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A personal recollection: A tribute to Yuriy Reznikov

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ABSTRACT

Meeting the right people at the right time is as important as hard work, persistence, and talent. Yuriy Reznikov was one of the key people who shaped my life and had an important impact on my scientific and personal development. His motivation, diplomacy, openness and engagement taught me how to appreciate the work of other people, to collaborate with peers, and even to face the world outside academia. As a tribute to Yuriy, I would like to share with you this brief personal recollection of time spent in the Department of Physics of Crystals at the Institute of Physics in Ukraine, first as a master and then a PhD student.

When I started working with Yuriy in 1996 I was about to finish my master's project at the Kiev National University. My scientific advisers, Igor Pinkevych and Victor Reshetnyak, collaborated closely with Yuriy. It was Victor who introduced me to Yuriy's lab at the Institute of Physics (IoP). I did not know much about the academic environment outside university but the idea of working together with an experimental group was very appealing. Eventually I enjoyed it so much that I stayed and started my PhD at the IoP.

The decision to stay was motivated not only by the scientific environment. Socializing with Yuriy and his group was as exciting and rewarding as exchanging ideas with them (see Fig. 1). Already at the first meeting Yuriy Alexandrovich (or Prof. Reznikov) insisted that I should address him by his first name – something very atypical to a rather formal academic environment in Ukraine. In fact, Yuriy was not only an excellent scientific leader but also the soul of the group. The group was his hobby, his life, his second family.

The main scientific focus of the Department of Physics of Crystals headed by Yuriy was liquid crystals (LCs). This research field was booming in the 90s. Tube-based televisions were replaced by liquid crystal displays and industrial needs were requiring developments of new technologies. Wide view angle modes of LCDs, rubbing-free alignment of LCs on substrates, and bistabile devices were the topics constantly discussed at the meetings and conferences. Yuriy was always well informed about hot directions and relevant research labs: thanks to his personal contacts the group actively collaborated with universities and companies all over the world. Of course, we all benefited from Yuriy's open-mindedness. Ukraine had just become independent and the subsequent economical crisis implied that the National Academy of Sciences could not be maintained as it used to in the Former Soviet Union. Thanks to collaborations initiated by him and in spite of budget cuts the members of the group could still travel to international conferences and profit from the third-party funding of collaborative projects. I can say without exaggeration that his generosity encouraged young researchers to stay in academia as well as helped many established scientists to survive through the turbulent times of the 90s.

Yuriy's amazing intuition was not only confined to science. At that time the urban population of Kiev preferred to live in flats arranged into large communal complexes. He was one of the first to realize that a few remaining non-urbanized areas were worth investing and moved to a house on the outskirts of the city. By now it is one of the most demanded living areas of Kiev.

On the scientific side, his interests were always very broad. One of the key topics was surface anchoring effects [1], and here Yuriy's contribution was pioneering: he was one of the first researchers to realize that the nematic alignment on a cross-linkable polymeric film can be controlled by UV light. Prior to this discovery, surface orientation of the nematic director was achieved by mechanical rubbing, which often damaged thin film transistors controlling the pixels in a display. Calculating the director distribution and optical response of a liquid crystalline cell was my very first contribution to the science in the group [2]. I must confess that working together on that very first theoretical model was great fun. It taught me that real-life problems often require sets of theoretical and computational tools that differ from the ones used by pure theoreticians. The trial and error process of refining the model made me realize that I will always rely on certain approximations. How reasonable these approximations are should, however, be verified by the experiment.

In this respect I am highly indebted to Yuriy. He knew very well how important it is for a young scientist to feel capable of contributing to the research of the group. He constantly encouraged me to dig into different problems, read relevant literature, and closely communicate with the experienced members of the group.

