

# Gasan Mamed Bagir ogly Abdullaev (on his sixtieth birthday)

Zh. I. Alferov, E. P. Velikhov, B. M. Vul, A. M. Prokhorov, M. A. Topchibashev, and V. M. Tuchkevich

Usp. Fiz. Nauk 126, 349-351 (October 1978)

PACS numbers: 01.60. + q

August 20, 1978 was the 60th birthday of Gasan Mamed Bagir ogly Abdullaev, a major Soviet physicist, President of the Azerbaidzhan Academy of Sciences, and a Corresponding Member of the USSR Academy of Sciences.

Abdullaev was born into a peasant family in the village of Yaidzhi, Dzhul'fa District, Nakhichevan' ASSR. He experienced many deprivations and misfortunes as a youth: the large family lost its father early.

After graduation from the Physicomathematical Department of the V. I. Lenin Azerbaidzhan Pedagogical Institute in 1941, Abdullaev taught physics and mathematics at the school and teachers' college at Ordubad.

Since 1944, Abdullaev's entire life and work have been inseparably connected with the Academy of Sciences, where he advanced from laboratory assistant to Academician and Director of the Azerbaidzhan Academy of Sciences.

In 1948, having completed his graduate work, Abdullaev defended his Candidate's dissertation, which was devoted to the distribution and jump of potential at an anode in cuprous oxide. The electronic mechanism that he proposed to explain his results was simple and contained ideas that were new for their time but were subsequently developed thoroughly in studies by Abdullaev and his students.

The need to accomplish the new objectives that the young scientist set for himself led Abdullaev to the Leningrad Physicotechnical Institute, where he worked from 1950 through 1953. Here, in Prof. D. N. Nasledov's laboratory, Abdullaev carried out important research on selenium rectifiers. His complex studies resulted in establishment of the physical nature and of the processes of producing, forming, and unforming of the barrier layer in selenium rectifiers.

Abdullaev defended a Doctorate dissertation on "A Study of the Physical Processes Occurring in Selenium Rectifiers" at the USSR Academy of Sciences Physicotechnical Institute in 1954.

Immediately after returning to Baku, Abdullaev embarked on a program of development of semiconductor physics at the Azerbaidzhan Academy of Sciences. He recognized clearly that it would be impossible to solve this problem without highly qualified manpower. He organized the preparation of manpower at Baku and seized every opportunity to send capable young people to the scientific organizations of Moscow and Leningrad and especially to the USSR Academy of Sciences Physicotechnical Institute, with which he retained strong bonds.

During this time, Abdullaev began a coordinated investigation of selenium and devices based on it. The discovery and detailed explanation of the specific physical-property peculiarities of selenium that have made it possible to develop a series of widely used transducers are associated with Abdullaev's name. The possibility of explaining the "anomalous" properties of selenium on the basis of a specific network structure posited for it has now been established as a result of Abdullaev's work. The electrical and thermal properties of selenium, their variations with temperature, impurity content, heat treatment, diffusion processes, the effects of strong electric and magnetic fields, and other disturbances have now been explained.

An important result of Abdullaev's research was establishment of the inherent possibilities of a new class of complex semi-conductor compounds and preparation of these compounds. Valuable aspects of these studies, which were started back in the 1960's, are the consistent and detailed elaboration of a technology for making single crystals, establishment of the energy spectrum of the carriers, explanation of the electrical, thermal, optical, and other phenomena, and the design of various types of transducers.

Abdullaev's name is associated with the fundamental concepts of semiconductor physics regarding the properties of  $A^{III}-B^{IV}$  compounds and their more complex analogs. Among the many semi-conductor transducers developed on the basis of these compounds and with group one chalcogenides, switching devices with memory occupy a special position. Both polarity-dependent and polarity-independent switching elements with variable parameters have been made. The possibility of controlling them with light and with electric fields has been indicated. Quantum generators, decoders, scanners, detectors for various types of radiation, coolers, etc., have been developed on the basis of this same group of materials.

