

# Memories of Mitya Diakonov

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Shocking news about Mitya's passing away struck many of his friends completely unprepared. (In fact I am finishing a paper right now on the first simulation of ensemble of dyons, inspired and incorporating several years of beautiful Mitya's work: but now I will never know what he would think of it.) Yet let me gather some cherished recollections of him. <sup>1</sup>

I met Mitya at the end of 1970's, where it should have happened: at LIYAF Winter School. Ran by its main organizer, Lev Abramovich Sliv, for about 40 years or so, it was the best place in the country to learn what physics is about, who does it, to get to know the physics people at its best, at an informal level. Of course, I met there many more people who remain good friends till today: Genya Levin for example.

Mitya was then involved, with Dokshitzer and Troyan in perturbative QCD work which gave him a name and recognition in the theory community: but that was far from my interests. Yet in few short years we shared interests closely and in the next decade, 1980's, we start working on QCD topology – instantons in particular. We had not worked together, rather forming two competing groups by the end of the decade, and 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.

In 1986 Mitya was preparing his Doctoral defense<sup>2</sup> on the instantons, and I was one of his “opponents” as it was called at the defense. Coming to Leningrad, I was usually staying in the “House of visiting scientists” – actually a place where the armed gards of the Winter Palace were kept, next door to now world famous Hermitage museum, but that time something went wrong with it and Mitya simply invited me to spend few days in their apartment. 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 eated very simple food (I recall “macaroni po flotsky” – simple pasta dish) and discuss very high-level issues of history and literature.

His father, Igor Diakonov, was the center of that beautiful family. Historian and linguist, world-class authority on shumerian and other cultures of the mil-

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<sup>1</sup>I apologize to some for not writing in Russian: his many friends in the West would perhaps like to read it as well.

<sup>2</sup>I remind the Western readers that it is not a Ph.D. but the second much more prestigious degree, somewhat on the level of full professor.

lennia past<sup>3</sup>. 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.

Once he sent his student to Winter school, for the so called cultural part of it, who read the translated story by a shumerian school boy on a subject of how he spent the last day. The simple story of a teacher, sending for his father because he was late to school, and a father who invited the teacher home for dinner to settle the issue, had lasting influence on us. It proved without extra effort the obvious fact that people basically had not changed even slightly in the intervening thousands of years.

Mitya's mom, Nina Yakovlevna Diakonova, also linguist and literature expert, was very active self-confident woman, to whom I also was easily connected. She can also be found in (russian) wikipedia where one can get the details. She is active at very old age, her students come and she definitely keep so to say cultural presence in the family. I know it because in 2009 when she was 94 she was still teaching and her contract was renewed for 5 more years. (I learned it from Arkady Vainshtein who pointed out online video

[http://vk.com/c1ub4153484?z=video407433\\_159350313%2F093a34ee09d5cc30f7](http://vk.com/c1ub4153484?z=video407433_159350313%2F093a34ee09d5cc30f7)

where Mitya is also present)

I (and perhaps the rest of the crowd) had a feeling that Mitya is different, an esthetic element very important for his physics works, lectures and talks, and he also wrote some poems, mocking theatrical pieces , played guitar and piano etc. Read if you like his literature works in

[http://samlib.ru/d/djakonow\\_d\\_i](http://samlib.ru/d/djakonow_d_i)

. It is of course partly explained by his family background, subjecting him to "the other culture"<sup>4</sup> from childhood. But he also was very much interested in so-to-say ongoing history and find meaning in some events the rest of us had little understanding. Already around 1980, at solid Brezhnev time, he somehow proclaimed to few friends that the country is in free fall and nothing can stop it. I did not believe a word of it then thinking it withstand another century or so: and yet a decade later Mitya's prediction was fulfilled! The Communist party, then around 10 million members or so, hardly even made any effort, when the whole house of cards suddenly fell apart.

