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Joint scientific session of the Division of General Physics and Astronomy of the Russian Academy of Sciences and the Russian Research Centre 'Kurchatov Institute' (in commemoration of the 90th anniversary of Academician Lev Andreevich Artsimovich's birth) (3 March 1999)

A joint scientific session of the Division of General Physics and Astronomy of the Russian Academy of Sciences and the Russian Research Centre 'Kurchatov Institute', dedicated to the 90th anniversary of Academician Lev Andreevich Artsimovich's birth, was held in the Blue Hall of the Presidium of the Russian Academy of Sciences on 3rd March 1999. The following reports were presented at the session:

(1) **Boyarchuk A A** (Division of General Physics and Astronomy, RAS, Moscow) "Academician Lev Andreevich Artsimovich";

(2) **Velikhov E P** (Russian Research Centre 'Kurchatov Institute', Moscow) "Lev Andreevich Artsimovich and the triumph of the tokamak";

(3) **Shafranov V D** (Russian Research Centre 'Kurchatov Institute', Moscow) "Trends in magnetic helical systems for CNF";

(4) **Kulipanov G N** (G I Budker Institute of Nuclear Physics, Siberian Branch of RAS, Novosibirsk) "Synchrotron radiation: its history and prospects";

(5) **Petrov M P** (A F Ioffe Physical-Technical Institute, RAS, St. Petersburg) "Leningrad Fiztekh Fellows in the tokamak team of Lev Andreevich Artsimovich (1962 – 1973)";

(6) **Reports.** To the memory of L A Artsimovich.

An abridged version of the first, third, and fifth reports is given below. A review paper based on the forth report is planned for publication in a subsequent issue of *Physics – Uspekhi*.

Lev Andreevich Artsimovich
(25.02.1909 – 01.03.1973)

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Academician Lev Andreevich Artsimovich

A A Boyarchuk

To my lot fell the honorable duty of opening our session today. The task is as honorable as it is difficult, for while on the subject of Academician Lev Andreevich Artsimovich we do more than touch a brilliant personality of an outstanding scientist and organizer of research. The phenomenon of Lev Andreevich Artsimovich by name is an ample manifestation of a remarkable stratum of the history of our science and of our state as a whole. By tragic, if not symbolic, coincidence Lev Andreevich's life was interrupted virtually contemporaneously with the completion of maybe the most romantic period of the sixties, when in science the generation of young scientists inspired by large-scale programs and radiant prospects met aptly with the outstanding scientists of the elder generation, whose labors made the country into a superpower. As is apparent now, that was the period of

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fastest economic growth and, accordingly, of fastest development of the scientific complex.

Lev Andreevich belonged to the generation of 'personalities of national significance', whose life and creative activity was motivated not only by their extraordinary spirit and scientific talent, but the entire course of history of our native land. They came as an embodiment of the aspiration to serve lofty and impersonal purposes, which is so typical of the Russian intelligentsia. The beneficial influence of these outstanding people who came to know well not only the blessing of scientific creative activity, but the innermost mechanisms of science organization and the top national priorities as well, persisted for many years after they were gone.

Lev Andreevich was in charge of the physics research in our country for 17 years since 1957, when our division has been renamed the 'Division of General and Technical Physics' and detached from the former Division of Physico-Mathematical Sciences of the USSR Academy of Sciences.

