Yuliĭ Borisovich Khariton (on his eightieth birthday)

A. A. Aleksandrov, E. I. Zababakhin, Ya. B. Zel'dovich, P. L. Kapitsa, I. K. Kikoin, M. A. Markov, N. N. Semenov, V. Ya. Frenkel', and A. I. Shal'nikov

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February 27, 1984 marked the eightieth birthday of Academician Yuliĭ Borisovich Khariton. This is simply hard to believe! So fresh is his creative mind, so indefatigable is he himself: practically every working day, including Saturdays and Sundays, begins in his case at 8 AM and ends at 9–10 PM. His life of 80 years includes 67 years of work: from the age of 13 he worked for wages—first in a library, and from the age of 15 as an electrician. Starting in 1921 Yu. B. Khariton, who at that time was seventeen years old and a second year student at the Physico-Mechanical Faculty (PMF) of the Polytechnical Institute, worked in the Physico-Technical Institute (PTI) being engaged in research on molecular beams.

In 1925 the State Publishing House published a "Collection of Problems in Physics"—possibly the first Soviet collection of problems in this subject for institutions of higher learning. Many future prominent physicists made use of this collection. The senior author A. F. Val'ter was 27 years old, the second oldest—V. N. Kondrat'ev—was 23 years old, and the junior author Yu. B. Khariton was 21 years old. Only in June 1925 did he receive his diploma on graduating from PMF.

Before proceeding to a brief review of Khariton's research we note briefly his biography. He was born in 1904 into the family of a St. Petersburg journalist. In 1919 on graduating from a secondary technical school, he tried to enter the Technological Institute, but was refused admission as being too young. In 1920 Khariton became a student of the Electromechanical Faculty of the Polytechnical Institute, and starting with the spring of 1921 he became a student of the PMF. Khariton often recalls that time when in his "life a most important event occurred. I was" he writes "invited to see Nikolaĭ Nikolaevich Semenov who offered me and two other fellow students (A. F. Val'ter and V. N. Kondrat'ev) work in his laboratory. This was tremendously good fortune". His first work (1924) was the investigation of the critical temperature of condensation of metallic vapors. Khariton discovered that this temperature depends on the vapor density. N. N. Semenov, Yu. B. Khariton, and A. I. Shal'nikov then carried out a long series of investigations on the interaction between molecules and the surfaces of solids. These investigations turned out to be very important not only from the point of view of general physics, but also in their applications.

Thus, the twenty year old Yu. B. Khariton became one of the authors of a series of first class investigations, which brought him out into the area of international physics. The collection of problems made him known among people connected with higher educational institutions. A truly notable,

YULIĬ BORISOVICH KHARITON

surprisingly early emergence. Even for that remarkable time during which Khariton was growing up.

In 1926 Yu. B. Khariton and Z. F. Val'ta in the course of studying the luminescence accompanying the oxidation of phosphorus vapor by oxygen discovered the phenomenon of a lower limit of this luminescence with respect to oxygen pressure. The most prominent scientist of that time in the field of chemical kinetics M. Bodenshteĭn asserted in print that the phenomenon of a limit on ignition temperature is in principle impossible and is a consequence of definite experimental error. In 1927 N. N. Semenov carried out a more detailed investigation of the ignition limit and gave the first theoretical interpretation of the mechanism of such phenomena which became the foundation for the creation of the theory of branched-chain reactions. After this the phenomenon of the lower limit was fully accepted, among others by M. Bodenshteĭn himself. That was the beginning of the Soviet school of chemical physics.

The young Yu. B. Khariton in 1926 with the support of A. F. Ioffe, P. L. Kapitsa, and N. N. Semenov was sent to England into Rutherford's laboratory where he studied sen-

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sitivity of the eye to weak light pulses (in connection with the utilization of scintillations), and also the interaction of α-radiation with matter. Here an important investigation was carried out on the mechanism of action of small amounts of impurities in ZnS. Simultaneously with this a study was made of the migration of energy in crystal—prior to its "de-excitation". Without directly being involved in problems of nuclear physics which were the basic ones in the Cavendish laboratory Khariton became familiar with all the research being carried on there, showed a continuing interest in them, until—after the discovery of uranium fission (1939)—the nucleus became the principal activity in his life.

