Nicolas Rashevsky

Nicolas Rashevsky	
Born	9 November, 1899
	Chernigov, Ukraine
Died	January 16, 1972
	Holland-Michigan, United States
Residence	US
Nationality	US and Russian
Ethnicity	Russian
Fields	Theoretical physicist, Mathematical biology
Institutions	University of Chicago, Ann Arbor, Michigan
Alma mater	Kiev University, University of Chicago
Religious stance	Orthodox

Nicolas Rashevsky (1899-1972) was a Ukranian-American theoretical biologist who pioneered mathematical biology, and is also considered the father of mathematical biophysics and theoretical biology.^[1] ^[2] ^[3] ^[4] ^[5]

Academic Career

He studied theoretical physics at the University of Kiev in Russia before 1917, and immigrated first to Turkey, Poland, France, and then to the US in 1924 because of the October revolution. In USA he worked at first for the Westinghouse Research Labs in Pittsburgh where he focused on the theoretical physics modeling of the cell division and the mathematics of cell fission--a subject that also attracted fission-related defense interests. He was awarded a Rockefeller Fellowship in 1934 and went to the University of Chicago to take up the appointment of assistant professor in the Department of Physiology. In 1938 he made his first major contribution by publishing the first book on *Mathematical Biophysics*, and then in 1939 he also founded the first mathematical biology international journal entitled *The Bulletin of Mathematical Biophysics* (BMB) ^[6]; these two essential contributions founded the field of mathematical biology, with the BMB journal serving as the focus of contributing mathematical biologists over the last 70 years.

His later efforts focused on the topology of biological systems, the formulation of fundamental principles in biology, relational biology, set theory and propositional logic

formulation of the hierarchical organization of organisms and human societies^{[7] [8]}. He also introduced the concept of "organismic sets", that was later developed by other authors^[9] through applications of category theory to relational biology^[10], organismic supercategories and Complex Systems Biology^[11]. In 1938 he published the first book on mathematical biology and mathematical biophysics entitled: "Mathematical Biophysics: Physico-Mathematical Foundations of Biology." This fundamental book was then followed in 1940 by "Advances and applications of mathematical biology.", and in 1947 by "Mathematical theory of human relations", an approach to a mathematical model of society. In the same year he establishes the World's first PhD program in Mathematical Biology at the University of Chicago. Only J. H. Woodger seems to have preceeded in 1937 Rashevsky's efforts in mathematical biology with his genetic axiom system^[12]. However, Woodger's `genetical axiom system' has had only very limited impact on the subsequent development of genetics because it is restricted to Mendelian genetics; one could similarly comment on Rosen's later papers on quantum genetics that--unlike his other work on complexity and life, categories of metabolic-replication systems, complex dynamics, etc-did not make any apparent impact on either molecular biology or molecular genetics, DNA Dynamics, DNA, and so on.

Some of Rashevsky's most outstanding PhD students who earned their doctorate under his supervision were: George Karreman, Herbert Landahl, Robert Rosen and Anatol Rapoport. Interestingly, in 1948, Anatol Rapoport took over Rashevsky's course in mathematical biology, so that Rashevsky could teach mathematical sociology instead.

However, his more advanced ideas and abstract relational biology concepts found little support in the beginning amongst practicing experimental or molecular biologists, although current developments in complex systems biology clearly follow in his footsteps. In 1954 the budget for his Committee of Mathematical Biology was drastically cut; however, this was at least in part politically imposed, rather than scientifically, motivated. Thus, the subsequent University of Chicago administration--notably represented by the genetics Nobel laureate George Wells Beadle-- who reversed in the 1960s the previous position and quadrupled the financial support for Rashevsky's Committee for Mathematical Biology research activities^[13]. There was later however a fall out between the retiring Nicolas Rashevsky and the University of Chicago president over the successor to the Chair of the Committee of Mathematical Biology; Nicolas Rashevsky strongly supported Dr. Herbert Landahl-his first PhD student to graduate in Mathematical Biophysics, whereas the president wished to appoint a certain US biostatistician. The result was Rashevsky's move to Ann Arbor, Michigan, and his taking ownership of the well-funded "Bulletin of Mathematical Biophysics". He also formed in 1969 a non-profit organization, "Mathematical Biology, Incorporated"-- which was to be the precursor of "The Society for Mathematical Biology"-- with the purpose of "dissemination of information regarding Mathematical Biology".