Lev Andreevich gave much consideration to the problems associated with the institution of research. He outlined his credo in a brilliant report presented at the meeting of the Presidium of the USSR Academy of Sciences on 3rd December 1964. He considered a proper decision upon the line of investigation to be the key point. He believed that astrophysics and the physics of elementary particles were those lines at that time. In his opinion, only in these fields could the discovery of fundamentally new phenomena be anticipated. This viewpoint was fully confirmed later. He also believed that solid-state physics had been thoroughly studied, so that no major discoveries would be forthcoming. But present-day research in this field steadily yields excellent results. Lev Andreevich would have supposedly assigned them to applied results. In general, the proper correlation between fundamental and applied sciences and the promotion of scientific results are rather intricate questions. Scientific results are introduced in life by no means easily or fast, and all attempts to speed up this process by passing government resolutions would meet with only limited success. Lev Andreevich was firmly convinced that academic institutes should pursue only fundamental research despite the fact that this viewpoint was not shared by the majority of scientists. They believed that detachment from real life was impermissible, that industrial branch institutes had for the most part insufficient qualifications to find the applications for the results of fundamental research, and that academic institutes should therefore pursue applied research, too. It is pertinent to note that the question of the interrelation between fundamental and applied sciences is still an open question.

Lev Andreevich placed particular emphasis on the staff. He reasoned correctly that new laboratories and institutes should not be established unless there is a bright personality who has achieved much success in science. A prominent example of this kind: the Candidate of sciences Yuriĭ Nikolaevich Denisyuk, one of the founders of holography, was elected a Corresponding Member of the USSR Academy of Sciences.

Lev Andreevich Artsimovich believed that scientific activity should not be confined to Moscow and Leningrad. Major academic research centers should encompass the entire territory and involve residents of many regions in scientific activity. The now-familiar research centers like those at Troitsk, Chernogolovka, and the Special Astrophysical Observatory were formed in the time of L A Artsimovich. The instrument making and technological basis for physics and astronomy made rapid strides. He devoted much effort and personal time to attain these ends and would use his authority in government circles. Were it not for active participation, our biggest telescopes, the optical BTA and radiowave RATAN-600, would never have been realized.

Also noteworthy is the remarkable style of supervision or, to be more precise, of education of the staff members of the Division of General Physics and Astronomy, RAS. Owing to this, after Lev Andreevich passed away, our division (as before, it is the largest in the RF Academy) remained stable and grew steadily for many years to come. This style is characterized by more than the quest for high scientific and organizational standards. Exacting to his collaborators, Lev Andreevich preserved, brought up, even 'cultivated' in them the spirit of independence, the ability to make quick and efficient decisions and to act under any circumstances and in any instances. He never allowed himself petty cares, was a man of his word, consistent in decisions and careful. His coworkers always had the feeling of a secure rear and could expect reliable backing, objectivity, and support.

Today our scientific community, together with the entire country, is living through one of the most arduous periods in its history. May the bright example set by Lev Andreevich Artsimovich keep up our spirits.

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Trends in magnetic helical systems for CNF

V D Shafranov

Introduction

This year, the 25th of February was the 90th anniversary of the birth and the 1st of March, the 26th anniversary of the decease of Academician Lev Andreevich Artsimovich, an outstanding physicist, a man of rare combination of logic and intuition, the first Academician-Secretary of the Division of General Physics and Astronomy of the USSR Academy of Sciences. He was a person of brilliant and aphoristically thinking mind; a man of extensive knowledge; an ironical, witty, and sarcastic critic; an irreconcilable opponent of publicity campaigns and superficial studies in science. Lev Andreevich was among the magnificent four of our physicists and outstanding personalities to whom the controlled nuclear fusion (CNF) research in our country owes its highest level since its inception. They are Academicians A D Sakharov and I E Tamm, who put forward and elaborated the basic principles of magnetic thermal insulation of a plasma, and Academicians L A Artsimovich and M A Leontovich, who instituted the studies which gave birth to the foundations of high-temperature plasma physics and controlled nuclear fusion. The task of supervising the experimental research and verifying theoretical predictions in the field of CNF as well as guiding the quest of real conditions of high-temperature plasma production and confinement fell to precisely the lot of L A Artsimovich.

Helical magnetic systems is an extended name of the stellarator systems of magnetic plasma confinement. Since their declassification in 1958, stellarators (toroidal facilities in which the system of nested magnetic surfaces necessary for plasma confinement is established by external currents, not requiring the induction of current in the plasma) have