

Vladimir Il'ich Talanov (on his seventieth birthday)

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On June 9, 2003 Vladimir Il'ich Talanov, Full Member of the Russian Academy of Sciences (RAS) and an outstanding Russian physicist, will be celebrating his 70th birthday.

Talanov was born in Gorkii (now Nizhnii Novgorod). In 1955 he graduated from the Radio-Physics Department of Gor'kii University and entered the postgraduate course; on graduation, he presented and defended his PhD thesis.

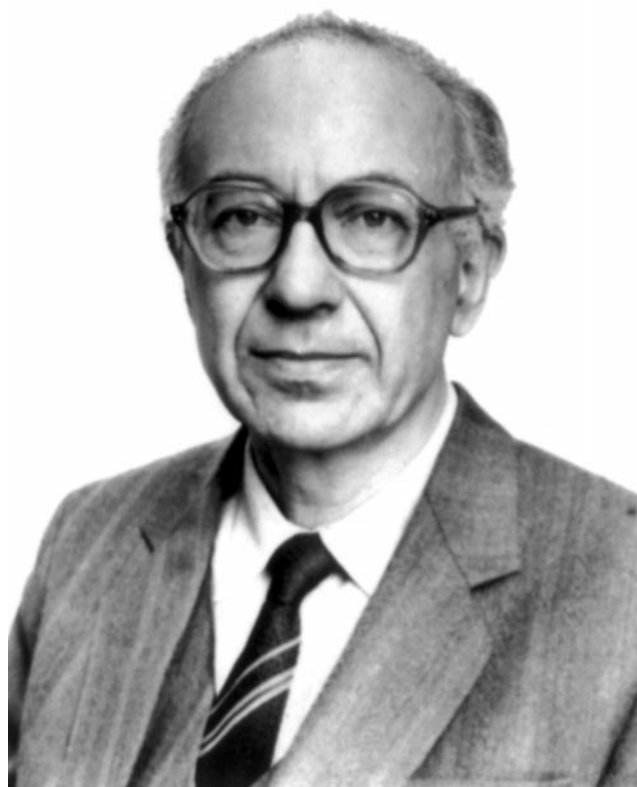
Between 1957 and 1977 Talanov worked in the Radio-physics Research Institute (NIRFI) where he defended his DSc thesis in 1967. When the Institute of Applied Physics (IPF) of the RAS was formed, he became head of one of its departments. In 1988 he became Director of the new Division of Hydrophysics and Hydroacoustics of the IPF.

In 1987, Talanov was elected a Corresponding Member of the Academy of Sciences of the USSR, and in 1992 a Full Member of the Russian Academy of Sciences. Since 2003, Talanov has been an advisor of the RAS.

Talanov's first research work was on the diffraction of surface electromagnetic waves; his supervisor was M A Miller. In his work from 1955–1963, Talanov obtained rigorous analytical solutions to a number of problems in this field and constructed a theory of antennas with modulated surface impedance. This theory made possible the design of efficient highly directed emitters with a frequency-controlled beam-pattern.

At the beginning of the 1960s, Vladimir Il'ich saw the promise of the parabolic equation method for the theory of open waveguides and resonators and developed, on the basis of this equation, the theory of mirror waveguides (1964). A series of subsequent publications authored by Talanov and his disciples covered a wide range of research fields in quasi-optics.

With the appearance of lasers, nonlinear dynamics of high-power optical radiation in various media became an important area of research, including nonlinear phenomena of the self-action of wave beams. Talanov then turned to the theory of self-focusing, first pointed out by G A Askaryan in 1962 as a possibility for electromagnetic waves. V I Talanov obtained a number of results which built the foundation of the theory of self-focusing of wave beams in media with cubic nonlinearity. Among them are self-similar solutions of the nonlinear parabolic equation (nonlinear Schrödinger equation) for such wave beams (1964); a new class of invariant transformations and an analog of the virial theorem for this equation, which established the sufficient condition for self-focusing of arbitrary-profile beams; a fundamental result on transverse instability of plane waves in nonlinear media (together with V I Bespalov, 1966); the development of the general theory of space-time self-action of waves in dispersing media (together with A G Litvak, 1967); and the determina-



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tion of the type of field singularity in the neighborhood of the focal point (together with S N Vlasov, 1978). These results were later expanded in the theory of wave collapse.

