

**MEMORY SKETCH TO V.N. GRIBOV'S PORTRAIT**

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It is very difficult for me to write about Vladimir Naumovich. First, because I understand that I am not able to put into words the bright image of V.N. living in my heart. And second, there are things I just may not remember. But there are moments in my memory that I would like to share with the reader.

It was during a lecture of I.Ya. Pomeranchuk at MIFI in 1964 or 1965, when I heard Gribov's name for the first time. Pomeranchuk told us that the next lecture would be skipped, because he was expecting the visit of V.N. Gribov from Leningrad, and they would work together. It was clear that I.Ya. was very happy about this.

I wrote my diploma work at ITEP, my advisor was M.V. Terentyev. There was a marvelous atmosphere at the Theory Department of the institute: many discussions, a big seminar every Monday at 15:30, and another small "coffee"-seminar on Thursdays ... One day rumour spread in ITEP that Gribov was coming. I remember the excited expectation of the event and the seminar itself. The lecturer's extraordinary fascination. What was its secret? The mystery of his personality. But also, I think, the process of thinking that took place in front of the audience's eyes, being a pleasure for V.N. himself, charmed us.

Around 1968 V.N. has invented the Reggeon diagram calculus. I recall how highly this work was esteemed by Sasha Polyakov. Probably, it was just this paper that initiated (or supported) Polyakov's idea about the bootstrap approach in quantum field theory which he developed not much later.

The paper of Gribov and A. Migdal has played an important role in the appearing idea of A. Polyakov and A. Migdal to derive the Kadanov - Potashinsky - Pokrovsky scaling law for critical phenomena from quantum field theory.

For me personally, the works of Polyakov and A. Migdal together with the papers of Gribov and Lipatov on the double logarithms have played a crucial role. As a PhD student at ITEP (from 1967 to 1970, my advisor was I.Yu. Kobzarev), I was working on a phenomenological approach to the theory of weak interactions. The above papers persuaded me to switch to more fundamental field theoretical investigations.

I remember the LNPI schools in the mid-seventies. During the days there were lectures and seminars; among others, a seminar by L.D. Faddeev on the quantization of solitons. Faddeev had a hard time, facing the temperament of V.N. who did not believe that solitons may survive after quantization. In the evenings everybody, including V.N., gathered in somebody's room, drinking tea, (small amounts of) vodka, listening and singing songs of Galich and Okudzhava, with Yura Dokshitzer and Mitya Diakonov playing the guitar. And still later, after midnight, sometimes night seminars ("lipatniks") began.

I recall that once, being in Leningrad, I attended a seminar of Gribov in the Physics-Technical Institute. Suddenly Ya.B. Zeldovich entered the room. He interrupted the speaker and began to talk about the Hawking effect. And he told us with repentance that Gribov predicted the black hole radiation long before Hawking's paper appeared.

Every time when I was in Leningrad I was living at the place of Arkady Aronov, an outstanding condensed matter physicist, a very kind and nice man. The Aronovs' home was on the Engels street, quite close to the Gribovs' house. And every time we made a gift to ourselves: we called Gribov and spent an evening with him.

The next piece of memory is an international symposium in the sunny Tbilisi, probably in 1976 or 1977. A.D. Sakharov, not yet in exile, but already in disgrace, participated at the symposium. People, more exactly the soviet colleagues, tried to stay at a distance from him. So the open and friendly conversations between V.N. and A.D. really caught the eye. Gribov was not a dissident, although his relation to the Soviet regime was obvious and that to the human rights movement was, naturally, positive. I recall that at the same symposium we were sitting in the bar of the hotel where the participants were living. We were talking about various things, and the conversation was partly definitely anti-soviet. So I suggested to be careful - there could be microphones. V.N.'s reaction was that there is no doubt that there are microphones, but it could be guaranteed that they do not work.

The instantons in the gauge field theory were discovered in 1975. They were found as the minimum of action in the Euclidean formulation. V.N. did not like the Euclidean description, regarding it as unphysical. Soon he came to the conclusion (and this was not much later done by 't Hooft) that the instantons describe a process of under-barrier tunneling from one classical vacuum to the other.

It was in 1977 when Gribov discovered that in non-Abelian gauge theories the local gauge condition does not fix the gauge unambiguously. This phenomenon is now known as "Gribov copies", and is, at the same time, an important mathematical discovery. How very typical for V.N. that he made it while he was thinking about the physical nature of the confinement. The "copies" were important for him not as a mathematical theorem, but as a possible explanation for this phenomenon.

In 1980 Gribov moved from Leningrad to Moscow, where he became a member of our Landau Institute for Theoretical Physics. I recall the piety with which our "pillars of science" approached Gribov. Still, their scientific interests were rather far from the main interests of Gribov, although he was ready to discuss any physics, be it condensed matter physics or cosmology. For example, I remember a meeting of the "Scientific Council", where a widely known physicist working on cosmology and gravitation was giving a talk. V.N. jumped to the blackboard (which was on a stage in the hall where the Friday seminars of the institute were held), took the chalk from the speaker, and started to explain why and where he, the speaker, was not right. Then he turned to the audience and said, "It would be nice to invite a specialist in quantum gravity here". Unfortunately, no close contacts were formed between V.N. and the members of the Quantum field theory group of the institute. Gribov did not care much about the beautiful features of the integrable field theory, he considered them as specific properties of two-dimensional theories. On the other hand, the efforts of V.N. to solve the problem of quark confinement in the framework of quantum chromodynamics did not attract the quantum field theorists who at that time moved away from gauge theories and became interested in strings, integrable models and conformal field theory.

In the beginning of the 1980s we started to organize schools on quantum field theory in Odessa (separating them from the schools of the institute). This went on for a few years; V.N. and Julia came every time. V.N. participated intensely in the discussions. Those were happy times ...

From the mid-1970s to his last day V.N. was working on the problem of quark confinement. This problem was in the centre of attention in the early 1970s, and the greatest minds have tried to find a solution. Tiring of the lack of success, gradually almost everybody abandoned the problem, switching to other subjects, first of all to string theories. So Gribov, who was convinced that it was absolutely necessary to solve the problem of quark confinement, continued his studies almost alone. This was a hard and heroic task, and I hope that this work of V.N. will find congenial followers to continue it.