Separate mention should be made of Abdullaev's research (in collaboration with biologists) in molecular biology and biophysics. The previously unknown phenomenon of amplification of light-induced electrical potentials in the retina under the action of selenium, which participates in the mechanism of conversion of radiant to electrical energy, was established experimentally. Apart from their importance for the understanding of the visual process, these studies are of unquestionable value for application of selenium compounds as an effective therapeutic agent. The fact that selenium selectively inhibits the activity of the first form of the enzyme that catalyzes the synthesis of ribosom rib-

onucleic acid on a desoxyribonucleic acid (DNA) matrix was established for the first time.

In spite of the wide range of the problems that attracted Abdullaev's scientific interest, a far from complete list of which has been given above, he gives almost as much attention to scientific-organizational work and manpower training. Abdullaev is the organizer and continuing director of the Order of the Red Banner of Labor Institute of Physics of the Azerbaijan Academy of Sciences.

A whole series of scientific and scientific-production organizations, now independent, were created with the Azerbaijan Academy of Sciences Institute of Physics as a base, thanks to Abdullaev's untiring interest and personal initiative; examples are the Sector for Radiation Research, the Special Design Office (SDO) of the Institute of Physics with its pilot-production facilities, etc. A significant part of the scientific manpower working successfully in these organizations and in the scientific agencies and post-secondary educational institutions of the Republic was taught by Abdullaev himself.

From 1968 through 1970, Abdullaev was Academician-Secretary of the Division of Physico-technical and Mathematical Sciences of the Azerbaijan Academy of Sciences. During this comparatively short time he was able to improve significantly the effectiveness of the scientific work done by the Division's agencies. Since 1970, Abdullaev has been President of the Azerbaijan Academy of Sciences.

Abdullaev has rendered a major service in initiating and developing studies in related branches of the fundamental sciences in the Republic's Academy of Sciences—branches such as electro-chemistry, biochemistry, biophysics, molecular biology, molecular genetics, etc.

An enormous amount of intense work by Abdullaev in the scientific agencies of the Azerbaijan Academy of Sciences brought about a radical reorientation to solution of national economic problems meeting of practical needs on the basis of solution of problems in the basic sciences. Since 1970, the number of Author's Certificates obtained by staff of the Azerbaijan Academy of Sciences has increased by many tens of times and the specific weight of studies whose results are put to work in industry has increased sharply, largely because of the creation of a network of economically oriented SDO's and pilot plants.

Abdullaev directs formation of the network of SDO's and pilot-plants in the Azerbaijan Academy of Sciences in a planned and persevering manner, making it one of his continuing concerns: he is interested in the goals, manpower, and physical equipment of these agencies.

The development of new branches of industry that do not use large amounts of metals, something that is new for Azerbaijan, must be regarded as an important result of Abdullaev's efforts; examples are the manufacture of integrated circuits and solid-state devices.

Abdullaev's social and political activity is many-faceted. He is a member of the Central Committee of the Azerbaijan Communist Party, a passionate propagandist of the ideas and decisions of the party and government, and a diligent organizer of their implementation. As a Deputy of the USSR Supreme Soviet, he often appears before the electors of the Sheki District, where the scientific base of Azerbaijan Academy of Sciences was created and successfully developed on his initiative.

Abdullaev is a member of the Scientific Council on the complex problem "Semiconductor Physics and Chemistry" in the Presidium of the USSR Academy of Sciences and Chairman of the Board of the Republic's "Znaniye" (Knowledge) Society.

Abdullaev has authored 10 monographs and a large number of inventions, some of which have been patented abroad.

Abdullaev was the motive force behind organization of one of the country's first Departments of Semiconductor Physics in the S. M. Kirov Azerbaijan State University, and he taught special courses there for many years.

Abdullaev's accomplishments have been recognized with the Orders of Lenin and the Red Banner of Labor; he is an honored scientific worker of the Azerbaijan SSR and a recipient of a Republic's State Prize.

Abdullaev is a man of high civic conscience who is always actively striving, always out ahead. He is a demanding supervisor and a good comrade.

As of this day Abdullaev is full of new creative thoughts and scientific ideas, which he will bring to life with his characteristic consistency and energy.

Translated by R. W. Bowers