

## MEMORIES OF DIMITRY DIAKONOV

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Collecting my memories below, I decided not to focus on particular physics ideas and their development over time, but to focus on what makes Dimitry Diakonov so special. Using his family background, based on linguistics and history, he developed over the years multiple interests and skills reaching far outside physics.

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I met Dimitry (for friends and family — Mitya) 50 years ago, around 1974, at the place where it should have happened: the Winter Physics School near St. Petersburg. Its main organizer for about 40 years or so, Lev Abramovich Sliv, was a distinguished nuclear physicist. Yet the school was very wide, including theorists and experimentalists from various fields of physics. It was the best place in the country to learn what physics is about, who does it, and to get to know the physics people at their best, on an informal level. Of course, I met there many more people who remain good friends till today.

The time was very special. In 1973 Quantum Chromodynamics was discovered, and strong interaction theory was a widely open field. In 1974 I just got my Ph.D. and my first job at Budker Institute in Novosibirsk Akademgorodok, and I was open to new directions.

Mitya was in a similar situation. He was then involved, with Dokshitzer and Troyan in perturbative QCD. This work gave him a name and recognition in the theory community: but that was far from my interests. Yet, listening to him I had a feeling we would not just be friends, but also competitors, providing each other with needed support, as new adventures would come. Indeed, in a few short years, we shared interests closely, and in the next decade, in the 1980s, we began to work on QCD topology, instantons in particular. We had not worked together, rather forming two competing groups by the end of the decade, since we had rather different styles. And

yet, we obviously were doing the same thing, and spent many evenings debating this or that question, whenever we managed to meet, for the next 30 years.

Let me start with describing his family background, which determined his cultural style we all admired in him. I (and perhaps the rest of the crowd) had a feeling that Mitya was different, he had an aesthetic element very important for his physics works, lectures, and talks. He also wrote some poems, mocking theatrical pieces, played guitar and piano, *etc.* You may read his literature works on the internet.

In 1986, Mitya was preparing his Doctoral defense<sup>1</sup> on the instanton ensembles, and I was one of his “opponents”, as it was called, at this defense. Coming to Leningrad, I was usually staying in the “House of Visiting Scientists”, a place where the armed guards of the Winter Palace were kept, next door to the now world famous Hermitage Museum. However, that time something went wrong with it, and at the end, Mitya simply invited me to spend a few days in his family apartment. The large apartment included all his extended family: the parents, the aunt and her adopted daughter. I was very impressed by the atmosphere at the large dinner table, where people ate very simple food (I recall macaroni “po flotsky”, a simple pasta dish) and discussed very high-level issues of history and literature.

His father, Igor Diakonov, was the center of this beautiful family. Historian and linguist, world-class authority on Sumerian and other cultures and languages of the millennia past. We all know the famous quote that the older we become, the more clever our father looks. This is of course true for all fathers and grandfathers, as we simply get to certain life-persistent questions at some age. Very often it is too late: and indeed today I would have asked Mitya’s father many more questions than I did in 1986. His worldwide fame made him the author of an article in Encyclopedia Britannica, which was sent to him in full (also contributing to Mitya’s knowledge of random subjects ...). He is discussed in Wikipedia, both in English and Russian language versions, which provide very different pictures of him.

Once Diakonov-the-father was asked to send one of his students to the Winter School, for the so-called cultural part<sup>2</sup> of it. It was a girl who read the story written by a Sumerian school boy on the subject of “how he spent the last day”. The simple story from a clay tablet was that of a boy who came late to school, the teacher, sending for his father, and a father who invited the teacher home for dinner (which settled the issue), had lasting influence on us. It proved without extra efforts the obvious fact that people basically have not changed even slightly over the past thousands of years.

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<sup>1</sup> In Russia “doctor of science” is not a Ph.D. but the second degree, roughly corresponding to full Professor level in the West.

<sup>2</sup> Thus, one can see how wide was a range of topics discussed there ...

Mitya's mom, Nina Yakovlevna Diakonova, also a linguist and expert in English literature, was a very active self-confident woman, with whom I also easily connected. She can also be found in (Russian) Wikipedia where one can get the details. She was active till a very old age, her students were coming to her apartment. She definitely maintained, so to speak, a cultural presence in the family. Example: in 2009 (when she was 94) she not only was still teaching, but her contract was renewed for 5 more years (!)

