

Lev Borisovich Okun' (on his seventieth birthday)

Professor Lev Borisovich Okun', full member of the Russian Academy of Sciences, theoretical physicist of world renown, is 70 on July 7, 1999.

Lev Borisovich Okun' was born in Sukhinichi of the Kaluga region. In 1953 he graduated from the Moscow Engineering Physics Institute (his graduation research was done under V I Kogan and A B Migdal) and soon started work at the Institute of Theoretical and Experimental Physics (ITEP), first as a postgraduate and now, for more than twenty years, as the head of the Theory laboratory. In 1956 Lev Borisovich presented and defended his PhD thesis, with I Ya Pomeranchuk as his advisor, and wrote and defended his DSc thesis in 1961. In 1966 he was elected a corresponding member of the Academy of Sciences and in 1990, a full member of the Academy. Lev Borisovich has been teaching students for many years at the Moscow Physico-Technical Institute (now Moscow Institute of Physics and Technology — MIPT), where he has been Professor since 1967.

Lev Borisovich Okun' is one of those scientists who, owing to their comprehensive approach to science as a whole, direct the progress of physics, essentially anticipating the main directions of physics development.

For example, the realisation of the fact that even the most powerful available accelerators will not be able to reach the critical energy scale that contains new physics in its explicit form led L B Okun' to the idea of the necessity of efficiently using all other sources of information; of these, L B Okun' selected two that he considered to be the most important, the two that have now surged powerfully forward:

(a) interactions between elementary particles at early stages of evolution of the universe and their role in cosmology as a whole;

(b) high-precision experiments at the available energies, including low energies, when the new physics manifests itself as minute deviations from standard laws.

These two fundamental directions are closely connected to the pioneering work of L B Okun', his students and co-authors, and also to the many years of his 'missionary' work at physics schools, conferences and seminars.

The scope of interests of Lev Borisovich covers practically the entire physics of elementary particles.

Weak interactions attracted Lev Borisovich from the very start of his scientific career. This choice proved extremely fruitful: the phenomenological four-fermion Fermi theory has been transformed over the years since its inception into one of the greatest achievements of theoretical physics: the electroweak gauge theory. In the joint paper with B L Ioffe and A P Rudik in 1957 it was noticed that breaking of P-parity in β -decays at the same time means breaking of C-parity. In the same year, together with B M Pontecorvo, the mass difference between K_L and K_S mesons was evaluated. In 1963 Lev Borisovich published



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an exceptionally good book *Weak Interaction of Elementary Particles*. At the beginning of the 1970s Okun', together with V N Gribov, A D Dolgov and V I Zakharov, studied the behavior of weak interactions at asymptotically high energies. The new gauge theory of electroweak interactions is presented in the monograph *Leptons and Quarks*, published in 1981 and, in the second edition, in 1990. In the 1990s, a series of papers suggested a simple scheme for taking into account electroweak radiative corrections to the probabilities of Z-boson decays. The scheme was applied to analyzing the precision data collected at the LEP1 and SLC accelerators (together with M I Vysotsky, V A Novikov and A N Rozanov).

Another wide field of interest for Lev Borisovich was strong interactions. The famous Okun' – Pomeranchuk theorem on the equality of interaction cross sections for particles of the same isomultiplet at asymptotically high energies was proved in a paper published in 1956. In 1958 Okun' proposed the composite model of hadrons, within which he predicted the eta and eta-prime mesons (note that the term 'hadron' was introduced into physics by none other than L B Okun'). At the end of the 1970s Okun' (together with A I Vainshtein, M B Voloshin, V I Zakharov, V A Novikov and M A Shifman) suggested the

QCD sum rules and applied them to describe particle masses and lifetimes.

The ‘newest’ field — the ‘intersection’ of cosmology and elementary particle physics — was also born in papers of Lev Borisovich. The paper of 1965 written with S B Pikelner and Ya B Zeldovich analyzed the possible concentration of primordial elementary particles (in particular, of free fractional-charge quarks) in our Universe. In connection with the discovery of CP-parity non-conservation, the paper of L B Okun’, I Yu Kobzarev and I Ya Pomeranchuk discussed a ‘mirror world’ that is connected to ours by gravitation only. The paper of 1974 with I Yu Kobzarev and Ya B Zeldovich discussed the formation of vacuum domains in the Universe; a paper of the same year with I Yu Kobzarev and M B Voloshin found the mechanism of decay of metastable vacuum. Each of these papers gave rise to a new field of research.

Lev Borisovich has been teaching since 1962, at the chair of Elementary Particle Physics of the Moscow Physico-Technical Institute (MPTI). Fourteen of his students have defended PhD theses during this period; Lev Borisovich founded a powerful scientific school. He is invariable lecturer at the ITEP Winter Physics Schools.

The participation of Lev Borisovich Okun’ in the ITEP physics seminars is the decisive factor of their scientific level. Many a participant is grateful to him for the talent of posing the ‘right’ question. One well-known example is a remark during A M Polyakov’s talk in 1975 that the solution of the Yang–Mills equations found by the speaker was none other than the magnetic monopole.

In the last decade the non-academic activities of Lev Borisovich Okun’ had great importance for the survival of science in Russia and other countries of the Commonwealth of Independent States (CIS). He was one of the organizers of the International Science Fund (Soros fund) and the International Association of Assistance and Cooperation with scientists of the CIS (INTAS).

The international scientific community has expressed high appreciation of the results obtained by Lev Borisovich Okun’. He has read honorary lectures at Harvard (1989), Berkeley (1990), Carnegie-Mellon University (1991), Pisa (1993), Vienna (1994), and Brookhaven (1995). From 1981–1986 Lev Borisovich sat on the Scientific Policy Committee of CERN, and after 1992 was a member of the DESI Science Council. He was awarded the Matteucci Prize of the Italian Academy of XL (1988), the Lee Page Prize (USA, 1989), the Karpinsky Prize (Germany, 1990), the von Humboldt Prize (Germany, 1993), the Bruno Pontecorvo Prize (Dubna, 1996), and the Special prize of the Open Society Institute (1997).

We congratulate Lev Borisovich on behalf of numerous colleagues on this jubilee occasion and wish him good health, new impressive achievements and success in all his endeavours.

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V I Zakharov, B L Ioffe, V I Kogan,
A Yu Morozov, V A Novikov, V A Rubakov,
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