mathematicians whose role in shaping 20th-century mathematics was absolutely instrumental.² This topic deserves the attention of professional historians, and I am admittedly an amateur in this field. Since professional historians are in no hurry, and time is rapidly erasing the recollections of live witnesses, I would like to, at least, set the stage. My role is more than modest. I collected, at a rather fragmentary level, relatively accessible notes and recollections of live participants in these events. Some were published in the Russian media, and thus the only effort needed to make

them accessible to the western reader was translation; others were not published.

The place of action is the Soviet Union, the time is the 1970s and 80s, a time of a general decline of the regime that accelerated after the 1968 Soviet invasion of Czechoslovakia. The social and economic climate was rapidly deteriorating. Stagnation, moral degradation and decay became permanent components of the everyday life of Soviet citizens. Among other ugly phenomena of the so-called *real socialism* that flourished under Brezhnev was state-sponsored anti-Semitism. Vehemently denied in public, it was in fact orchestrated by the highest echelons of the Communist Party and, behind the scenes, encouraged and promoted by the state-party machine.

As a particular manifestation, discrimination against Jews in the admission policies of Soviet universities reached its peak. Of course, it was not the first peak, and not even the strongest, but it was strong enough to virtually close all reputable departments of mathematics in the Soviet Union, as well as some physics departments, to Jewish applicants.^b I do not know why, but it is a well-known fact that the Russian mathematical establishment was pathologically anti-Semitic. Such outstanding mathematicians as Pontryagin, Shafarevich and Vinogradov, who had enormous administrative power in their hands, were ferocious anti-Semites. The tactics used for cutting off Jewish students were very simple. At the entrance examination, special groups of “undesirable applicants” were organized.^c They were then offered killer problems which were among the hardest from the set circulated in mathematical circles, quite frequently at the level of international mathematical competitions. Sometimes they were deliberately flawed. Even if an exceptionally bright Jewish student occasionally overcame this barrier in the written examination, zealous professors would adjust the oral exam appropriately, to make sure that this student flunked the oral exam.

What else is there to say on this issue? Everybody knew that “pu-

^bStatistical data illustrating this fact in the most clear-cut manner were presented in the *samizdat* essays^{3,4}, see also the book⁵.

^cThe working definition of “Jewishness” was close to that of Nazis; having at least one Jewish parent or even one grandparent would almost certainly warrant one’s placement in the category of undesirables.

rification” of the student body, Nazi style, had taken place for years. It was a part of Soviet state ideology. Needless to say, the Soviet state did not want it to become public knowledge, especially in the West. The silence was first broken by dissidents and Jewish *refuseniks*^d in the 1980s in a series of *samizdat*^e essays, one of the first and the most famous of which, *Intellectual Genocide*, was written by Boris Kanevsky and Valery Senderov in 1980. This book presents the first publication of this essay. As you will see, it is very factual and is based on a study of 87 Moscow high school graduates from six special math schools, many of whom had won prizes in national mathematics Olympiads. The bulk of the essay is an unemotional comparative analysis of various math problems given to “desirable” and “undesirable” applicants, with statistically motivated conclusions at the end. The essay was deemed a political provocation, and heavy consequences ensued shortly. One of the authors, Valery Senderov, was sentenced to seven years in prison and 5 years in exile on charges of anti-Soviet agitation and propaganda. Boris Kanevsky was also arrested and spent three years in prison. It is hard to believe it now, but this is a true story. This is how it was ... and, unfortunately, this is not just “the past, long gone.” Although anti-Semitism is no longer encouraged by authorities in the new Russia, some of the zealous professors who were part of the “intellectual

^dA group of people treated as political enemies in the USSR in the 1970s and 80s. The only “crime” committed by these people was that they had applied for and got denied exit visas to Israel. And yet, they were treated essentially as criminals: fired from jobs and blacklisted, with no access to work (with the exception of low-paid manual labor), constantly intimidated by the KGB, at the verge of arrest. In fact, the most active of them, those who tried to organize and fight back for their rights, were imprisoned.

^eA strict censorship existed in the USSR. Nothing could be published without pre-approval from *Glavlit*, an omnipotent State Agency implementing censorship. The class of suppressed books and other printed materials included not only those with political connotations, but, in general, everything that was not considered helpful for Soviet ideology. Forbidden publications circulated in typewritten form. People retyped them, using mechanical type-writers and carbon paper, or photographed them, page by page, using amateur cameras, and then printed them at home on photopaper, producing huge piles. The process was called *samizdat*, which can be loosely translated from Russian as self-publishing. *Samizdat* was forbidden by the Soviet law.

genocide” in the 1980s continue to occupy high positions and flourish at Moscow University and some other institutions. Alas, there is no full stop in this story yet. Apology or remorse is not in sight.

