

Dear friends,

I am truly grateful for this opportunity to speak about Lev Gorkov and the role he played in my life. He meant a lot to all of us, as a scientist and a teacher, as a leader and a human. His work defined careers of many Fiztech students myself included. Here I will touch on a few aspects that mattered most to me.

Preparing to speak, I tried to clarify to myself what were the important things I've learned from Gorkov.

Of course, Gorkov is a giant of theoretical physics. He introduced the quantum field theory techniques in our field and defined theory of superconductivity as it is now practiced by all of us. However, as I recall from my time at Fiztech, the techniques were learned from his publications and the A, G and D book, whereas the in-person conversations have taken a completely different angle. It looked as if, at least when talking to students, he was interested only in understanding physics in simple terms and with minimal usage of formalism.

He made the point of always insisting on explaining things in layman's language and formal arguments would simply make him smile. In particular, I remember vividly the discussions in the journal club seminar run by him and Sergey Iordanskii. The papers students talked about were always experimental. And, speaking metaphorically, they were picked to illustrate that solid state physics is about identifying, understanding and creating alternate universes where the laws of physics are the same, but the fundamental particles and fundamental constants are different.

In some cases, perhaps trying to unleash everyone's intuition, and also quickly get to the bottom of things, Gorkov would even offer analogies from popular culture - I still remember his explanation of transport of a sliding charge density wave made by a reference to a scene in Yves Montand's movie in which the character is driving a car with explosives over a bumpy road. Entertaining, but also helping to drive the point home.

This conveyed a clear notion that good experiment drives good theory, and was a very much eye-opening experience for students. Especially those who thought that theoretical physics was all about being rigorous and technically clever. And it wasn't simply a pedagogical trick of his. The same approach was practiced in research seminars he gave, and in lively discussions after the seminars given by others.

Looking back, I think it reflected a conscious effort to change his own work style in order to respond to rapid changes in physics. The world of solid state physics at the time was becoming ever more diverse, and driven by surprises and discoveries. Experimental techniques diversified and matured rapidly, progress in creating new materials opened up, one by one, new areas and new striking phenomena: low-dimensional systems, new classes of superconductors, heavy fermion systems, CDW, SDW, QHE, high-Tc, and many others.

All of which posed challenges to traditional theoretical approaches. Theorists, if they wanted their work to matter, had to learn to extract essential physics from experimental results. Do it on the flight, and synthesize models accordingly. This was a new approach to theory – synthetic model building. Or, if you wish, an “opportunistic” approach. This is how my colleague Patrick Lee (whose style evolved similarly) likes to call it, perhaps poking a little fun at himself. I, as a student, was fortunate enough to learn it from Gorkov. Later I saw it at other world-class theory groups, notably Bell Labs, where theorists acted very much like Gorkov did in his talks and with students.

Something else, related, pops to mind. Gorkov arranged for a Russian translation of a very useful book by White and Geballe, based on a course they (a theorist and an experimentalist) taught at Stanford. Titled “Long range order in solids”, it covered essentially all of condensed matter physics of the time, demonstrating in each case how theory and experiment play hand-in-hand. A perfect example of a synthetic approach in action, captivating and inspiring, and quite different from other physics texts available at the time. (In case you forgot: original English texts were not legally accessible, only Russian translations were available.) This book

influenced me, as a PhD student, perhaps as strongly as what Feynman lectures did 5 years earlier when I was a freshman. Ted Geballe, with whom I spoke recently about it (and who is turning 100 in January!), said he knew about the passion Gorkov, his long-time friend, had for this book, and was happy to learn that it was well read in the Soviet Union.

Now on a lighter note. As we all know, Gorkov took his work very seriously, with a clear conviction that he had a mission in life. Once, when I was a PhD student, he asked what I was working on, and after I told him, said: This sounds pretty important. Things like that happen to a scientist only a couple of times during his career. When you see it coming you need to put away everything else. My word to you: postpone that trip to the country or mountains, annoying as it sounds, and focus on finishing that paper. If it smells like something important, simply say “NO” to forces of distraction (“гомеостатическое мироздание”, А & Б Стругацкие) and focus on your work. I am not sure I followed the advice at that time, but I remembered it. And at critical times later in my life did exactly what Gorkov said. Last time it was four years ago when I instantly cancelled all summer travel and trips to conferences, including some pretty important ones, and spent summer in my office doing calculations with a student. And let me tell you, it payed off wonderfully just like Gorkov said.

It is also amusing to recall the moment I first heard about Gorkov. I remember that very clearly: His name, quite literally, simply appeared in the night sky above my head. It was a cold winter 1980-1981, I was standing at the Pushkin square late at night chatting to a mathematician friend. The Izvestia publishing house, a highrise near which we stood, at the time featured a running news strip with headlines from Soviet newspapers. The letters were lighting up and running in the dark sky above our heads. Suddenly, however, the news strip stopped talking about Communist Party, Brezhnev, the gargantuan crops at collective farms, etc., and instead made an entirely different pronouncement.

It went on as: “Today the All-Union Council for Inventions and Discoveries registered a discovery of a new striking phenomenon of gapless superconductivity, made by physicists Alexei Abrikosov and Lev Gorkov”.

The contrast with other news was startling, providing an instant proof that the Orwellian world we inhabited was not completely immune to good things. Also, this happened at the moment when the cold weather, as well as a plain-cloths KGB character making circles around us trying to eavesdrop on our conversation, almost made us leave. But now, feeling somehow inspired, we carried on with our discussion. What followed started a new chapter in my life, but it would be a story more about myself rather than about Gorkov, so let's keep it for a different occasion.

A first encounter with a person often defines (at least, for me) much of what happens later, and so it was in this case. A few years passed, and, as a student at Gorkov's theory group at Fiztech, I came to appreciate how hard he worked, despite hostile environment, to open to us a gateway into world class physics. Very little was said (such was the time) but the feeling was unambiguous. And I never saw Gorkov in live action, it looked as if it was enough for him to project determination and force, although now I know it was quite different behind the scenes. Sort of like Hogwarts students who fight evil "all by themselves", and Dumbledore the headmaster merely encourages students through his presence rather than helping directly. It actually sounds like a pretty good analogy.

As you can probably see, it is easy to go on and on, but let me stop and conclude. Gorkov was a great scientist and a pioneer, not just in theoretical physics, but also in a variety of other ways. A man of integrity, courage, a scientist with wide interests, he was constantly trying to learn new things and expand his "phase space". He consciously changed his style throughout his career in an effort to remain a leader in pursuit for truth. Which he most successfully did.

Thank you for listening!