Biography

In 1917, Nicolas Rashevsky joins the White Russian Navy and in 1920 he and his wife, Countess Emily had to flee for their lives to Constantinople where he taught at the American College. In 1921 they moved to Prague where he taught both special and general relativity. From Prague, he moved in the 1930s to Paris, France, and then to New York, Pittsburgh and Chicago, USA. His life has been dedicated to the science that he founded--Mathematical Biology, and his wife Emily was very supportive and appreciative of his scientific efforts, accompanying him at the scientific meetings that he either initiated or attended. He cut a tall, impressive figure with a slight Russian accent, but a clear voice and thought to the very day when in 1972 he passed away from a heart attack caused by CAD. His generosity was very well known and is often recognized in print by former associates or visitors. As the Chief Editor of BMB he had a declared policy of helping the authors to optimize their presentation of submitted papers, as well as proving many valuable suggestions to the submitting authors. His suggested detailed changes, additions and further developments were like a real `gold mine' for the submitting authors. Interestingly, he managed to stay aloof of all science `politics' most of the time, even in very adverse circumstances such as those during the MacCarthy era when completely unfounded political accusations were made about one or two members of his close research group. Not unlike another American theoretical physicist Robert Oppenheimer, he then had much to lose for his loyal support of the wrongly accused researcher in his group.

Notes and References

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- [2] http://planetphysics.org/encyclopedia/NicolasRashevsky.html Nicolas Rashevky's Biography
- [3] http://www.smb.org/ The Society for Mathematical Biology
- [4] Robert Rosen Essays on Life (2004).
- [5] Evelyn Fox Keller Making Sense of Life pp. 82-89
- [6] http://www.springerlink.com/content/x513p402w52w1128/
- [7] http://planetphysics.org/encyclopedia/NicolasRashevsky.html Nicolas Rashevsk's biography
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- [9] Planet Math page (http://planetmath.org/encyclopedia/NicolasRashevsky.html)
- [10] http://planetphysics.org/encyclopedia/AbstractRelationalBiologyARB.html Abstract Relational Biology and Category Theory Representations of Functional Organisms and Societies
- [11] http://planetphysics.org/encyclopedia/OrganismicSupercategoriesAndSuperComplexSystemBiodynamics. html Organismic Supercategories and Complex Systems Biology
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Further Reading

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External links

- Books by Rashevsky (http://openlibrary.org/a/OL2010564A/Nicolas-Rashevsky)
- The Bulletin of Mathematical Biophysics (http://www.springerlink.com/content/ x513p402w52w1128/)
- Rashevsky's theory of **two-factor systems** for neural networks (http://www.springerlink.com/content/m0358168q574qm11/)

See also

- Mathematical biology
- Principles of Biology
- Relational Biology
- Biocybernetics
- Mathematical sociology
- Bulletin of Mathematical Biophysics
- Complex Systems biology
- Theoretical biology
- Mathematical Biophysics
- Bioinformatics
- Society for Mathematical Biology
- The Society for Mathematical Biology (http://www.smb.org/)
- Organismic set theory
- Organism
- Organismic sets of zeroth order
- Organismic development
- Organization
- Two-factor theory of nerve impulse
- Mathematical logic
- Topology
- Epigenetic landscape
- Network theory
- Graph theory
- Algebraic topology
- Category theory
- Symbolic logic
- Relation algebra
- Neuron
- Neurophysiology
- Neural networks
- George Karreman
- Robert Rosen
- Conrad Hal Waddington
- Brian Goodwin
- Herbert Spencer
- Brownian motion-theory
- Theoretical physics
- October revolution

- University of Kiev
- Cell division

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