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Fig. 1. Different facets of the group life. Top: My first international conference with the IoP group in Strasbourg, France in 1998: (left to right) Andrey Iljin, Irina Estrela-Lopis, Oleg Lavrentovich, Yuriy Reznikov, Viktor Reshetnyak. Bottom: A weekend during the visit of the Liquid Crystal Institute, Kent, Ohio, USA: (left to right) Denis Andrienko, Anatoliy Glushchenko, Oksana Glushchenko, Katerina Artyushkova, Yuriy Reznikov.

Realizing the importance of reliable and accurate surface anchoring measurement techniques, we went on and systematically analyzed different approaches for measuring the in-plane anchoring strength. Here the key issue was the optical response of the cell: only for very smooth variations of the director the polarization of the laser beam could follow the director rotation. In this, the so-called Mauguin regime, the polarization of the outcoming laser beam coincided with the orientation of the liquid crystal director at the surface. This, however, was not the case for rather large distortions induced by the magnetic field or substrates in super-twisted cells. More advanced models for light propagation, beyond the Mauguin limit, were required. Developing them and understanding the errors introduced by the Mauguin approximation formed the base of several follow-up publications [3].

At the same time, the liquid crystalline community became aware of the fact that the director optical response could be further enhanced by using azo-dye doped liquid crystals. In doped systems one could even observe the light-induced director sliding on the substrate [4]. This sliding could be controlled and even completely quenched by the amount of induced anchoring energy. Moreover, in the dye-doped liquid crystals there was a substantial increase of the optical torque already at moderate laser intensities. This effect allowed us to detect a transfer of the angular moment of light to the elastic deformation in a liquid crystal [5].

These observations resulted in several technological developments. For example, in a cell with a weak in-plane anchoring it was possible to achieve smaller driving voltages than those of the conventional in-plane switching mode displays [6]. Eventually, we could also provide quantitative models for the liquid crystalline alignment at interfaces [7,8].

Yuriy always patiently listened to the members of the group, sometimes for hours, trying to make sense of our half-baked ideas. The blackboard behind his desk was full of diagrams, equations, sketches of experimental setups, and cell designs. It is during these discussions that the ideas were generated and crystallized into experiments and models. How he managed to dedicate so much time to other people is still a puzzle to me.

From early stages on he encouraged the group members to be independent by wisely delegating not only scientific but also administrative responsibilities. I still can remember the confidence boost I experienced when Yuriy asked me to take care of one of the large collaborative projects funded by the Soros foundation. He also let me do the experiment with the precious equipment, which was a unique experience for a theoretician: a sudden realization that one can spend hours adjusting the Berek compensator, while it took only a second to write a sentence about the circular polarization of light being achieved with this tool. He also encouraged us to be mobile and taught us how to promote and advertise our work.

In 1998, after two years in the group and a year or so before my PhD defense I decided to move abroad and within months obtained an offer to pursue a degree at the University of Bristol together with Prof. Mike Allen. The move was motivated by several factors. First, I felt some peer pressure: many of my friends were less lucky in finding stimulating and flourishing scientific environments in Ukraine and so left. Second, I wanted to follow a new research direction, in this case related to computer simulations. Finally, I felt that as a theoretician I should experience working in a “pure theoretical” environment. Even in this situation Yuriy remained diplomatic and understanding: he did not object to my move yet convinced me to finish the ongoing work, write a thesis, and defend my PhD. Looking back I do realize that it was really worth the effort. And when I was defending my “simulations” PhD thesis in Bristol, I could proudly say to the PhD committee that I have seen liquid crystals not only on the computer screen, but also in an experimental lab, and even in a large-scale LCD factory.

After I left IoP we kept good relations and contact. I have joined the alumni of the group, the Liquid Crystal Net (http://lcnet.org.ua/), a community of people working in the area of liquid crystals. A few years later Yuriy’s recommendation linked me to an interesting project with the Korean company LG, where I developed the code for the prediction of optical properties of multilayered birefringent materials.

It was an exciting experience to work at IoP and I am greatly indebted to Yuriy for being and excellent scientific mentor, a role model, and a friend.

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