IN MEMORY OF HENRI AMVROSIEVICH RUKHADZE

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On March 7, 2018, Henri Amvrosievich Rukhadze died suddenly in the 87th year of his life. He was a doctor of physical and mathematical sciences, a professor, a two-time laureate of the State Prizes of the USSR and recipient of the M.V. Lomonosov Award of the first degree (Moscow State University), an Honored Scientist of Russia, a Chief Researcher of the Theoretical Department of the A.M. Prokhorov General Physics Institute of RAS, Professor of Moscow State University, Moscow Institute of Physics and Technology, Moscow Engineering Physics Institute, an Academician of the Russian Academy of Natural Sciences and of the A.M. Prokhorov Engineering Academy, an outstanding specialist with a worldwide reputation in the field of electrodynamics of material media, plasma physics and plasma electronics.

Henri Amvrosievich Rukhadze (in Russian Serov) was born on July 9, 1930 in the village Khidistavi of the Gori district (Georgia) to a family of mathematicians: Amvrosiy Kalistratovich Rukhadze, an employee of the Institute of Mathematics of the Georgian Academy of Sciences and professor at the Tbilisi Polytechnic Institute, and Tamara Yegorovna Talakvadze, a mathematics teacher, who died early (1942). In the family there was a cult of French culture, the elder son was named Henri in honor of Henri Poincaré, and the younger, a daughter - Jeanne in honor of Joan d'Arc. Mathematics reigned in the home. The greatest Georgian mathematicians: N.I. Muskhelishvili, I.N. Vekua and others often visited, and the desire to become a mathematician for Henri was natural.

He began school locally, but spent the last four years in Tbilisi, graduating with a gold medal of merit. In the last grade of the school Henri decided to apply to the recently-opened Physics and Technology Faculty (PTF) at Lomonosov Moscow State University. His father supported his decision, and Henri passed the qualifying competition for admission to the PTF at Tbilisi University (where I.N. Vekua himself gave the mathematics examination). In July 1948 Henri flew to Moscow. He passed his entrance examinations (in mathematics - from I.D. Kudryavtsev himself), moved to a hostel in Dolgoprudny and began attending lectures. Among the lecturers were such academicians as G.S. Landsberg, S.M. Nikolsky, L.I. Sedov, P.L.

Kapitsa and L.D. Landau, and seminars led by I.D. Kudryavtsev, K.A. Semendyaev, S.L. Mandelshtam, MA Lavrentiev, et al. A list of names that boggles the mind.

A physics practicum (six hours, twice a week!) was conducted by N.A. Irisova, who managed to teach Henri to sense physical quantities "by touch", M.D. Galanin (the "seminarian") taught him to solve problems and developed in students an intuition for physics, without which the issues of general (in contrast to theoretical) physics cannot be solved. And after the lectures of L.D. Landau in the second year, a student with such a mathematical grasp as Henri, could hardly fail to become a theorist. The floor of the "minimum" Henri passed to Lev Davidovich personally, but then everything changed. L.D. Landau, P.L. Kapitsa, G.S. Landsberg, left the faculty. Instead of Landau - A.A. Sokolov, instead of Landsberg - S.G. Kalashnikov (S.L. Sobolev also taught Mathematical Physics), and soon the PTF itself was liquidated with the transformation into MIPT. Second and third courses in the PTF were closely tied to the partnership with the institutes of the Academy of Sciences (as was the case with the PTF). Henri's group was connected to the Institute of Chemical Physics, where was the director N.N. Semenov. Here, fate bestowed upon him close ties with V.N. Kondratiev (chemical kinetics), V.I. Gol'danskyy, S.P. Dyakov (see references to him in Landau on Hydrodynamics). Henri studied with a group of talented guys, fellow students L.V. Keldysh, Yu.A. Ryzhov, Yu.E. Nesterikhin et al.

