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In memory of Igor' Nikolaevich Golovin

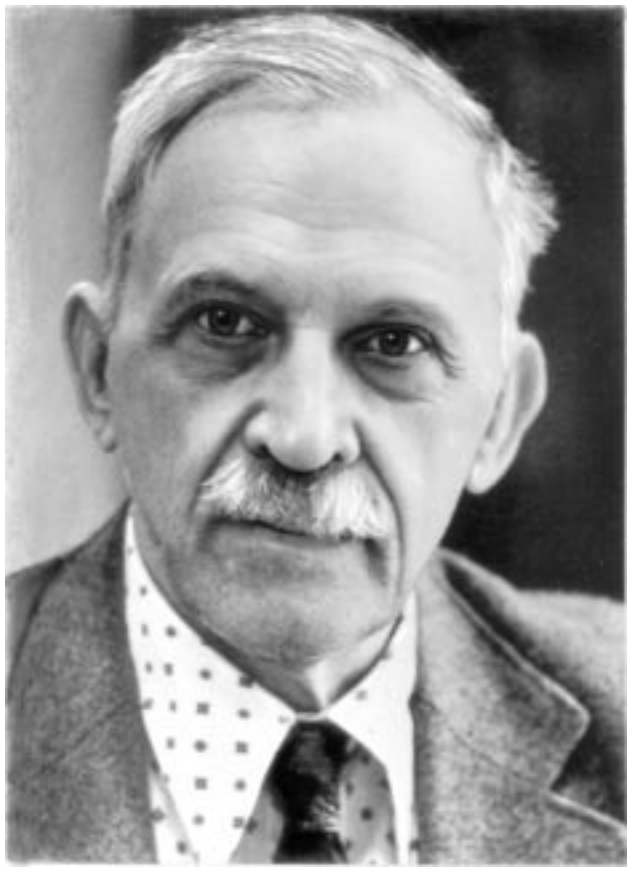
15th April 1997 ended the life of Professor Igor' Nikolaevich Golovin, a brother-in-arms of I V Kurchatov, and an outstanding scientist in the field of controlled thermonuclear fusion.

Igor' Nikolaevich was one of the most colorful actors in the Soviet nuclear project. His enthusiasm, spectacular appearance, forceful drive, and profound baritone made up his unforgettable image. The veterans of Arzamas-16 have remembered him since January 1951, when he first visited the secret town to take part in the fateful meeting on 'peaceful fusion'. Forty years later, when he made his second visit, he was received as an old colleague. He was something of an engine at full steam, dashing onwards and taking new allies on board.

Igor' Nikolaevich was born on 12 March 1913 in Moscow. Even as a student, Golovin developed interest in scientific research. His diploma thesis, dealing with the theory of nuclear forces, was published in 1936 in the form of two papers in *Zh. Eksp. Teor. Fiz.* [*Sov. Phys. JETP*] and *Usp. Fiz. Nauk* [*Sov. Phys. Usp.*]. As a postgraduate student of I E Tamm he was able to calculate the nuclear bonding energy for tritium and ^{3}He with unprecedented accuracy. At the same time he wrote reviews for *Astronomical Journal* about the source of stellar energy, and for *Uspekhi Khimii* [Advances in Chemistry] on the fission of heavy nuclei. In 1939 he finished his postgraduate studies, defending his candidate's thesis entitled "Polarization of vacuum in Dirac's theory". It might seem that the scientific career of Igor' Nikolaevich as a theoretical physicist specializing in the structure of matter and nuclear energy was predetermined.

After graduation, however, he was assigned to the Moscow Aviation Institute. There he embarked upon setting up a laboratory equipped for studying the physics of fission of heavy particles. His efforts were only supported inasmuch as his specialists resolved practical problems important to aviation. Soon the war began. In July 1941 Golovin joined the Moscow volunteer corps, and in the critical days of the autumn found himself near the town of Gzhatsk. He survived by a miracle.

Evacuated with his institute to Alma-Ata [Kazakhstan], in June 1942 Golovin went over to the Ukrainian Physico-Technical Institute, also relocated to the same place, and joined the laboratory of K D Sinel'nikov. He took part in the development of a wide-angle camera lens, and studied the possibility of detection of a directional sound wave against an intensive acoustic background. He developed a detailed theory of the excitation of hollow resonators with an unmodulated electron beam. He checked his theory with



Igor' Nikolaevich Golovin

experiments, and in May 1943 built a 15-watt generator of nine-centimeter waves. By this time Golovin had fully mastered advanced experimental techniques, making and improving high-vacuum systems with his own hands. This knack for independent creative work and experimenting highlighted his whole life.

In the fall of 1943 the People's Commissariat [Ministry] for electrical engineering, concerned with the development of the centimeter-wave technology, recalled Sinel'nikov's lab to Moscow. Golovin moved to the new premises in the town of Fryazino near Moscow. A year later, however, having heard of the launch of the Soviet nuclear project, he visited Kurchatov at home and joined the staff of Laboratory No. 2. He was back to nuclear physics, and became a lifetime member of Kurchatov's group.

After six years in Laboratory No. 2, Golovin, a young man of 37, became Kurchatov's right hand and faithful aide — his first deputy at the Institute. Golovin held this post throughout almost all of the 1950s — not the easiest years by

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far in our recent history. These were the years of Stalin and Beria, the years of the nuclear arms race and the anticipation of the imminent self-destructive confrontation between the USA and USSR.

