



**BIOGRAPHY OF
N. N.
BOGOLIUBOV
(1909 - 1992)**

**born Aug. 21, 1909,
Nizni Novgorod ,
Russia.
died Feb. 13, 1992,
Moscow , Russia.**

N. N. Bogoliubov was the outstanding scientist of highest rank: specialist in mechanics, mathematics and theoretical physics, he used freely all the disciplines in various research areas. This style leads to numerous works of highest level. In this sense he continues the tradition of the great universal scientists, such as L. Euler and H. Poincare.

His studies were related to statistical physics, quantum field theory, theory of elementary particles, and mathematical physics. Together with N. M. Krylov, N. N. Bogoliubov developed (1932–1937) the asymptotic theory of nonlinear oscillations, proposed the methods of asymptotic integration of nonlinear equations describing various oscillatory processes and gave their mathematical substantiation.

He advanced the ingenious idea (1945) of the hierarchy of relaxation times, which has important meaning in the statistical theory of irreversible processes; proposed (1946) the efficient method of a chain of equations for the distribution functions of complexes of particles; and constructed (1946) the microscopic theory of superfluidity which was based on the model of weakly nonideal Bose-gas. Ten years later, by using the [H. Frohlich](#) quantum mechanical model of electron gas interacting with the ion lattice of a metal, N. N. Bogoliubov generalized the own apparatus of canonical transformations used in the theory of superfluidity and developed the microscopic theory of superconductivity.

Turning to the problems of quantum field theory, he gave (1954–1955) the first version of an axiomatic construction of the scattering matrix based on the original condition for causality; proposed a mathematically correct version of the theory of renormalization with the use of the apparatus of distributions and introduced the so-called *R-operation* (1955, together with O.S. Parasiuk).

He also developed the regular method of refinement of quantum-field solutions – the method of renormalization group (1965, together with D.V. Shirkov); and gave a strong proof of the dispersion relations in the theory of strong interactions (1955–1956); proposed a method of description of the systems with *spontaneously broken symmetry* which was named the method of *quasiaverages* (1960–1961); and, by studying the problems of symmetry and dynamics within the quark model of hadrons, introduced (1965, together with B.V. Struminsky and A.N. Tavkhelidze) the notion of a new quantum number “*color*”. He proved also the existence of the [thermodynamic limit in statistical thermodynamics](#) of many-particle systems in a series of innovative papers. This ingenious approach by N. N. Bogoliubov, permits him to develop a general formalism for establishing of the limiting distribution functions in the form of formal series in powers of the density. In that study he outlined the method of justification of the thermodynamic limit when he derived the generalized Boltzmann equations.

Biographic Data of N. N. Bogoliubov:

Nicolai Nicolaevitch Bogoliubov was born 21.08.1909 in Nizhny Novgorod in the family of famous orthodox priest and theologian. Soon the family moved to Kiev, where the future scientist spent his green years. He did not get the regular lessons at school and University. He himself, later on, filling in forms, wrote "finished the

post-graduate courses". He studied himself and in the flat of academician N. M. Krylov and on his seminar. In 1924 he wrote his first paper "On the behaviour of the solution of linear differential equations at infinity". In 1930 the Academy of Sciences of Bologna awarded him the prize and in this year he got the Doctor of Sciences degree. 1932: Together with N. M. Krylov start to develop the new branch of mathematical physics, which they called "non-linear mechanics", the new science dealt with non-linear oscillations with various applications to theoretical mechanics, mechanics of rigid body, celestial mechanics etc.

Timeline:

1939-1945: Mathematical problems of stochastic systems: ergodic behaviour, Fokker-Planck equation, dynamics of systems with large degrees of freedom. Statistical theory of Perturbation.

1946: Kinetic equations. Monograph: Problems of dynamical theory in statistical physics.

1947: Paper: On the theory of superfluidity, Correspondent Member Acad.Sci. USSR.

1949 :Monograph "Lectures on Quantum Statistics".

Head of the Department of Theoretical Physics of Steklov Mathematical Institute, Moscow; since 1983 -Director.

1953: Full Member of Acad. Sci.USSR.

1957-58: Theory of superconductivity.

1956-1965 and 1979-1992 : Director of the Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Dubna,

1965-1992 Director JINR, Dubna.

1957: Monograph (with D.V.Shirkov) Introduction To the Theory of Quantised Fields" (now 4 eds.)

1959: Two-time thermal Green's Functions (with S.V.Tyablicov)

1961: Quasi-averages in the problems of Statistical physics.