This family background subjected Mitya to a different culture<sup>3</sup>, linguistic and historical, from childhood. But he also was very much interested in current history, finding meaning in some events that the rest of us had little understanding of. Already around 1980, at solid Brezhnev's time, he somehow proclaimed to a few friends that the country was in free fall and nothing could stop it. I did not believe a word of it then thinking it would last another century or so, and yet a decade later, Mitya's prediction came true! The Communist party, then around 10 million members or so, hardly even made any effort, when the whole house of cards suddenly fell apart.

Let me also mention another place where I regularly met Mitya (and many dear friends), the Bakuriani Physics School. Bakuriani is a mountain village near Georgia's border with Turkey. Organized by David Kotlyarevsky and related to the mountain-top cosmic ray station there, it gave us a chance to discuss physics and also to ski. One picture of me and Mitya (see Fig. 1) shows us busy digging out a heavy vehicle borrowed from the Russian artillery, which was the only one able to reach the top station in winter time. There some of us gave talks, had lunch and then put on skies and went some 20 km downhill back to "The Physicist House" in Bakuriani. I would count that day as one of the most memorable ones in my life. (The cosmic ray station and even ski lifts we used on the mountain were later destroyed, during Georgian Civil War. Kotlyarevsky emigrated to Israel, where he continued in his late years organizing some science events for kids. Many more members of the Bakuriani brotherhood are all over the world now.)

Let me tell another little story of Mitya, showing how he was different. After one of the Bakuriani Schools we left earlier (what fools we were, in retrospect) and took a regular bus to Tbilisi. Mitya happened to share a seat with a pretty teenage Georgian girl on the bus, and there were several hours to go. Instead of simply chatting/flirting with her, he got his notebook, opened a new page and asked her to teach him Georgian language. He started systematically, listing all Georgian alphabet, the names of all the letters *etc.* That part was interesting to me too: so I was listening to them, sitting behind: then I got distracted or tired, but I recall that by the end of

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<sup>3</sup> The famous notion of "two cultures", scientific and humanistic ones, was proposed by C. Snow: but for me, its champion was Evgeny Lvovich Feinberg who was also fluent in both and even wrote a book about their interrelation.



Fig. 1. Mitya (below) and myself while digging out the artillery truck, the only way of transportation to the mountain cosmic ray station. Note that Mitya is dressed city-style yet already behaves like an experienced mountaineer.

the ride, he had a concise summary of Georgian in a few pages, grammar, and all that. If needed, he was prepared to give a small lecture about it, perhaps at home at his dinner table.

I of course met Mitya often during his work in Nordita, Copenhagen, on both sides of the Atlantic. The heaviest blow to his life during this period, affecting his outlook on life, was the pentaquark story. It was first discovered by several groups, and then undiscovered by many more. While his (with Vitya Petrov) chiral model predicted it to exist, most people were skeptical. The controversy about it remains to this day.

After Mitya returned to St. Petersburg, we were meeting less frequently. The last photo of us together is due to Leonid Glozman (another organizer of an excellent school in Schladming Austria, 2009, to whom we are all very grateful). It was on the day when there was heavy snow and the lifts/slopes were closed. Leonid still suggested that we should not spend a free half-day at the blackboard but go for a hike, without skiing but by foot, through the snow on the path he claimed he knew well. We had a bit of a problem even to find its beginning, but then indeed we ended up in a small Austrian

village (where the photo Fig. 2) was taken) with a warm place to drink coffee and stronger things, having an excellent time together. The subject of our discussion was a recent revival of the QCD topology, now at nonzero temperatures, and driven by the fact that instantons get dissolve into  $N_c$  self-dual dyons if the field background has nonzero  $A_0$ . It is enough to say that Mitya and collaborators did elegant and inspiring one-loop calculations explaining the measure of these dyons, with lots of other valuable insights. Those were the elements needed for my attempts to understand the near- $T_c$  QCD topology: I am sure those papers will have citations long after we are all gone.



Fig.2. We at another school in snowy mountains, this time near Schladming, Austria.

Having experienced Nordita, with its cool and rational self-governing style, Mitya thought Russian scientists are as clever as the Nordic ones, and can self-govern themselves, guided by some council of experts. Needless to say, the Russian tradition of government, including the Academy of Sciences, was very different, even in the “perestroyka” time. His efforts have met with a lot of resentment, to put it mildly. I had not managed to discuss the status of that project with him, but learned from Ludwig Faddeev (his distant relative), who was kind of worried about him. The last email from Mitya I had received had no trace of that: it was an invitation to the next summer Euler symposium.

Shocking news about Mitya’s passing away struck many of his friends completely unprepared. The Covid pandemic and other disastrous events wiped out most of Diakonov’s school. What is still left are the papers, written in a distinct elegant style ...