I would not describe more turbulent 1980's: the only thing is to mention another place to meet Mitya and many dear friends was Bakuriani School, on Georgia's border with Turkey. Organized by David Kotlyarevsky and related to mountain-top cosmic ray station there, it gave us opportunity to do physics

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<sup>3</sup>Just last week I met a reference to his opinion on interrelation of semitic cultures when looking up in wikipedia something about phoenicians.

<sup>4</sup>The famous thesis of "two cultures", scientific and humanitarian ones, belongs to C.Snow: but for me its champion was Evgeny Lvovich Feinberg who also was fluent in both and even wrote a book about their interrelation.

and ski. One picture of me and Mitya (see Fig.(a)) show us busy digging out heavy vehicle borrowed from russian artillery, which was the only one capable to reach the top station: there some of us gave a talk, we 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.

(Last Bakuriani I have been was the 11-th, in 1986 , its UFN summary–partly written by myself – I now found via google online

[http://ufn.ru/ufn86/ufn86\\_11/Russian/r8611o.pdf](http://ufn.ru/ufn86/ufn86_11/Russian/r8611o.pdf)

: it reminds the talks and intensity of the school, although Mitya Diakonov was not there. The station and even lifts we used on the montain were later destroyed, in Georgean civil war. Kotlyarevsky emigrated to Israel, where he continued organizing some science things for kids in his late years. Many more members of Bakuriani brotherhood are all over the world now.)

Let me tell another little story of Mitya, showing how he was different. After one of Bakuriani schools we were leaving earlier (what fools we were, in retrospect) and took a regular bus to Tbilisi. Mitya happen to share a seat with a pretty teenage Georian girl in that bus, and there were several hours to go. Instead of simply chatting/flirting with her, he got his notebook and ask her to teach him Georgian language. He started systematically, listed all Georian alphabet, the names of all 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 by the end of the ride he has a concise summary of Georgean in few pages, grammar and all that. If needed, he was prepared to a small lecture about it, perhaps 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 of his life of that period, affecting his life outlook, has been the pentaquark story. It was first discovered by several groups<sup>5</sup> and then undiscovered by many more. While his (with Petrov) chiral model predicted it to exist, I at the time suggested another reason for its existence: pentaquark can be viewd as two diquark clusters and anti-s  $(ud)^2\bar{s}$ . These diquarks are indeed very compact, instanton-induced, supported on the lattice especially in the 2-color theory: but later calculations had proved that their mutual repulsion is way too large to make the pentaquark viable.

After Mitya returned to St Petersburg, we met more rarely. The last photo of us together is due to Leonid Glozman (another organizer of an excellent school, in 2009 Schladming Austria, 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 free half-day at the blackboard but have a hike, without skiing but by foot, through the snow on the path he claimed he knew well. We got a bit of a problem even to find its beginning, but then indeed

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<sup>5</sup>The combined statistical evidence of all those experiments was much better than currently for the famous CERN discovery of Higgs boson, by the way. I still cannot understand how might it happened unless human psychology was involved...

we ended up in a small village (where the photo has been made, so we are tired) with a warm place to drink coffee and stronger things, having an excellent time together.

The subject of our discussion was recent revival of the QCD topology, now at nonzero temperatures and driven by the fact that instantons fall into  $N_c$  selfdual 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 are the elements needed for my attempts to understand the near- $T_c$  QCD topology: I am sure those papers would have citations long after we are all gone.

Having experienced Nordita, with its cool and rational self-governing style, Mitya thought Russian scientists are at least as clever as Nordic ones, and can self-govern themselves, by some council of experts. Needless to say, Russian tradition of government, including in the Academy of Sciences, are very different and his efforts should have met with a lot of resentments and misunderstandings, to put it mildly. I had not managed to discuss the status of that project with him, and only briefly learned from Ludwig Faddeev, who was kind of worried about him and his lab: it might become rather nasty lately, I don't know. Last email from Mitya I had recently received had no trace of that: it was an invitation to the next summer Euler symposium.



Figure 1: The upper one is from around 1982, Bakuriani, on the way up to the cosmic ray station. Note that Mitya is still dressed city-like but behaves as a good mountaineer. The lower one is 2009 near Schladming.