PERSONALIA

In memory of Yuliĭ Borisovich Khariton

On December 19, 1996, Yuliĭ Borisovich Khariton departed this life. He was a full member of the Academy of Sciences since 1953, three times Hero of Socialist Labor, and a recipient of Lenin and State Prizes. His many awards include Kurchatov and Lomonosov medals. It is to I V Kurchatov and Yu B Khariton that our country owes the development of nuclear weapons which formed the basis of its defensive power. The exceptional intellectual longevity of Yuliĭ Borisovich allowed him to stand for almost half a century (from 1946 till 1992) at the head of the All-Russian Research and Development Institute of Experimental Physics (VNIIEF), a nuclear research facility of which he was one of the founders. From 1992 to the end of his days he was the honorary science director of VNIIEF.

Yuliĭ Borisovich was born on 27 February 1904 in St. Petersburg. The good home education allowed him to enter the electromechanical department of the Polytechnical Institute in Petrograd (St. Petersburg) in 1920, at the age of 16. He would have done this a year earlier, had the current higher education policy permitted. Here he attended the lectures of the patriarch of Russian physics A F Ioffe, which awoke the interest in physics in the young student. To his last day Yuliĭ Borisovich was deeply concerned with the advances and problems of this science, and this was felt by everyone who met him.

After a year of studies at the Polytechnical Institute, Khariton moved from the electromechanical to the physicomechanical department, and attracted attention of NN Semenov, who taught the physical laboratory course. Semenov invited him to his laboratory at the Physico-Technical Institute.

Soon after his graduation from the Polytechnical Institute in 1925, Khariton jointly with Z F Val'ta, published the paper entitled 'Oxidation of vapors of phosphorus at low pressures' in 1926. The modest title of this work, seemingly concerned with a highly specialized topic, does not reflect its importance. Specifically, the self-ignition of phosphorus only occurs at a certain minimum pressure of oxygen, which is critical for this process. It is only at the critical pressure that the chain of elementary processes which comprise this phenomenon start to ramify. The discovery of the fact that there exist critical parameters beyond which the chain processes become possible was not recognized immediately. A reputable German physical chemist M Bodenstein challenged the results of the experiment. He removed his objections only after N N Semenov and colleagues had reproduced Khariton's experiments and given a theoretical interpretation of the observations. This was the origin of the theory of branching

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chain reactions, which won Semenov the Nobel Prize and provided the theoretical basis for the rapidly developing nuclear and nuclear explosion technologies.

From 1926 to 1928 Khariton stayed in England, working in the Cavendish Laboratory under the guidance of Ernest Rutherford and J Chadwick. In 1928 he received a Ph.D. degree for his work "On the count of scintillations caused by alpha particles", carried out in this laboratory. Having returned from England in 1928, Yulii Borisovich abruptly changed the direction of his research and embarked upon the study of explosives. This was a well-considered patriotic act, dictated by the Nazi threat in Germany and the impending doom of war. In the course of his studies Khariton found that the phenomenon of detonation also has a critical parameter. In the case of an explosive charge such a parameter is its diameter. In the 1930s Khariton founded and headed the Laboratory of Explosives in the Institute for Chemical Physics which detached from the Physico-Technical Institute. This laboratory was soon to become an acknowledged school of the physics of explosion.

A long-term and very fruitful cooperation between Khariton and Ya B Zel'dovich started in the late 1930s. They were quick to respond to the discovery of fission of uranium in 1939: in their papers published in 1939–1941 they conjecture and analyze the most important processes which ought to take place in the bulk of fissionable material. They also formulated the prerequisites of the exponential growth of the fission rate — that is, of the nuclear explosion.

From the first months of the Great Patriotic War Yuliĭ Borisovich was engaged in the successful development of cumulative charges. In February 1943, Laboratory No. 2 was established by decree of the Government within the Academy of Sciences of the USSR, tasked with the applications of atomic energy. Kurchatov was put in charge of this laboratory. One group within the lab concentrated on the problems of nuclear weapons. Appointed by Kurchatov to supervise the development of nuclear weapons was Yuliĭ Borisovich Khariton, a knowledgeable and experienced researcher in the physics of explosion and nuclear physics.

Soon Yulii Borisovich understood that in order to proceed with the development of nuclear weapons they had to be able "to set off large masses of explosives; this work cannot be carried out in Moscow, another place has to be found". Together with P M Zernov, the future director of the facility first known as KB-11 and then renamed VNIIEF, Yulii Borisovich visited a number of factories in Central Russia looking for suitable premises for the newly established design bureau. The choice fell on one of the plants of the People's Commissariat for Ammunition located in the village of Sarov, later to become known to the world as Arzamas-16.

Intensive and exhausting work on the construction of a nuclear charge resulted in a successful test on August 29, 1949. The next issue on the agenda was the development of the thermonuclear bomb. This transition in the United States gave rise to spirited discussions on the desirability of the development of thermonuclear weapons, and led to a reshuffle in the scientific management of the nuclear weaponry project: R Oppenheimer was replaced by E Teller. In this country the transition from nuclear to thermonuclear weapons was smoother, and Khariton remained in charge of the project at both stages of the development.

The achievements of the Nuclear Center headed by Khariton would have been impossible without the intellectual core of theoretical physicists centered around the outstanding scientists Zel'dovich and A D Sakharov.

For many years Yuliĭ Borisovich steered activities of immense consequence for the nation. He possessed a number of valuable human qualities very important for a dignitary of his rank. Usually a top manager deals with his direct subordinates. This suffices in a command hierarchy. If, however, you want to get to the very essence of things, you have to follow the chain all the way down to the tiniest cog in the works. Now and then in the office of Yuliĭ Borisovich a young specialist could be seen reporting on his first assignment, or the VNIIEF celebrity M V Belkin, a virtuoso of mechanical craftsmanship, would be discussing a clever gadget designed to ensure the precise adjustment of some assembly or device. Yuliĭ Borisovich had a clear understanding of the fact that there are no 'secondary' issues. Disregard of minor details may lead to disastrous failures. A theoretician can neglect the particulars in the general description of a physical process or a device, but this is not appropriate for a top executive who is responsible for the entire project, for the success of a crucial experiment. Responsible, in other words, for exploding a nuclear charge of the required power and ensuring the safety of personnel and the local population. He used to say, "There is one principle that I profess: you must know ten times as much as you need."

Kurchatov and Khariton occupied a special place in our authoritarian system. They were not only captains of an important scientific development, but statesmen of renown. This was recognized at the top level of government, and the leaders of the country emphasized their standing by having them elected to the Supreme Soviet of the USSR.

The people close to Khariton often joked that his only fault was the absence of any fault. He was a person of winning charm. He enjoyed everybody's love, and a request or a task from him were regarded as an honor and special privilege. Many people passed through his school of science and life. He was a man of duty, a man of exceptional responsibility and phenomenal energy.

Yuliĭ Borisovich had a perfect academic schooling, both Russian and European. It would be difficult to describe the imprint of such a schooling, but it is readily recognized even by the person's manners: tact, a self-restraint in expression, a neatness in appearance, and an ability to hear the interlocutor and respect his opinion.

The memory of Yuliĭ Borisovich as an outstanding scientist, a wise statesman, is written forever in the history of our country. And for those who happened to know him in person, he will forever remain an attentive teacher, a model man of culture, and a paragon of devotion to science.

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