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PERSONALIA

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Evgenii Nikolaevich Avrorin (on his 80th birthday)

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Evgenii Nikolaevich Avrorin was born on 11 July 1932. His father, Nikolai Aleksandrovich, was a geo-biologist and his mother was a soil scientist. Evgenii Nikolaevich's childhood years were during the not simple pre-war era and the even more complicated years of the Great Patriotic war (1941–1945). Already in high school E N Avrorin fell in love with physics and, having spent time at three universities — in Leningrad, Kharkov, and Moscow — presented his diploma work, supervised by E S Fradkin at the P N Lebedev Physical Institute of the USSR Academy of Sciences (FIAN), on the renormalizability of the quantum theory of meson fields.

In February 1955, E N Avrorin was unquestionably appointed by the Ministry of Medium Machine Building to work in the Theory Sector headed by Andrei D Sakharov in Sarov, at the first (and at that time the only) nuclear weapons center (Arzamas-16). His immediate supervisor was Yu A Romanov. Thus, E N became at once a member of the team working on one of the most important tasks: creation of the first Soviet binary thermonuclear gadget, the RDS-37.

The same year, a governmental decree ordered the creation of a new nuclear weapons center (former Chelyabinsk-70) in the Ural. E N, invited by Yu A Romanov, went there as a member of the first landing party of theoreticians.

In the Ural, he was entrusted with the preparation of the physical experiment dedicated to measuring radiation ranges, which was required to improve the interpretation of the results of RDS-37 tests. The experiment run by the Ural team in 1957 proved successful. Its format, the contents of measurements, the computations of the basic processes, and the key issues of the measurement design were in fact resolved by a young researcher — Avrorin. In 1961, E N submitted and defended his PhD thesis based on the results of this experiment.

The test of RDS-37 was in fact the key physics experiment in which new principles of designing thermonuclear charges were verified simultaneously. These principles were a promising huge potential in enhancing the hydrogen bomb's power, in intensifying the explosion processes, and in changing the conditions of process proceeding. However, the path in weapons systems from testing the primary principles to their implementation was very rugged. Both design centers started intense development work. The Ural center scored first. The systems developed and tested in 1958 were found to meet the requirements expected of battle weapons, and became the first thermonuclear gadgets accepted for the armed forces.

The next important step was taken in Sarov thanks to a fruitful idea suggested by Yu N Babaev and Yu A Trutnev. The two centers obtained these excellent results during the last above-ground atmospheric test explosions of 1961–1962.

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Evgenii Nikolaevich Avrorin

In 1963, the research team of the All-Union Scientific Research Institute of Technical Physics (VNIITF in *Russ. abbr.*), which included E N Avrorin, A A Bunatyan, B M Murashkin, and P I Koblov, was awarded the Lenin Prize for its contribution to this work.

In the 1950s, special attention was paid to possible peaceful uses of the energy of nuclear explosions. The compactly concentrated energy released in nuclear explosions looked very attractive for constructing giant dams, canals, reservoirs, and underground storage. But the conditions of peaceful applications imposed new requirements on nuclear charges, such as enhanced radiation safety. The development of such charges proved to be one of the biggest challenges in the history of development of nuclear explosive devices.

Scientists of the Ural nuclear center proposed, designed, and conducted experiments which made it possible to answer the fundamental questions of thermonuclear ignition. Their results allowed greater certainty in advancing towards creation of new types of systems. An important part of this work was performed under the guidance and with personal

participation of E N Avrorin. Similar studies were also conducted in Sarov. The finalized version proposed for industrial applications brought together the designs of both centers. In parallel to this, Evgenii Nikolaevich supervised work on the problems entailed by minimization of the pollution from radiation. In 1966, these results brought him the title of Hero of Socialist Labor, and in 1974 E N submitted and defended his DSc thesis comprising an assemblage of these projects.