1967: On the theory of superfluidity.

1980-1981: The theory of polaron.

The **[BIOGRAPHY](#)** of N. N. BOGOLIUBOV can be found in a few places.

Wikipedia electronic Encyclopedia(**<http://en.wikipedia.org/>**), an article **[N. N. BOGOLIUBOV](#)**.

[CERN Courier BIOGRAPHY](#).

Short Biography in Russian at JINR

ArXiv(<http://www.jinr.dubna.su/>), an article [N. N. BOGOLIUBOV](#).

Short summary of the scientific works is given in article [N. N. BOGOLIUBOV: 50 years of scientific work](#).

The best biography was written by his younger brother:
A. N. Bogoliubov "N. N. BOGOLIUBOV. Life and Works". JINR Publ., Dubna,1996.

There is rich collection of photos at (<http://www1.jinr.ru/Exhibits/Bogolubov/index.html>).

Wikipedia electronic Encyclopedia -- Biography of N. N. BOGOLIUBOV: http://en.wikipedia.org/wiki/Nikolay_Bogolyubov

Wikipedia electronic Encyclopedia(<http://en.wikipedia.org/>), includes an article on Bogolubov transformation [Bogolubov transformation](#).

Wikipedia electronic Encyclopedia(<http://en.wikipedia.org/>), refers to the Mathematicians Genealogy Page [N. N. BOGOLIUBOV](#).

Bibliography of N. N. BOGOLIUBOV consists of about 400 papers and about 20 monographs on statistical mechanics, non-linear mechanics, stability of dynamical systems, quantum field theory and theory of polarons.

Partially, his classical works were published in English:

N. N. Bogoliubov, Problems of a Dynamical Theory in Statistical Physics. in: Studies in Statistical Mechanics, eds. J. de Boer and G. E. Uhlenbeck, (North-Holland, Amsterdam , 1962), vol.1, p.1.

N. N. Bogoliubov, Lectures on Quantum Statistics, vol. 1: Quantum Statistics (Gordon and Breach Sci.Publ., Inc., New York, 1967).

N. N. Bogoliubov, Lectures on Quantum Statistics, vol. 2: Quasi-Averagess (Gordon and Breach Sci.Publ., Inc., New York, 1970).

Now the monumental Collected Papers of N. N. BOGOLIUBOV in 12 vols. were published in Moscow by Fizmatlit (2005--2009). All the volumes include the detailed comments and many additional materials.

The analysis of the works of N. N. BOGOLIUBOV in the field of

STATISTICAL PHYSICS was carried out in the review articles:

N. N. Bogolyubov (jr) and D. P. Sankovich (1994). "N. N. Bogolyubov and statistical mechanics". [Russian Math. Surveys](#) 49(5): 19—49.

A. L. Kuzemsky, Statistical Mechanics and Many-Particle Model Systems. *Physics of Particles and Nuclei*, 2009, vol. 40, Issue 7, pp.949-997.(in English)

[\(PDF, 531.5Kb\)](#)

A. L. Kuzemsky, Bogoliubov's Vision: Quasiaverages and Broken Symmetry to Quantum Protectorate and Emergence. *Intern. J. Modern Phys.*, 2010, V.B24, No. 8, p.835-935.

[\(PDF, 856Kb\)](#)

А. Л. Куземский, Предвидение Н.Н. Боголюбова и современная теоретическая физика. *Новости ОИЯИ, Дубна*, N 3, с.13-15, Дубна, 2010. [in Russian]

A. L. Kuzemsky, Bogoliubov's Foresight and Modern Theoretical Physics. *JINR News*, N 3, p.13-15, Dubna, 2010. [in English] [\(PDF, 3 Mb\)](#)

A. L. Kuzemsky, Bogoliubov's Foresight and Development of the Modern Theoretical Physics. [Electronic Journal of Theoretical Physics](#) (<http://www.ejtp.com/>), 2011, V.8, No. 25, p.1-14. [\(PDF, 130Kb\)](#)

[OBITUARY of N. N. BOGOLIUBOV](#) was published in *Physics Today*, v.46(3) (1993), pp.101-2.

Additional information can be found in a few journals (*Physics Today*, v.46(3) (1993), pp.101-2; *Uspekhi. Fiz. Nauk*; and in papers:

V. S. Vladimirov, A. A. Logunov and A. Salam, *Teoreticheskaya i Matematicheskaya Fizika*, Vol.92, No.2, pp. 179-181, August,1992. [Theor. Math. Phys. 92, 817 (1993)] as obituary notes.

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