To put a personal touch on this picture and to give a clearer idea of the atmosphere in which we lived, I would like to tell of an episode which happened to me in 1985 or '86. A friend of mine gave me a wonderful gift: a photocopy of Feynman's book *Surely You're Joking, Mr. Feynman*. I swallowed it overnight. It was so fascinating that I could not keep it to myself. I badly wanted to share my fascination with others. Upon reflection, I decided that the only way for me to do so was to translate it into Russian and try to publish the translation.

I called a person – let us call him RA – who was in charge of one of the departments of the popular magazine *Nauka i Zhizn* (*Science and Life*). From time to time, he would provide me with small writing jobs, so I could make an extra 20 or 30 roubles to make ends meet. In those days, this magazine had a circulation of three million plus. Now it is almost extinct; a meager 30 thousand is all that the new Russia can support.

RA met the idea with enthusiasm and was very supportive. He told me that I could go ahead and translate from a quarter to a third of Feynman's book, at my choice. He would push it through the board and take care of the copyright issues.

“Just make sure you stay away from chapters with political connotations, and passages where he might mention our spy at Los Alamos, Klaus Fuchs,” he added. “Focus on science.”

I worked for a month or so, and came up with 120 typewritten pages which I brought to *Nauka i Zhizn*'s office and left with RA.

In a few days he called me and said: “Are you mad?”

“What happened?”

“In your translation I found at least three paragraphs where Feynman mentioned he was Jewish. The board will never authorize this material for publication. Cut them out!”

“I do not understand, RA ... You said yourself, just steer clear from Klaus Fuchs and political issues, and so I did ... this is not political...”

“This *is* political. Just do what I am telling you, or say farewell to

the project.”

What could I do but comply? My crippled translation was serialized and published.^f

On this book

A few words on the structure of this book. As I have already said, mathematics – the purest and the most beautiful of all sciences – is not responsible for the abuses associated with it. In the mid-1990s Alexander Shen, professor at the Independent University of Moscow, published⁶ in *The Mathematical Intelligencer* a selection of problems which were offered to “undesirable” applicants at the entrance examinations at the Department of Mechanics and Mathematics (Mekh-mat) of Moscow University. Many of these problems are captivating. Their solution does not require knowledge of a higher level of mathematics; what you learned in high school will do. The solution does require, however, ingenuity, creativity and unorthodox attitudes. Solutions to these problems were thoroughly analyzed by Dr. Ilan Vardi. He wrote two excellent essays which are being published in Part 1: *Mekh-mat entrance examinations problems* and *Solutions to the year 2000 International Mathematical Olympiad*. The second essay is meant to complement the first one by providing a natural frame of reference for evaluating the relative complexity of various problems.

Part 2 provides the reader with necessary historical background. English translation of Kanevsky and Senderov’s essay *Intellectual Genocide* opens this chapter. Among other things in Part 2 the reader will find an essay *Science and Totalitarianism* written by A. Vershik, which has

^f *Nauka i Zhizn*, # 10, 12 (1986); 2, 8 (1987) and 8 (1988). There is a funny continuation to this story. *Surely You’re Joking, Mr. Feynman* was published in Russian in full only in 2001.⁷ My 1/3 of translation was incorporated; the remaining 2/3 of the book were translated by Natasha Zubchenko. Apparently, she was educated in classical British English. Many nuances of Feynman’s English puzzled her and she found them incomprehensible. We had exchanged innumerable messages, and I had a few phone conversations with Natasha, trying to help her out. And yet, quite a few hilarious misinterpretations slipped unnoticed. For instance, orthodox rabbi was translated as “православный раввин.”

never been published in English previously.

Part 3 describes a little-known page of 1970s-80s Soviet history, one rather rare example of the oppressed organizing to defend their dignity and trying to fight back. This is the story of the so-called *Jewish People's University*, the inception of which is associated with the names of Kanevsky, Senderov and Bella Abramovna Subbotovskaya.

It opens with the article *Free Education at the Highest Price* written by K. Tylevich, a young friend of mine who became interested in the story, made an extensive literature search, and summarized what little was known in the literature, by the beginning of 2004. Then follow personal recollections of D. Fuchs, A. Zelevinsky (both taught at the Jewish People's University) and I. Muchnik (Subbotovskaya's ex-husband), live witnesses of the events. They are emotionally charged and immerse us in the depths of this dramatic story.

Bella Subbotovskaya's idea was to launch something along the lines of unofficial extension classes, where students unfairly barred from the official universities could get food for their hungry minds from the hands of first-class mathematicians and physicists. It was supposed that the classes would take place on a regular basis through the entire school year, that they would be open to everybody (no registration or anything of the like was required) and that the spectrum of courses offered would be broad and deep enough to provide a serious educational background in the exact sciences.

Andrei Zelevinsky (now at the Northeastern University, Boston) recalls:⁸ "... I was truly impressed with her [Subbotovskaya's] courage and quiet determination to run the whole thing. All the organizational work, from finding the places for our regular meetings to preparing sandwiches for participants, was done by her and two other activists: Valery Senderov and [...] Boris Kanevsky. Both, as I understand, were active dissidents at the time. I think they made a deliberate effort to separate mathematics from politics, in order to protect us, professional research mathematicians."