On returning from England in 1928 Khariton turned to the investigation of explosives: kinetics and detonation. He headed a special laboratory in the Institute of Chemical Physics which separated from the PTI. Here he found the Soviet school of the physics of explosions, the acknowledged head of which is Yu. B. Khariton. Among the most important results of these researches we note "Khariton's principle" which determines the possibility of detonation of an explosive. According to this principle the time of flying apart of matter compressed by a shock wave must be greater than the reaction time. Thus, the concept of an "explosive" or an "inert" material is a relative one: the assignment of a potentially explosive compound to the one or the other group depends on the dimensions of the charge.

In 1939 Yu. B. Khariton and Ya. B. Zel'dovich began to publish results of the analysis carried out by them of the mechanism of uranium fission proceeding according to the scheme of a branched chain reaction. In their work of 1939–1941 the authors investigated the conditions for the realization of a fission chain reaction in natural uranium, in a homogeneous mixture of uranium with different neutron moderators, and what is particularly significant in a mixture enriched in the 235 isotope. [It is appropriate to recall that in 1936 Yu. B. Khariton developed a general theory of the centrifugal separation of gas mixtures the conclusions of which are valid also for the case of isotope separation. Although at first this method of separation was rejected in relevant work in the U.S.A. and the USSR, in recent years in connection with the altered situation in energetics (cf., the August 1978 issue of the Scientific American) the centrifugal method is now estimated to be a more promising one in comparison with the diffusion method. This circumstance imparts particular importance to Khariton's article]. The authors investigated the problem of the stability of a nuclear reactor (a term which appeared later) and elucidated the factors which determine it, and in particular pointed out the role played by delayed neutrons for the control of a chain reaction and, on the other hand, determined the conditions the fulfillment of which would lead to the production of a nuclear explosion.

From the first days of the Second World War Khariton devoted himself entirely to defense work associated with explosives. Then in 1943 he was involved by I. V. Kurchatov in research on the uranium problem. The issue of the newspaper "Pravda" dated January 26, 1983 concisely characterizes the significance his research initiated at the time under discussion: "A particularly important significance from the point of view of the State and of science are the investigations of the Academician in the domain of atomic energy and nuclear technology which opened up new directions and paths for experimental and theoretical investigations in a wide field of phenomena of exceptional interest". When we rejoice in the fact that our Motherland is strong and that for almost forty years now no one dares to attack us let us remember that to this Yuliĭ Borisovich Khariton also made a great contribution.

In recent years Khariton has been successfully working also on problems of thermonuclear laser fusion. The horizon of his physics interests is exceedingly broad. Thus, the collection of articles published by the Academy of Sciences in celebration of Khariton's eightieth birthday contains an article by him and his collaborators devoted to aperiodic pulsed reactors.

Yuliĭ Borisovich Khariton is an outstanding Soviet scientist and an active worker in the affairs of state. From 1950 he has been a deputy of the Supreme Soviet of the USSR, devoting much time to his duties as a deputy. He has been named a Hero of Socialist Labor three times, and has been awarded the Lenin and State Prizes. The technical achievements of Yu. B. Khariton are distinguished by a firm scientific basis underlying them. The Academy of Science of the USSR has acknowledged the importance of the scientific investigations of Yuliĭ Borisovich by the award to him of the I. V. Kurchatov medal (1974) and the M. V. Lomonosov medal. He was awarded this highest distinction by the Academy in 1982. His truly titanic work was acknowledged by many high state awards.

In conclusion we would like to say a few words which characterize Yuliĭ Borisovich as a man. He is exceptionally modest, delicate—but this delicacy does not impede his firm, goal-oriented and successful direction of work carried out on a tremendous scale. He is infinitely kind—he is always ready to come to the aid of those who need it. He is a most interesting conversationalist: an excellent raconteur and an attentive listener. Contact with him brings unusual joy, discussion with him of physical problems, and also of questions connected with art and literature, stimulate thought, and broaden the horizons of those conversing with him. He feels deeply and knows poetry and prose well. A passionate traveller, Yuliĭ Borisovich has visited many countries of Europe and, one can say, the whole Soviet Union. He deeply experiences the beauty of nature: during lengthy excursions on foot it is for him an inexhaustible source of pleasure and inspiration complementing art and music.

Together with all the physicists of the Soviet Union we bring hearty congratulations to Yuliĭ Borisovich on his anniversary and we wish him much health and many creative achievements to the glory of Soviet science and the benefit of our Motherland.

Translated by G. M. Volkoff