In his fourth year, Henri found himself at the MEPhI (then, in 1951, - the Moscow Mechanics Institute of Ammunition). Here were V.G. Levich (stat. physics), E.L. Feinberg (quantum theory of radiation), V.I. Kogan (quantum mechanics). Here Henri began to teach mathematical physics. Feinberg brought him to the FIAN, in the I.E. Tamm theoretical department, and work began on his thesis. In the fifth year of MEPhI he studied under I.Ya. Pomeranchuk (kernel theory) and A.B. Migdal (additional chapters of quantum mechanics).

In FIAN, in the theoretical department, Henri's primary instructors were V.L. Ginzburg, who taught a remarkable seminar on Wednesdays starting in 1952, and V.Ya. Feinberg: the Don Quixote of Tamm, always ready to do anything for any graduate student. But for his chief advisor, Henri chose Viktor Pavlovich Silin, who had just defended his candidate dissertation and offered Henri a chance to write his thesis on the topic of interaction of nucleons in the Tamm-Dankov model, more precisely, the deuteron problem. The thesis was defended in February 1954, Henri's first scientific work was sent in the print, and V.P. Silin recommended him to I.E. Tamm for graduate school. As a graduate of MEPhI, Henri would normally be placed in the Institute of Chemical Physics of the Academy of Sciences, but N.N. Semenov granted Henri's request to release him to the FIAN to I.E. Tamm, whose postgraduate student he became on April 15, 1954.

Henri's years in graduate school, from 1954 to 1957, were filled with work on the continuation of his thesis - the problems of mesodynamics in the framework of the Tamm-Dankov model, and then the scattering and bound state of two nucleons, practically under the direction of V.P. Silin. These were years of companionship with fellow graduate

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students - Yu.M. Popov (the author of the laser on the p/n transition), V.P. Shabansky (the author of a monograph on the magnetosphere of the Earth), S.I. Syrovatsky, whose results on magnetic hydrodynamics became the basis of the corresponding section in the "Electrodynamics of Continuous Media" Landau-Lifshitz, G.M. Vagradov, whose results on nuclear theory allow him to work still successfully at the Institute of Nuclear Research of the Academy of Sciences. In 1957, Henri Amvrosievich Rukhadze defended his dissertation on "The interaction of two nucleons in the Tamm-Dankov method," in which the completely renormalized theory of the deuteron (deuteron theory with vector interaction in the Tamm-Dankov approximation) was first constructed.

He had no Moscow residence permit, and in October 1957 Henri managed to get a job only as a research assistant at the Physics and Energy Institute in Obninsk (then p.o.b. 412). Here, fate brought together him with V.M. Agranovich (theory of excitons), V.S. Stavinsky (multivolume reference book on nuclear reactions), A.I. Leipunsky (nuclear reactors), G.I. Marchuk (geophysics, computational mathematics), V.F. Turchin (slow neutrons). One and one-half year.

Starting in December 1958, Henri finally found himself at FIAN again. Now this is the laboratory of plasma physics of V.I. Vexler, who attended lectures on plasma physics by Henri and his co-workers in Dubna, M.S. Rabinovich (plasma physics), L.M. Kovrizhnyh (high-temperature plasma), I.S. Spiegel, V.N. Tsytoich, G.A. Askar'yan (nonlinear optics, laser physics) and in the theoretical sector of V.P. Silin.

Starting in 1958, the main direction of A.A. Rukhadze's research was associated with the development of electrodynamics of media with spatial dispersion and its applications to the physics of nonequilibrium plasma and plasma-like media. In 1964, Henri defended his doctoral dissertation on "The theory of stability of thermodynamically nonequilibrium and inhomogeneous plasma." In 1968 he joined the CPSU. In 1971 Henri obtained an appointment for plasma electronics in the M.S. Rabinovich laboratory of plasma physics. Henri, together with V.P. Silin, first formulated the general principles of the electrodynamics of media with spatial dispersion and revealed the nature of the magnetic permeability of media as a manifestation of such a dispersion. Based on the results of these works, he published a well-known monograph "Electromagnetic Properties of Plasma and Plasma-like Media" (jointly with V.P. Silin) and a textbook "Fundamentals of Plasma Electrodynamics" (jointly with A.F. Alexandrov and L.S. Bogdankevich). For the creation of this textbook, the authors were awarded the State Prize of the USSR in 1991. In 1984, the English translation of the textbook was published in Germany by the publishing house Springer.

