

Igor Ekhiel'evich Dzyaloshinskii (on his 90th birthday)

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February 1, 2021 was the 90th birthday of the prominent theoretical physicist and corresponding member of the Russian Academy of Sciences (RAS), Igor Ekhiel'evich Dzyaloshinskii. A disciple and colleague of the legendary Lev Davidovich Landau, one of the founders of the Institute of Theoretical Physics (ITP) of RAS, editor of the journal *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (ZhETF — *J. Exp. Theor. Phys.*) and *Pis'ma v ZhETF* (*JETP Lett.*), professor at Moscow Institute of Physics and Technology (MIPT), the faculty of Mechanics and Mathematics of Lomonosov Moscow State University (mech.math. MSU), and the University of California, Irvine — this is a short list of highlights in the scientific biography of Igor Ekhiel'evich.

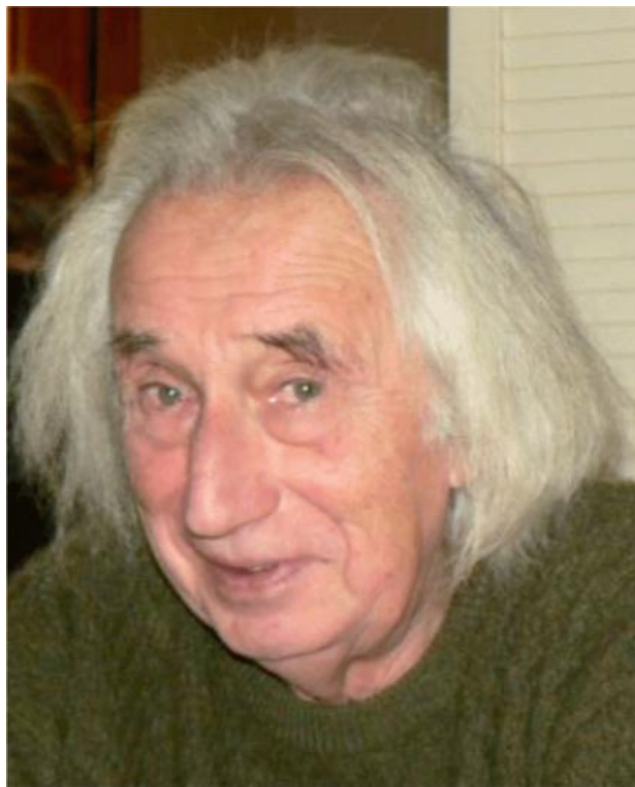
The scientific interests of Dzyaloshinskii cover the whole spectrum of condensed media theory; most of his papers have been widely recognized.

Already in his younger days, Dzyaloshinskii became a leader in the community of the physics of magnetic phenomena and presented such results as the prediction of the 'magnetoelectric effect,' the introduction of the 'Dzyaloshinskii–Moriya interaction,' and the theory of helical superstructures and commensurability effects. This topic is in the list of his publications for today: the epoch of multiferroics that came in the 2000s was, in fact, based on the predictions made more than half a century before by the young scientist I E Dzyaloshinskii. These studies were included in the candidate thesis Dzyaloshinskii defended in 1957.

When speaking at the defense, Landau, who was not lavish in giving praise, said that Dzyaloshinskii was one of the most talented young theoreticians whom he had met in recent years.

During that same time, the temperature diagram technique was developed. It was included in the written (together with A A Abrikosov and L P Gor'kov) handbook of several generations — *Methods of Quantum Field Theory in Statistical Physics* — that was awarded the 1989 L D Landau Prize. The book ("AGD" or the "Green Book" as referred to by many generations of students, postgraduates, and research workers at ITP) laid foundation of the scientific language used to date by theoretical physicists around the world.

The fundamental contributions due to Igor Ekhiel'evich involve the microscopic theory of van der Waals forces, one-dimensional systems of interacting particles, quantum liquids and crystals, spin glasses, topological defects in magnets and liquid crystals (incidentally, it was precisely Dzyaloshinskii who introduced in Russian theoretical physics the idea that liquid crystals are an important area of application of general principles), exactly solvable models, an original renormalization group for high-temperature superconductors, states with time reversal symmetry violation.



