A Review of the Book "THE THREE FROM THE ATOMIC PROJECT. TOP-SECRET PHYSICISTS LEIPUNSKIIS" by B.S. Gorobets, edited by I.O. Leipunskii, prefaced by Yu.N. Ranyuk (LKI, Moscow, 2008)

Not more than a year has passed since the first large scientific and biographic research by B.S. Gorobets – "Landau's Circle" ("Letnii Sad" Publishing and Trade House, Saint-Petersburg, 2006) – was published, as his another and not less important research in the same genre appeared. The book "Landau's Circle" invoked a stormy – but unambiguously positive – reaction in the physics community. Among the biographic literature, this book is one of those few that revealed the versatility of heroes's souls which manifested itself in various nuances – sometimes, not very cheerful – during those involved and ambiguous, rough and heavy, not always heroic thirties, fourties, and fifties of the last century. Whatever the heroes of his book did, the author describes them very benevolently with a high comprehension of their acts.

The same is true for the book "The Three from the Atomic Project", devoted to the Leipunskii's family – Alexander Ilyich, Ovsei Ilyich, and Dora Ilyinichna. What another family – besides the Leipunskii's one – produced such bright stars and did it during one generation? Moreover, the three Leipunskiis should be supplemented by the Academician A.F. Prikhotko, the spouse of Alexander Ilyich. Perhaps, only the Curie family could boast of such an achivement, but within two generations.

All the three Leipunskiis made a huge contribution to the successful development of the atomic project in the USSR – it was the creation of an atomic bomb, the construction of nuclear reactors, and the development of measuring and diagnostic facilities for nuclear researches. Enormous is also their contribution to the creation of specialized higher-education institutions for training nuclear experts. Nowadays, those higher schools are leading in our country (in particular, the Moscow Engineering Physics Institute – MEPhI – and its branch). All that is well reasonably described in the book by B.S. Gorobets. The author has carried out a large piece of research work dealing with the treatment of archival documents and the determination of the contribution made by his heroes to the largest project of that epoch which remained to be a top secret till the end of the 20-th century and, therefore, had become almost a legend in many aspects, but whose document-based history remains almost unknown for the scientific community (the relevant archival documents were started to be published only at the end of the 1990s and in the narrowly specialized literature). The author's success in this research was undoubtly predetermined by his wide erudition in such domains as physics, mathematics, and geology, as well literary criticism and linguistics. In all these fields, B.S. Gorobets is the author of books; he was also an editor of some volumes of the Landau and Lifshits Course, including their French translations. Moreover, he also translated the Polish poetry. All that has manifested itself in a masterful possession of the literary and art language by the author.

Certainly, the readers – including the experts in nuclear physics – will find a lot of new in the reviewed book about the heroes, which were underestimated at their life and are remained underestimated today as well. But they did deserve that their country should be proud of them, and they have not sunk into oblivion. A lot of interesting is reported about the private life of heroes, their roles and acts both within the period of Stalin's government and just after it. The author does not avoid to speak about such subjects – which have been almost forbidden till the recent time – as the role of Beriya in the Atomic project.

The major part of B.S. Gorobets's book is devoted to Alexander Ilyich Leipunskii. I had the luck to hear and see A.I. Leipunskii in 1957–1959 and even to personally communicate with him a little during my work at the well-known Institute for Physics and Power Engineering (PhEI) in Obninsk, the motherland of the first-ever atomic power station. Just at that time, Alexander Ilyich was appointed the scientific director of the Institute. He often came to the theoretical department, to our head L.N. Usachov; he had discussions till late night with V.V. Orlov, perhaps, one of the most prominent theorists of the present time in the field of the physics of fast neutron reactors, which had been constructed by A.I. Leipunskii and collaborators. The concept of fast neutron reactors was put forward by Alexander Ilyich

in 1946, but the works dealing with their installation at nuclear power plants, ships, and submarines – and even at aircrafts – were finished when he became the scientific director of the PhEI. For those works, A.I., together with his collaborators, among which there were the PhEI employees, was awarded the Lenin Prize in 1960. But previous A.I. Leipunskii's works were not less remarkable: in 1932, A.I. – first in the USSR – split the lithium nucleus by accelerated protons; in 1939, he predicted the chain nuclear reaction, the basis of all nuclear power engineering, and a number of other reactions. At the age of incomplete 30 years, he became a Ukrainian Academician. At last, he was awarded the rank of the Hero of Socialist Work. Nevertheless, with all that, A.I. was not elected a member of the Academy of Sciences of the USSR, although he was nominated three or four times. The matter was not in the obstruction by authorities, because the nominee was favored by the Ministry of Medium Mechanical Engineering and the Ministry of Marine Fleet of the USSR. The barrier has erected by the Academy itself, and the relevant reasons are discussed in the book.