A.A. Rukhadze introduced a major contribution in the theory of oscillations and stability of a nonequilibrium and inhomogeneous plasma. Together with V.P. Silin, he developed an asymptotic theory of oscillations of inhomogeneous media and formulated "quantization rules" for determining the vibration spectra and analyzing their stability. The results of these studies were included in the monograph "Waves in magnetoactive plasma", published jointly with V.L. Ginzburg and translated into English and Bulgarian languages, and in "Oscillations and Waves in Plasma Media," that was published jointly with A.F. Alexandrov and L.S. Bogdankevich.

A.A. Rukhadze is rightfully considered the creator of relativistic plasma microwave electronics. He together with his disciples - theoreticians and experimenters, developed not only the theoretical foundations of this field of science,

but also implemented unique plasma generators of coherent electromagnetic radiation. For the cycle of works on relativistic microwave electronics, A.A. Rukhadze together with A.F. Alexandrov and V.I. Kanavets in 1989, was awarded the Lomonosov Moscow State University Award of the first degree. Works by A.A. Rukhadze in this field are generalized in monographs: "Physics of high-current relativistic electron beams" (jointly with V.G. Rukhlin and S.E. Rossinsky) and "Physics of dense electron beams in plasma" (jointly with M.V. Kuzelev). An English-language edition of the latter was published in France in 1995.

A.A. Rukhadze laid the foundations of a new field of gas-discharge physics - discharge physics in radiating plasma. He formulated the conditions for transforming a fraction of the electrical energy deposited into a gas discharge, into optical radiation in a wide range of the spectrum. Based on the developed theory of such discharges, effective gas-discharge light sources were created for the energy pumping of high-power gas lasers. For these works A.A. Rukhadze with the team of co-authors was awarded the State Prize of the USSR in 1981. According to the results of the work, he wrote, together with A.F. Alexandrov, the monograph "Physics of high-current light sources."

A.A. Rukhadze is the author of more than 600 scientific papers, including more than 50 reviews, 3 patents and 22 monographs. Under his leadership, hundreds of undergraduate theses were completed, 76 candidate dissertations were defended and among his students are 34 doctors of science.

A.A. Rukhadze is a member of the Editorial Board of the journals "Applied Physics" and "Bulletin of the Lebedev Physics Institute", Ch. editor of journal "Engineering Physics"; translator and editor of R. Feynman's "Quantum Electrodynamics", numerous textbooks on plasma kinetics, etc., and of the unique 4-volume set of L. De Broglie works. He is a member of such international committees as ICTP International School and ICPIG conferences.

A.A. Rukhadze was awarded the Order of the Red Banner of Labor and the Order of Badge of Honor, medals "For Labor Valor" and "Labor Veteran", he is a foreign member of the Georgian Academy of Sciences, Honorary Doctor of Sofia University "St. Kliment Ohridski" (Bulgaria), the N.N. Bogolyubov Institute of Theoretical Physics of National Academy of Sciences of Ukraine, Dagestan State University.

An important feature of his scientific activity throughout his life was the support of the latest scientific ideas breaking traditional perceptions of entrenched scientific schools about the world, which often replace creativity and bursts of thought with craft. He actively criticized the activities of the Commission on Combating Pseudoscience of the Russian Academy of Sciences. He approved or did not consider as pseudoscientific some studies rejected by the scientific community, in particular the "New Chronology" of A.T. Fomenko and studies on the physics of nuclear reactions at low energy. He was a reviewer of the pseudoscientific book of G.I. Shipov "The Theory of Physical Vacuum" and the author of the memoirs "Events and People", which marked its sixth edition in 2016.

The image of a mighty intellect, a "pure," active builder of the edifice of theoretical physics and new knowledge, whose whole life was spent at the cutting edge of Physics in Russia, an uncompromising, bright, sunny man with life-affirming humor will remain in our minds and hearts.

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