Physics – Uspekhi **39** (6) 645 – 646 (1996)

PERSONALIA PACS number: **01.60.+q**

Alekseĭ Mikhaĭlovich Bonch-Bruevich (on his eightieth birthday)

On May 23, 1996 the prominent Russian physicist and correspondent member of the Russian Academy of Sciences Alekseĭ Mikhaĭlovich Bonch-Bruevich, leading specialist in the field of quantum electronics and the physical optics, celebrated his 80th birthday.

A M Bonch-Bruevich is a physicist with a broad range of scientific interests based on his vast erudition, a profoundly clairvoyant understanding of the essence and unity of physical phenomena which, at first glance, are totally heterogeneous. These features, coupled with A M Bonch-Bruevich's pedagogical and organizational skills, have made him the acknowledged head of a school of science which has educated several decades of eminent scientists.

The bulk of his scientific career, which spans over 60 years of intense activity, is related to the physical optics and quantum electronics. Through his findings in the field of laser technology and the interaction of radiation with matter, A M Bonch-Bruevich has made a powerful contribution to the development of Soviet, Russian and world science.

A M Bonch-Bruevich was born in 1916 in the city of Tver' to a family of one of the pioneers of native radio technology which established and directed the Nizhniĭ Novgorod radio laboratory and founded the world's most powerful Komintern radio broadcasting station, the correspondent member of the Soviet Academy of Sciences, M A Bonch-Bruevich.

A M Bonch-Bruevich's scientific career got under way in 1932 as a laboratory assistant at the Leningrad Physicotechnical Institute. Here he delved deeply into scientific research and contributed his share to the first article which was printed in 1934. In the same year he enrolled at the Leningrad Polytechnical Institute and, after graduating in 1939, entered Graduate school at the Physicotechnical Institute. A M Bonch-Bruevich was a soldier in the Armed Forces from 1939 – 1946. He served a short stint in Leningrad, under siege at that time, then went on to train military officers. After being discharged in 1946, A M Bonch-Bruevich was involved in then cutting-edge research trends concerning the development of nuclear weapons.

Virtually all of A M Bonch-Bruevich's post-war activities revolve around the State Optical Institute (The S I Vavilov SOI), where, by recommendation of S I Vavilov, he performed a relativistic experiment of the first order. The results of this study, which directly confirmed the second postulate of the special theory of relativity, were followed up in his doctoral dissertation, which A M Bonch-Bruevich defended in 1956. At this time he was investigating the mechanism of photo-, cathode- and electroluminiscence and devoted much time and effort to developing new experimental techniques

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Translated by S Frauzel

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enlisted radioelectronic ideas. His monographs *The Application of Electronic Valves in Experimental Physics* (1951) and *Radioelectronics in Experimental Physics* (1966) have enjoyed far- reaching popularity and have been studied by a whole generation of physicists. The former has been issued in four separate editions. These monographs have been translated and published in many countries.

A M Bonch-Bruevich's expertise as scientist and organizer of scientific research projects clearly materialized in the Sixties, when he focused his attention on quantum electronics inquiry. He and his collaborators at the laboratory performed experimental and theoretical analysis which played a significant part in the development of solid-state lasers. A M Bonch-Bruevich and his fellow researchers developed the first laser on neodymium-doped glass, which was produced by domestic industry in 1964, i.e. before the industrial output of glass lasers got underway abroad. A number of the lasers developed in the laboratory by A M Bonch-Bruevich on neodymium-doped glass for technological and scientific purposes were showcased at exhibitions abroad and received gold medals at the Exhibition of Achievements of the

National Economy (Moscow). In 1974 A M Bonch-Bruevich was among the circle of inventors who were awarded the State Prize of the USSR for having developed the fundamental principles for the creation of lasers on neodymium-doped glass and their launch into mass production.

In 1962 A M Bonch-Bruevich and his associates were the first in the USSR to undertake systematic investigation on the influence of laser radiation on absorptive media. In subsequent years they successfully elucidated all the fundamental regularities underlying these processes and worked out a theory accounting for such phenomena. This laid the groundwork for developing the physical concepts of a new trend in research — the optical treatment of materials (laser technology), which is being actively pursued at present. In 1970 the first monograph ever published on the high-power influence of optical radiation *The Effect of High-Power Radiation on Metals* was published by A M Bonch-Bruevich and M A El'yashevich.

From 1972 – 1976 A M Bonch-Bruevich supervised a comprehensive research project during which the effects of laser radiation on transparent and slightly absorptive media were comprehensively studied. In the process, a number of previously unknown phenomena were detected and a model was built for the optical destruction of real transparent media, based on a statistical approach to related processes. This study served as the basis for solving the important task of creating optical materials with enhanced radiation strength and led to the formation of a new branch in the physical optics known as 'power optics'. A M Bonch-Bruevich is a leading specialist in this new scientific trend having gained recognition as an important independent division of optics and quantum electronics. Beginning in 1969, he has supervised the organizational committee of regular All-Union conferences (held at the State Optical Institute) on the nonresonance interaction of laser radiation with matter, which has enjoyed immense popularity and commanded great authority. Under his direct supervision All-Union seminars were held for a number of years on focused issues relating to power optics. Over the past decade A M Bonch-Bruevich and his collaborators have performed top-priority studies on laser-thermochemistry, surface electromagnetic waves of optical range and optical tomography.

A M Bonch-Bruevich has both supervised and been directly involved in pioneer research projects on the optical and spectral properties of atoms in intense radiation fields of various spectral composition. These studies are of seminal importance to quantum electronics and atomic physics. Beginning in 1975, A M Bonch-Bruevich and his fellow researchers began to develop a new trend — studying the processes of interaction of optical radiation with atoms during collisions, which came to be known as 'radiation collisions'. In recent years these studies have focused on the interaction of atoms with dielectrics and metals in intense light fields. In the process, a new phenomenon was discovered, i.e. photodetachment of separate metal atoms from its monolithic surface (photoatomic emission).

Along with his main scientific work, A M Bonch-Bruevich has been committed for many years to intense scientific and social activities at a council bureau on coherent and nonlinear optics of the Russian Academy of Sciences, sat on the editorial boards of various leading scientific journals and several special-purpose science and technology coordinating councils.

A M Bonch-Bruevich has published some 250 scientific articles, three monographs and received 17 invention certificates.

A M Bonch-Bruevich has been awarded the second degree Order of the Patriotic War and the Order of the Red Banner of Labour. In 1976 he was a recipient of the honorary title of Honoured Scientist and Technologist of the RSFSR. In 1984 A M Bonch-Bruevich was selected as a correspondent member of the Academy of Sciences of the USSR.

A M Bonch-Bruevich harmoniously combines the qualities of a scientist, human being and citizen. His intelligence, personal appeal, never-failing kindness coupled with a firm and steadfast nature have endeared him to those who have come to know him, thus earning him profound respect.

On behalf of his colleagues, friends and learners, we are thrilled to convey our warmest regards to A M Bonch-Bruevich, wishing him health, stamina and even greater success to come.

E B Aleksandrov, Zh I Alferov, N G Basov,
F V Bunkin, O N Krokhin, B A Mamyrin,
M M Miroshnikov, V V Osiko, P P Pashinin,
G T Petrovskiĭ, A M Prokhorov, V M Tuchkevich