Another professor of this "university," Dmitry Fuchs (now at UC, Davis) writes: "We taught there major mathematical disciplines corresponding to the first two years of the Mekh-Mat curriculum: mathemat-

ical analysis, linear algebra and geometry, abstract algebra and so on. I taught there since 1980 through 1982, until Subbotovskaya's sudden death in September or October of 1982 put an end to this enterprise. Bella Abramovna was tragically killed in a hit-and-run accident which was universally believed to be the act of KGB. This has never been officially confirmed, though. At this time we did not use any particular name for our courses [...]. The number of students varied between 60 and 20. The place of our meetings was not permanent: we met at an elementary school where Bella Abramovna worked as a teacher, at the Gubkin Institute for Oil and Gas, at the Chemistry and Humanities Buildings of the Moscow State University, and so on. Anywhere, where we could get permission to occupy a large enough room... All instructors prepared notes which were photocopied and distributed among the students. An article on our "school" was published by a Russian-Israeli newspaper some time ago.⁹ It was interesting but excessively emotional. Among other things, the authors had a tendency to exaggerate the Jewish nature of our "university." It is certainly true that a substantial number of both students and teachers were ethnic Jews. This was the result of the well-known policy of the Mekh-Mat Admission Committee, and the Soviet State at large, rather than the deliberate aim of the organizers. After all, we taught only exact sciences. No plans were made to teach Jewish culture, history, or language."

Needless to say, all teachers of the Jewish People's University received no reward other than the wonderful feeling that what they were doing was a good deed. Although the goals of the university were purely educational, the very fact of its existence was considered a political act of resistance. The end of Jewish People's University, which gave excellent mathematical education to over 350 young people, was tragic. The actual circumstances of the death of Bella Subbotovskaya remain uninvestigated so far. Perhaps the materials I present in this book will attract the attention of a historian or a novelist, who knows?

Thank you

This book was in the making for four years. The work on it became my weekly hobby, sucking me in like a good detective story. In fact, it was a detective story which spanned two decades and three continents. As the story unfolded, increasing numbers of people became involved, and it is their generous assistance that made this publication possible. I am deeply grateful to all participants.

It was Gregory Korchemsky, a theoretical physicist from Orsay and an old friend of mine, who came to Minneapolis in the spring of 2000 and brought, as a present, Ilan Vardi's Mekh-Mat essay. From this essay I learned of Shen's article in *The Mathematical Intelligencer*, which, in turn, quotes *Intellectual Genocide* of Kanevsky and Senderov. When I tried to google Kanevsky and Senderov, I got a few dozen hits, none of them being particularly useful since they contained only marginal mentions of Kanevsky and Senderov's essay. Archive searches became inevitable. I wrote to many archives in an attempt to get a copy of the essay and/or locate the authors. In the autumn of 2000, three positive responses came — from G. Superfin (*Forschungsstelle Osteuropa*, Universität Bremen, Germany), N. Zanegina (Open Society Archives at Central European University, Budapest, Hungary), and G. Kuzovkin (Memorial Archive, Moscow). Along with other useful materials, they sent me photocopies of *Intellectual Genocide*, none of them complete, all taken from typewritten n -th carbon copy of distinct originals where I estimate $n > 3$. The tedious work of comparing three distinct copies, restoring the full original, checking all mathematical expressions and translating the original into English was done by Nodira Dadabayeva and Alexei Kobrinsky, my student helpers who were also responsible for typesetting all of the materials.

In November 2003, I managed to get in touch with Valery Senderov through the Editorial Office of *The Herald of Europe*. In December of the same year I interviewed him in Moscow. Not only did he share with me a treasure trove of personal recollections of the 1980's, but he also connected me to Boris Kanevsky in Jerusalem who owns a large private archive of *Samizdat* documents (and shared some of them with

me), and to M. Vyalyi, A. Belov-Kanel and A. Reznikov, the Editors of the *Matematicheskoye Prosveshcheniye*.⁹ This Russian magazine is intended for the general public and devoted to the advancement of mathematics. The 2005 Almanac of *Matematicheskoye Prosveshcheniye* will include a collection of articles on the Jewish People's University and B. Subbotovskaya. Two of these articles are translated into English and published in Part 3, with the kind permission of the Editors.

It is my pleasure to say thank you to Sally Menefee who handled all financial aspects of this project and to Roxanne Keen for proofreading the articles translated from Russian. I am grateful to Roman Kovalev who carried the main burden of translation. As usual, my World Scientific contact, Lakshmi Narayanan — “my Editor” — was instrumental in the speedy completion of this project. Special thanks go to Poline Tylevich, the graphic designer, who did a great job making this book visually appealing. And, above all, I want to say *thank you* to the contributors and advisors who are listed below.

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