Igor Ekhiel'evich Dzyaloshinskii

The scientific and pedagogical achievements of I E Dzyaloshinskii are well known and, in particular, were described in detail in previous well wishes marking milestones. It so happens that most of us (disciples and colleagues of I E Dzyaloshinskii) took part in these very celebrations in the journal *Uspekhi Fizicheskikh Nauk* (UFN) (see UFN **162** (1) 139 (1992); UFN **171** (2) 227 (2001); UFN **181** (2) 231 (2011)) (*Physics–Uspekhi* **35** (1) 49 (1992), *Physics–Uspekhi* **44** (2) 213 (2001), *Physics–Uspekhi* **54** (2) 221 (2011)).

However, new interesting and important work by Dzyaloshinskii appeared recently. In particular, noteworthy are two of his studies that predicted theoretically (and then revealed experimentally using muon spectroscopy methods in an etalon Cr₂O₃ magnetoelectric) a very interesting and nontrivial phenomenon. Namely, it turns out that, in a certain geometry, electric charges induce a magnetic field with quadrupole and monopole symmetry on a magnetoelectric antiferromagnet surface, both in the sample itself and in the surrounding space. I E Dzyaloshinskii continues to work and, in this milestone year, is finishing preparation of a paper, in collaboration with an international group of experimentalists, on the inverse electrocaloric effect in ion liquids (predicted theoretically in an earlier study undertaken by Dzyaloshinskii and Obukhov).

Dzyaloshinskii demonstrates surprising versatility in topics, interests, and aptitude related to applied methods of theoretical physics: from filigree phenomenological approaches to deep microscopic research. In all his creations, one can trace attention to the esthetic aspects of a problem—a theory should be as beautiful as Nature itself. Living in harmony with the experimental motivation, this dualism attaches peculiar coloring and significance to his works.

An ‘outdated man,’ Dzyaloshinskii often publishes his papers alone, sometimes with his nearest colleagues. With his ease and speed of work, he does not need any help from students. This was particularly obvious in his younger days at ITP, when he carried out research simultaneously on quite different subjects. He was generous to his students at ITP, suggesting research fields, giving pieces of advice, correcting their immature manuscripts beyond recognition, and frequently refusing to add his name to papers which would have never come out without him.

Some of us had the good fortune to take part for several years in the reviewing seminar organized by Dzyaloshinskii. This was not an easy test or exam, but very useful for those who coped with it. Then (and to the present day) we were attracted by the large scale and interdisciplinary approach to the physical scenarios and problems chosen by Dzyaloshinskii (and analyzed by all the participants in the seminar under his guidance). Always amazing was Dzyaloshinskii’s intuition: he seemed to know the result or the answer to the problem under investigation.

Even among brilliant people, constituting the core of the Landau Institute, Dzyaloshinskii was distinguished by extraordinary features: quick reactions, uncompromising assertions, colossal erudition, and breadth of interests both in physics and far beyond—in other exact sciences and even history, psychology, modern culture, and art. The path of Dzyaloshinskii’s personal development has been impressively overloaded, even according to the criteria of his dramatic generation. A fatherless street boy of the war years, a worker in a car repair shop (receiving food rationing cards for work), a brawler; he swam across the Volga River in Dubna on a bet, explored science for himself, entered MSU, and continued his ascent through the almost impermeable barrier of Landau’s school.

Moscow, Chernogolovka, Paris, Grenoble, Irvine—this is only a short list of geographic places where Igor Ekhiel’evich has left a bit of his personality as a scientist and man. Ninety years is a long period, indeed. We (and not only those who signed these well wishes)—friends, disciples, and colleagues of Igor Ekhiel’evich Dzyaloshinskii—wish him all the best on his birthday and hope he has good health and strength to continue his interesting creative life.

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