In addition to this, Talanov and a group of coworkers obtained a number of experimental results of major importance in nonlinear optics. Almost simultaneously with similar work in the USA, they discovered and studied the effect of the generation of a spectral continuum in the self-focusing of nanosecond light pulses in media with electron nonlinearity (1970). Under his supervision, a number of important application-oriented results were obtained in the mid-1970s on the propagation of high-power laser radiation through a transparent atmosphere; this work essentially founded a new research field — nonlinear atmospheric optics. The results, obtained in experiments at the laser facility at the Livermore National Laboratory in the USA and published much later, completely confirmed the data reported by Talanov's group at NIRFI.

In 1991 Vladimir Il'ich received, together with a team of colleagues, a Lenin Prize for research on the self-focusing of electromagnetic waves. A series of his papers in this field became the basis for a monograph, *Self-Focusing of Waves*, (1997) written together with S N Vlasov.

Characteristic features of Talanov's research style — the ability to rapidly master a new field and to formulate and solve the problems that are the most important for progress in this field — manifested themselves most clearly while at the Institute of Applied Physics of RAS. The task of the Department of Nonlinear Oscillations and Waves, which he headed, was mostly to run fundamental and applied research on wave processes in the ocean. From the standpoint of clarifying the physical mechanisms by which hydrodynamic processes in the depths of the ocean affect the phenomena on the surface and for the development of remote diagnostics techniques a principle issue was the influence of internal waves and non-uniform flows on wind-generated waves. The adiabatic approach to the solution of the general problem of interaction between waves of essentially different spatial and temporal scales suggested by Talanov led to the development by Talanov and his disciples of an experimentally confirmed and nowadays universally accepted kinematic model of influence of high-intensity internal waves on wind-generated surface waves. This model enabled Talanov to clarify specific features of the transformation of wind-generated wave spectrum in the field of variable flow.

Talanov played an important coordinating role in the mid-1980s when IPF carried out a series of application-oriented research projects in low-frequency ocean acoustics; this work led to unique experimental results on acoustic probing of the ocean and substantiated the proposals on developing systems of acoustic illumination of the underwater environment. At present, Talanov leads a new and promising direction of research — coherent seismoacoustics, which uses as its basis the experimental data accumulated in IPF RAS on acoustic diagnostics in an inhomogeneous media. The results obtained in this field demonstrated the feasibility of building systems of seismoacoustic diagnostics with high spatial resolution which cannot be achieved by using traditional approaches.

When at the IPF, the wide span of the research potential of Talanov showed another aspect of his talent — that of inventor and engineer. He suggested an original principle of designing a laboratory model of stratified ocean, which was used as a basis for designing (together with S D Bogatyrev) the Large Thermo-Stratified Tank of the IPF RAS. Talanov uses this setup (which is listed as one of the unique setups of national importance in Russia) to conduct studies of physical modeling of wave processes in the real upper ocean.

For his research in hydrophysics and hydroacoustics, Talanov received the Order of the Red Banner of Labor (1989) and the medal for “300 Years of the Russian Navy” (1996).

From the very first years of his intense research work, Vladimir Il'ich combined research with teaching at the Radiophysics Department of Nizhniĭ Novgorod University; the lectures he delivered to students there covered both general courses and an original course on asymptotic techniques of the theory of waves. For many years he headed one of the leading chairs of the department — the chair of electrodynamics. Talanov heads the leading research school of “Methods of quasioptics in the theory of wave diffraction and propagation, nonlinear self-action, and wave interactions”, in which seven DSc and sixteen PhD scientists take part.

Vladimir Il'ich Talanov is one of the best known representatives of the Nizhniĭ Novgorod Radiophysics School, which has provided fundamental contributions to

many fields of the modern physics of wave processes. Talanov's profound understanding of wave physics in its various manifestations and the ability to identify the main element of the problem, his openness and welcoming attention to the opinions of colleagues make communicating with him and discussing various problems extremely useful and stimulating.

Vladimir Il'ich's colleagues, students, and friends wish him happy birthday, good health, and much success in all his undertakings.

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