Severe restrictions imposed on releases of radioactive products into the atmosphere led to the banning of explosions with outbursts. The employment of camouflet nuclear explosions, where all products of an explosion are localized deep underground, was more successful. This work was carried out in the department headed by Evgenii Nikolaevich.

Since the late 1960s, VNIITF launched a research program on inertial confinement fusion (ICF) using the possibilities both of full-scale explosions and of modeling them with high-power laser systems. The researchers studied the conditions of the ignition of fusion targets, the conditions of the ignition and burning of various types of ICF targets, and possible applications of the promising targets in hybrid systems. E N made essential contributions to the development of this field and continues to actively follow achievements in this area.

The knowledge of the properties of substances and processes occurring in them is of fundamental importance for the development of nuclear explosive devices. From the very beginning, this stipulated the need to develop new experimental methods of investigation and more profound theoretical models. The first physics experiment of 1957 set the cornerstone for the unfolding of this avenue of research. The conditions of underground tests allowed lifting the studies to the next level. E N Avrorin and B K Vodolaga suggested a method for using strong shock waves in studying the relative shock compressibility of materials under ultrahigh pressures. This approach was applied in 1983 in a specialized physics experiment designed to study the effect of the electron shell structure of atoms on the shape of shock Hugoniots of aluminum, iron, lead, and other substances; the experiment provided data on the transparency of aluminum and iron at record-high temperatures.

In 1985, after E I Zababakhin's death, E N Avrorin was appointed science supervisor of the VNIITF. This position significantly expanded the scope of issues that he had to oversee. Political leaders began to drastically reorient the international policies of the country. The American side of negotiations insisted, as one of the essential steps to establishing mutual trust, on the need for a more exact and reliable method of controling the functioning of the Threshold Test Ban Treaty. In this context, the American side suggested using the gas dynamic method of power control. The control imposed significant restrictions on the work of the groups conducting tests. To resolve these aspects of control, the specialized bilateral experiment was proposed; this experiment, conducted in 1988, consisted of two explosions set up on the Semipalatinsk and Nevada test sites.

Only a small fraction of E N Avrorin's work was declassified and accessible to the scientific community, but the number was sufficient to allow being elected Corresponding Member of the USSR Academy of Sciences in 1988, and Full Member of the Russian Academy of Sciences in 1992.

In 1996, Director of the Russian Federal Nuclear Center–VNIITF V Z Nechai tragically took his own life. Some time before that, the Institute had lost funding, which led to the chronic non-payment of salaries. E N Avrorin agreed to add to his responsibilities of science supervisor the load of procurement and financial directorship of the Institute for two years and, in parallel, to select and train a new director. He succeeded in improving the organizational and economic activities of the Institute over a relatively short period and also nurtured a successor — G N Rykovanov.

For 25 years, Evgenii Nikolaevich has acted as head of the organizational committee of the Zababakhin Scientific Talks, both in their organizational aspect and in fact in the way each conference is run. He takes active part in the work of a number of other scientific conferences and seminars conducted by the VNIITF in collaboration with its partner establishments. For example, he is a co-chair of the international seminar, Radiation Physics of Metals and Alloys. At the moment, E N Avrorin is participating in preparing the 10th Seminar in this series and plays an active roles in the programs of the Russian Academy of Sciences.

At the end of 2006, E N Avrorin became an honorary science director of the Institute. The new position failed to dampen his energy — on the contrary, it gave him a chance to perceive better than in the past the most important current issues in the life of the Institute and its prospects, both in its mainstream activities and in energy conversion research. He pays special attention to the development of the industry of nuclear energy generation.

E N Avrorin's colleagues and associates wish him all the best on the occasion of this glorious day. We are happy to be able to work with him on the most important problems of scientific and technological development in our time. We wish him good health, plentiful strength, and much success on the path he has chosen.

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B M Koval'chuk, G N Kulipanov, Yu S Osipov,
N N Ponomarev-Stepnoi, N A Ratakhin,
G N Rykovanov, V A Simonenko,
A N Skrinsky, V E Fortov