

## Andrei Nikolaevich Lagarkov (on his 80th birthday)

DOI: <https://doi.org/10.3367/UFNe.2019.08.038657>

August 8, 2019 was the 80th birthday of Andrei Nikolaevich Lagarkov, an outstanding Russian scientist and science organizer, professor, academician of the Russian Academy of Sciences (RAS), research supervisor of the Institute of Theoretical and Applied Electrodynamics of RAS (ITAE RAS). A N Lagarkov is a world-famous scientist. He is the author of more than three hundred scientific papers, four monographs, and a number of patents for inventions in the fields of plasma physics, electrophysics, and electrodynamics. He was elected a corresponding member of RAS in 2000 and a full member in 2011. At the present time, he is a member of RAS Presidium and Bureau of the Division of Energetics, Mechanical Engineering, Mechanics, and Control Processes of RAS, and vice-president of the RAS Council for Research in the Area of Defense. For his active scientific and organizational activities, he was awarded the Order of the Red Banner of Labor in 1990, the Order for Merits Before the Fatherland of the 2nd degree in 1999, and the Order of Friendship in 2010.

A N Lagarkov was born on August 8, 1939 in Moscow. On graduating in 1963 from the Faculty of Electronic Engineering of the Moscow Power Engineering Institute, he graduated from the postgraduate course of MPEI and defended his thesis for the degree of candidate of Physical and Mathematical Sciences in 1967. That same year, he began working at the Theoretical Department (headed by the corresponding member of the USSR Academy of Sciences L M Biberman) of the Institute for High Temperatures of the USSR Academy of Sciences (IHTAS), where in 1977 he defended his doctoral thesis “Some questions of the theory of transport phenomena.”

While working at IHTAS, A N Lagarkov performed a series of studies on radiation heating of bodies penetrating the dense atmospheric layers at a hypersonic speed. The results of these studies stimulated considerably the further development of the theory of energy transport by radiation in inhomogeneous plasma and hot gases. The methods of mathematical simulation elaborated by A N Lagarkov turned out to be very effective in the study of properties of dense gases, liquids, melts, and dense plasma. A N Lagarkov became one of the founders of a new scientific discipline—the molecular dynamics method.

In the early 1980s, work was started under the guidance of A N Lagarkov on creating and investigating inhomogeneous composite materials and structures in which the interaction of an electromagnetic field with structure elements is of a nonpotential character. For carrying out research in this field, the Scientific Center for Applied Problems in Electro-



Andrei Nikolaevich Lagarkov

magnetics (SCAPE) was founded on the basis of IHTAS on the initiative of A N Lagarkov, who became its director. In 1999, he became director of ITAE RAS, the former SCAPE. Since 2017, A N Lagarkov has been the research supervisor of ITAE RAS.

During this time, fundamental studies were undertaken under A N Lagarkov's guidance, the results of which are widely acknowledged in the world scientific community. He and his colleagues were the first in the world to create a composite material containing no ferromagnetic inclusions and having negative values of magnetic permeability in the microwave range. Composites with negative values of dielectric permittivity in the microwave range were also created and investigated. The corresponding scientific publications were several years ahead of reports on analogous work done in Great Britain and the USA and underlay the development of metamaterials, interest in the study of which has been keen till the present day.

One of the unique properties of metamaterials is the possibility of obtaining superresolution (i.e., obtaining separate images of objects located at a distance shorter than the wavelength) in a lens fabricated of metamaterial. A series of studies analyzing resolution that can be reached in practical realizations of such lenses was implemented under A N Lagarkov's guidance. On the basis of the derived theoretical conclusions, A N Lagarkov performed an experiment in which the classical diffraction limit of resolution was overcome for the first time in the world.

Under the direct guidance of A N Lagarkov, theoretical methods of study of the electromagnetic properties of granular composite materials were developed, new experimental techniques and setups for testing the interaction of electromagnetic waves with materials and structures were constructed, and technologies for creating materials with unique electrophysical and radio-physical properties were elaborated at ITAE RAS. As a result of these studies, different composite, film, and nanostructured materials with new properties in the microwave and optical ranges for the needs of the aerospace industry, instrument engineering, energetics, transport, and medicine appeared and were investigated. In particular, a multilayer thin-film material with a unique combination of parameters—promising for various applications—was worked out on the basis of nanostructured magnetic films. A series of studies was performed for developing supersensitive methods of chemical and biochemical analysis on the basis of giant Raman scattering. New metamaterials fit for mass application were created, and analytical methods were developed on the basis of these materials, allowing the detection of minute concentrations of substances, which is necessary for many medical applications, as well as the search for explosive substances and other applications.

In 2011, a team headed by A N Lagarkov, in close cooperation with the Sukhoi group, designed and put into operation a unique automated measuring complex—a compact range equipped with modern instrumentation and mathematical support for all the processes of radio-physical studies and intended to test radar detectability of objects and measurement of radio-technical characteristics of antenna systems. The new complex has no equivalent in characteristics in the Russian Federation.

A N Lagarkov made a weighty contribution to the development of various areas of modern applied physics. He is the author of several achievements now applied in the defense industry. The institute founded by him is well known for its advanced developments in technologies of reducing radar detectability (stealth technologies), without which the necessary fighting efficiency and competitiveness of contemporary aviation technology is impossible. All the work performed at ITAE RAS in this field was initiated and guided directly by A N Lagarkov. One can state with certainty that it was precisely owing to his multifaceted organizational abilities that this branch survived in Russia through the difficult 1990s. Having rallied around himself scientists and technologists of different specialties, A N Lagarkov successfully solved many fundamental problems of stealth technologies and the application of the obtained results in the course of creating and modifying armaments and military and special technologies.

The activity of A N Lagarkov and the team headed by him is an example of the efficient interaction of scientific organizations with enterprises of high-technology branches

of industry, the arrangement of a complete innovation cycle—from acquisition of new fundamental knowledge to its practical application, the creation of technologies, products, and services, and their appearance in the market.

A N Lagarkov has been engaged in extensive scientific and organizational work. He has trained many talented scientists. He is head of the basic Chair Electrodynamics of Complex Systems and Nanophotonics at the Moscow Institute of Physics and Technology (MIPT) and chairman of a specialized dissertation committee for the defense of candidate and doctoral theses at ITPE RAS. He is member of many academic councils and publishes the results of his studies in prestigious scientific journals.

The friends, colleagues, and numerous pupils of Andrey Nikolaevich heartily wish him all the best on this jubilee and wish him health and creative longevity, new scientific discoveries and results, happiness, and well-being to his family.

*I V Grekhov, V N Kisel', A G Litvak,  
E A Mikrin, S A Nikitov, O F Petrov,  
M A Pogosyan, V P Smirnov, A N Starostin,  
V E Fortov, B Yu Sharkov, I A Shcherbakov*