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PERSONALIA

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Andrei Nikolaevich Lagarkov (on his 70th birthday)

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Andrei Nikolaevich Lagarkov, an outstanding Russian scientist in electrophysics, thermophysics, and modern problems of energy generation, and Corresponding Member of the Russian Academy of Sciences (RAS), celebrated his 70th birthday on August 8, 2009.

A N Lagarkov began his career in science (at the end of the 1960s and the beginning of the 1970s) at the Theory Department of the Institute for High Temperatures of the USSR Academy of Sciences, headed by Leon Mikhailovich Biberman. There A N Lagarkov submitted and defended his CandSc thesis in 1967, and the DSc thesis "Certain aspects of the theory of transfer phenomena" in 1977. During this period, Andrei Nikolaevich conducted a long series of studies connected with radiative heating of blunt-nosed bodies entering dense layers of the atmosphere at hypersonic velocities; he achieved considerable progress in the theory of energy transfer by radiation in nonuniform plasma and hot gases. A N Lagarkov was one of the first researchers who fully recognized the importance and promise of the computer experiment method for studying the properties of nonideal plasma and condensed media. The progress of the new research field — the molecular dynamics method — was based on A N Lagarkov's work. The method of mathematical modeling that he developed proved to be an efficient tool for studying the properties of dense gases, liquids, melts, and dense plasmas.

In addition to top-class skills, a wide range of interests and knowledge, and unbelievable intuition, Andrei Nikolaevich possesses an acute feel for the new physics. At the beginning of the 1980s, A N Lagarkov launched work on the dramatically new research avenue — the design of heterogeneous composite materials whose local interaction with electromagnetic fields is nonpotential (resonant) in nature. Such composites were later given the name 'metamaterials'. The nonpotential nature of the interaction is responsible for many properties absent from natural materials. It was possible to combine these new properties and thus design materials with the desired electromagnetic parameters. Thus, a composite material not containing magnetically ordered inclusions, though having negative permeability in the microwave range was created for the first time in 1995.

In the framework of this project, theoretical methods were developed under A N Lagarkov's supervision for exploring the electromagnetic properties of granulated composite materials; new experimental methods and testing devices were developed for studying reflection and transmission of electromagnetic energy in composite systems, and technologies were created for producing materials with unique electrophysical and radiophysical properties. For instance, a multilayer thin-film material with record-high magnetic permeability was designed as a result of the research program for studying the electrophysical properties of nanostructured materials, conducted under A N Lagarkov's guidance. This and other nanotechnologies make it possible to create materials with selective absorption of electromagnetic energy in various frequency ranges.

Andrei Nikolaevich Lagarkov

The institute headed by A N Lagarkov is also very well known for its advanced R&D in the field of so-called stealth technologies (technologies for reducing the detectability of various objects). We can state today that had it not been for Andrei Nikolaevich and his multifaceted managerial abilities in the tough 1990s, Russia could have lost this branch completely. Having gathered around himself a tightly knit team of scientists and technologists from a number of specialties, A N Lagarkov achieved constant growth in the potential of the institute for solving stealth technology problems. A number of fundamental and applications-related problems have been solved at the Institute for Theoretical and Applied Electrodynamics (ITAE) of the RAS: computational and experimental methods and complex technologies for lowering visibility and detectability, and

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an integrated system of radar-absorbing and other special materials whose characteristics are at least as good as those of the best products in the West. Their application has permitted a considerable decrease in the detectability of modern hardware items which nowadays cannot be competitive without resorting to these technologies.

Synthesized substances with negative values of both material parameters — permeability and permittivity — are an important class of metamaterials. They were created for the first time by A N Lagarkov and his colleagues in the mid-1990s. Recently, research into special electromagnetic effects in metamaterials has intensified in many countries. A N Lagarkov proposed and investigated a number of novel electrodynamic systems incorporating metamaterials, such as a convex focusing surface that can be used to create omnidirectional antennas and reflectors with improved properties, open resonators whose size may be essentially shorter than the radiation wavelength, coatings with unique radar-absorbing properties in a broad range of angles, etc.

The problem of the so-called 'superresolution' — that is, the possibility of obtaining images of sources separated by a distance considerably smaller than one wavelength, occupies a special place in A N Lagarkov's research programs. It is now known that superresolution can be achieved in systems employing metamaterials. A N Lagarkov identified in a series of papers the factors that impose limits on actually achievable resolving power. On the basis of these theoretical predictions, A N Lagarkov carried out the experiment in which, for the first time in the world, he went beyond the classical 'diffraction limit': images of sources spaced by a distance much shorter that one wavelength were observed as separated in the microwave range.

In 1989, A N Lagarkov first became Director of the Research Center set up by the decision of the government with a view to expanding the concepts he advanced; since 1999, he has headed the Institute for Theoretical and Applied Electrodynamics at the Joint Institute for High Temperatures of the RAS. In 2007, the Institute for Theoretical and Applied Electrodynamics became an independent entity in the Academy. In 2000, A N Lagarkov was elected Corresponding Member of the Russian Academy of Sciences.

In addition to his research and managerial activities, Andrei Nikolaevich devotes a considerable part of his time to teaching. He nurtured and trained the research team of the RAS ITAE. He created the scientific school 'Research into the electrodynamics and electrophysics of heterogeneous media'. A specialized Chair of Electrodynamics of Complex Systems and Nanophotonics based on the ITAE was set up at the Moscow Institute of Physics and Technology.

Friends and disciples of Andrei Nikolaevich wish him success in reaching new heights in his research and in carrying out much interesting and fruitful work.

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