To be first deputy of Kurchatov at the time of the development of our nuclear missile defense system is not a feeble man's job. This was a time of strong characters, working themselves to exhaustion doing their very best. They understood that their success was for the life of the country. They knew that they were under the constant surveillance of the secret police and under the close control of the Kremlin.

Igor' Nikolaevich did much for the development of the experimental base for plasma studies in the framework of the controlled fusion project. His name is associated with the construction of the first 'Tokamak' in 1955 and the studies performed with it. In 1958 he was in charge of the construction and operation of open magnetic traps. As a matter of fact, it was he who coined the terms 'Tokamak' and 'Ogra', which have now become international.

Kurchatov made efficient use of the enthusiasm and infinite energy of Igor' Nikolaevich, giving him urgent and important assignments. He was entrusted with the rushed development and construction of the large magnetic trap 'Ogra' to be completed before the 2nd Geneva Conference for peaceful use of nuclear power (September 1958), and was put in charge of the new direction of open magnetic traps for controlled fusion. This work, like all his other projects (whether it was the development of the tokamak with a diverter, the implementation of 'vacuum revolution' in thermonuclear installations, or the quest for low-radioactivity thermonuclear reactor based on helium-3 fuel with addition of deuterium), was marked by the desire to find a technical solution to the problem, governed by one main purpose: making another step towards a thermonuclear reactor. He was the first in this country to speak of the necessity of comprehensive engineering design of the reactor. He was a partisan of thermonuclear power technologies, recruiting to his cause not only his colleagues from other research institutes, but also the best figures from the industry.

Igor' Nikolaevich was a rare and original character, surprisingly harmonized with the person of Igor' Vasil'evich Kurchatov. He was a true romantic, a man of immense energy and broad outlook. He vanquished everyone, and sometimes stunned with his straightforwardness, spontaneity, and sincerity. Many Kurchatovians, whose names are well known today in the physical community, made their first steps in science under his encouraging and warm look. One should see his eyes light up upon hearing something sensible from his young or mature colleagues. With a smile of admiration he would mutter, include "Ish', ty!" [Oh, you! Attaboy! Brilliant!]

For him it was a trifling matter to make a phone call to the legendary Yu B Khariton, A P Aleksandrov, A D Sakharov, G N Flerov, or to meet them informally. For many years he worked in daily official and personal contact with Kurchatov. He talked with Niels Bohr and Edward Teller, and with other celebrities. By this alone he personified the linkage of the times.

He witnessed the great accomplishments and vicissitudes of our century. He lived in the era of expectations and disillusions, social experiments and merciless wars. He was entrained by this commotion; he never tried to escape, to become an armchair scholar. His own attitude seemed to be under permanent inhuman stress. Perhaps it was this that made him a captivating storyteller.

Concerned with the peaceful thermonuclear plasma, he was working for the power technology of the future centuries, for the distant future. He was in a hurry. And he did not like being distracted from this principal purpose.

He would light up when someone asked him whatever this plasma was. "Don't you know? You were born and you live under plasma, you can see it every day... Look out the window. See? It's the sun! Our aim is to learn how to hold the sun in our hands, to control the plasma."

Igor' Nikolaevich was a defiant optimist. No-one will recall him crestfallen. In any case, nobody ever saw him in the blues. As always happens in science, he had his ups and downs. He spoke of them with emotion. But he was never depressed. He lived a very active, long and bright life. He walked along with a steady and vigorous stride. His appraisals of people and events were uncommonly expressive. He might utter a harsh word. He would never conceal his real attitude to anyone, whether it was a rank-and-file employee or a scientific dignitary. He supported every promising initiative, and was a man of action. This is why he had so many admirers both within the scientific community and without. He enjoyed exceptional respect on account of his openness, enthusiasm, and top professionalism. Like any original and uncommon individual, however, not everyone was comfortable with him.

American physicists regarded Igor' Nikolaevich Golovin not only as a leading specialist in fusion in the Kurchatov institute, of which he was a founding father, but also as a 'colorful gentleman, who always had much to say on both political and technical issues'. According to them, he belonged to the 'outstanding figures of our epoch'.

He nourished the root system of human relations in the Kurchatov institute, having inherited much of the style and enthusiastic self-denial of Igor' Vasil'evich. Even his speech sometimes rang with sly intonations of the legendary 'Beaver'. It was not by accident that he became the first biographer of Kurchatov, and not by accident that the splendid Memorial Home of I V Kurchatov on the premises of the Institute was established through his initiative and efforts.

Igor' Nikolaevich was not merely a witness of the rise of the huge Kurchatov institute, of its triumphs and troubles. He was one of its founders and builders, who laid its strong basement. He lived by science to his last hour, and he left us suddenly, while working on his report for the seminar at the Institute, preparing for a scientific conference in the United States.

Time will pass. But not rarely shall we hear people say, "Igor' Nikolaevich was my teacher", while others say, "He came to my defense"...

E P Velikhov, B B Kadomtsev,
V M Kulygin, N N Ponomarev-Stepnoĭ,
Yu N Smirnov, V D Shafranov