Alexander Ilyich did not look like a "sickly intellectual"; he was sportive, not very tall but large. He possessed an infectious bass voice, constantly smiled, and radiated goodwill, although the life was unfair to him: he was arrested in 1938, but released soon owing to the guarantee of the President of the Academy of Sciences of Ukraine N.N. Bogomolets; this fact is also dealt with in detail in the book. A.I. bore no grudge against anybody, including the Academy of Sciences of the USSR, but preferred to have no affairs with it. For instance, in 1953, although he had been working in Obninsk and Moscow (in the MEPhI) for a long time, the documents for the rank of Professor were, nevertheless, applied to the Academy of Sciences of Ukraine.

A fragment in the book is devoted to Antonina Fedorovna Prikhotko, the spouse of Alexander Ilyich, an unusually beautiful and a really great woman. A.F. Prikhotko played a great role in Alexander Iliych's life, being not only a spouse, but also a colleague, an outstanding physicist-experimenter. In 1930, A.F. observed the dispersion in the spectra of molecular crystals for the first time in the world; she measured the normal and anomalous dispersions in the vicinity of absorption bands; at last, she experimentally discovered collective excitations in crystals, the so-called excitons. Antonina Fedorovna was a prominent scientist and one of the founders of the Institute of Physics in Kyiv, a full member of the Academy of Sciences of Ukraine. She, like her husband, was awarded the rank of the Hero of Socialist Work. I repeatedly saw Antonina Fedorovna at dissertation defences at the Institute of Physics and the Kyiv University; she was a member of their academic councils. Once, I was put in an embarrassing position, which was dealt with A.F. This happened at the defence of the Doctor of Science degree by A.M. Fedorchenko, the dean of the Faculty of Physics at the Kyiv University at that time. After the defence, there was, as usual, a banquet, and all Kyiv elite gathered there. I wished very much to somehow please A.F. and raised my glass to her. But, instead of saying "for a great woman", I pronounced "for a great physicist" and directed my steps towards her to clink our glasses. Suddenly, S.I. Pekar, who sat next to her, stood up and aggressively directed his steps towards me. I had nothing to do but to indicate that I did no want to specify anyone personally; let everyone consider himself great. However, I missed an opportunity to clink our glasses with Antonina Fedorovna.

Rather much and very warmly is said in the book about Ovsei Ilyich Leipunskii. I saw him many times at the Institute of Chemical Physics (ICP), when, being a student at the Faculty of Physics and Engineering of the Moscow State University, underwent there practical training in 1948–1952. Ovsei Ilyich Leipunskii was a disciple of Ya.B. Zeldovich. As early as in the war time, they created and broke, through a conservative attitude, a new theory of non-stationary powder burning in a rocket chamber, which was excellently confirmed by O.I. Leipunskii's experiments. On the basis of this theory, improvements to the production of "Katyusha" were made in 1943–1945: the charge weight and the distance of projectile flight were managed to be substantially enhanced, the premature explosions of projectiles and their self-quenching were removed.

For me, as well as, probably, for many others, it was a great news that Ovsei Ilyich had been the inventor – nowadays recognized all over the world – of a diamond growing method (his first publication is dated by 1939); following this method, the first synthetic diamonds were obtained in Sweden in 1953, then in the USA and the USSR. The method is based on finding the ranges of high pressure and temperature in the phase diagram, where a stable diamond phase is formed. The story of this discivery was described with detective-like details in the chapter "Diamonds and Sharks": everything is included – theft and appropriation of somebody else's invention, perfidy of and treachery by colleagues, the struggle of world states on diamond markets and in international courts for milliard incomes of the diamond industry. The scenario is not new: awards to businessmen and oblivion

to creators; however, in the case with O.I., the justice was partially restored.

Further, the reader comes to know that O.I. was one of the founders of methodology for the radiometry and dosimetry of ionizing radiation fields which accompany nuclear explosions. His team has developed, at the ICP and at a nuclear test site, the methods of estimating the radiobiological consequences of explosions with a detailed account of contributions made by neutron radiation emission and decay of strontium-90, caesium-137, and carbon-14 isotopes. The book popularly recounts the story of an ostensibly clean hydrogen bomb, a neutron bomb; it tells about the work of O.I.'s group at the Semipalatinsk nuclear test site, where O.I. was present at hundreds of nuclear explosions. It turns out that O.I. Leipunskii was a predecessor and, afterwards, a companion-in-arms of A.D. Sakharov in substantiating the harmful effects of the tests of nuclear weapons in open media. The calculations made by O.I. demonstrated that the steady radioactive background on the Earth created by the indicated isotopes would become twice as large by 2000 and would be preserved for centuries, mainly due to carbon-14. In 1963, to a large extent under the influence of those works, the governments of the USSR, the USA, and the UK concluded a treaty about the termination of all experimental explosions, but underground ones. In the physics community, Ovsei Ilyich was known as a standard of culture, erudition, and goodwill. His traditions are continued by his school at the ICP and the MEPhI, at the Chair of Protection Physics created by him and the corresponding seminar.

I have never seen the fourth hero of this family, D.I. Leipunskaya. She graduated from the same famous Faculty of Physical Mechanics at the Leningrad Polytechnical Institute and represented – like three other members of this great family – the school of A.F. Ioffe. But afterwards, D.I. had been working at a so secret institution – it was the Scientific and Research Institute No. 9 (nowadays, the A.A. Bochvar All-Russian Scientific and Research Institute for Inorganic Materials) included into the system of the Special Committee headed by Beriya – that little remained that is known about the details of her work there. She is only known to be a laboratory manager and has spent a good many months at the Southern Urals Mountains, at plant No. 817 (nowadays, the "Mayak" plant) which fabricated plutonium. In particular, she was engaged in the development of dosimeters. An unordinary contribution made by D.I. is confirmed by the fact that her name was included into the first list, signed personally by I.V. Stalin, of about 800 experts (selected among tens of thousands of those who took part in the Atomic project) who were awarded just after the first test of the bomb. Unfortunately, her name also appeared in the list of numerous victims of nuclear radiations, who paid their health and their lives for the creation of a nuclear shield which had guaranteed piece to our country for almost 60 years.

A self-valuable chapter, placed into the book's appendix and devoted to the Sukhumi Physicotechnical Institute (SPhTI), should be pointed out separately. The institute arose on the basis of two secret laboratories which were organized and headed by A.I. Leipunskii in 1945 and consisted, basically, of German scientists and experts that were brought into the USSR to work on the atomic problem. There is a book about the SPhTI written by the Head from the German side, M. von Ardenne. B.S. Gorobets's book, in its turn, includes notes with the memoirs of a Soviet expert, the chief of laboratory N.F. Lazarev, who had been working at the SPhTi for 40 years. The memoirs include the picturesque descriptions of work, life, and communication of the Soviet and German experts at that enterprise under the special regime conditions. In due course, the SPhTI became a huge institute, the number of its staff reached 6 thousand persons in the 1980s. Unfortunately, it was decomposed together with the disintegration of the USSR and the beginning of the Georgian-Abkhazian war; nevertheless, it undoubtly deserves its own chronicle.

In general, B.S. Gorobets's book was written not only in a document-based but also a fascinating manner. The gala style, so typical of some memoir and historical chronicles, is not characteristic of it altogether. The author unequivocally describes the conflicts, dramas, and tragedies of that epoch, where the heroes of the book and the persons from their environment were engaged, including such outstanding figures as L.D. Landau, P.L. Kapitsa, Ya.B. Zeldovich, K.I. Shchelkin, E.P. Slavskii, F. Houtermans. One may disagree with some original conclusions and assumptions of the author, but there's no denying that the author offered a logic and interesting way of exposition. In a word, a man, who will start to read this book, will not be bored.

A.A. Rukhadze