New Books

*Kybernetika*, Vol. 27 (1991), No. 5, 479--480

Persistent URL: http://dml.cz/dmlcz/125851

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## Norbert Wiener 1894—1964

Vita Mathematica 5.
Birkhäuser Verlag, Basel—Boston—Berlin 1990.
416 pages; 61 figures; 192 bibl. ref.; SFR 98,—.

More than 25 years have elapsed from the death of Norbert Wiener on March 18, 1964 and its memory and intellectual heritage are still vivid. The Birkhäuser Publishing house is to be congratulated for having thought to include this book as the fifth into its prestigious Vita Mathematica series (where till now the professional lives of Georg Cantor, Blaise Pascal, Heinrich Heesch and George Berkeley have appeared), preserving thus not only the image of the personality of Norbert Wiener but also the intellectual and scientific climate of his era for further generations.

The author of this scientific biography is Pesi Rustom Masani, professor of Mathematics at the University of Pittsburgh, who has collaborated with Norbert Wiener on prediction theory of multivariate stochastic processes already during his visit to Bombay. Wiener praises him in his autobiography "I am a Mathematician. The Later Life of a Prodigy" (Doubleday 1956) for his mathematical advice and quotes his belonging to the Parsees. Masani has edited also the Norbert Wiener: Collected Works (MIT Press 1976, 1979, 1981, 1985). He is visibly well suited as scientific biographer and explains in the book Wiener's ideas using mathematical symbolism when necessary with explanations in appendix of some chapters. But the book devotes ample space also to Wiener's general, philosophical and humanitarian ideas, attitudes and activities and presents them with deep cultural sensibility.

The book has 24 chapters, the titles of which reflect both the periods of Wiener's life and the development of his scientific interests and ideas. It is abundantly documented by essential parts of his correspondence. The book contains a list of events in Norbert Wiener's academic life and his bibliography with 287 items. For the first time a list of 12 Defense Department Documents mainly concerning Wiener's Second World War activity at MIT is published. The book's own bibliography has 192 references. Most valuable for the reader is a name index with 521 items and a subject index with 478 main headings. The printing of the book is excellent and the numerous and some of them rare photographic portraits of men of science bring delight to the enthusiastic reader.

The detailed reviewing of this erudite book would certainly require to proceed by chapters. Let us follow a similar way but taking the license to point out only certain facts of Wiener's biography which are less known and at the same time are somehow profiling. From the account about his childhood let us quote only that his father could speak fourty languages and has done a 24-volume English translation of Tolstoy's complete works. One of the distant ancestors of the Wieners was reportedly the Philosopher Moses Maimonides (1135—1204) of Cordoba. As a result of training from his father, Wiener had a Ph.D. from Harvard in 1913 at the age of 18. In Chapter 5 we learn about the great influence upon him during his postdoctoral stage in Cambridge, U. K., of Bertrand Russel who just has completed the monumental Principia Mathematica. Chapter 6 describes Wiener's sincere patriotic yearnings to join the Army even in anticipation of the United States participation in World War I. Actually he only succeeded to be useful in the war effort as computor of ballistic tables at Aberdeen Proving grounds. Chapter 7 deals with Wiener's interests after having joined the Massachusetts Institute of Technology as an instructor of the Mathematics department. His research started on postulate systems, but soon, when studying standard treatises of important analysts, his interest turned to the Brownian motion. Another phase of his activity during the early 1920s was the theory of the potential. Chapter 9 describes the work of Wiener starting from contacts with individuals from the electrical

engineering department of MIT in the field of operational calculus and harmonic analysis to his important results in generalised harmonic analysis and Tauberian theory. This chapter contains also Wiener's contribution to optics and his favorite consideration of the Michelson interferometer as part of a correlator, i.e. of an analogue computer for the covariance function of light signals. Chapter 10 deals with his collaboration with the German physicist Max Born in the fall of 1925 when the latter come to MIT and with Wiener's thoughts on Quantum Mechanics and Unified Field theory. Chapter 11 is about his collaboration with the German astrophysicists Eberhard Hopf which has led to the Hopf-Wiener equation, and with the young British mathematician R.E.A.C. Paley which has lead to the application of the Fourier transform in the complex domain. Chapter 12 informs about Wiener's work in Ergodic theory and about the consolidation of his ideas on statistical physics, where he praised the Gibbsian statistical mechanics and was concerned with the statistical interpretation of the thermodynamic entropy. Chapter 13 tells about Wiener's excitement over the analogue computer program at MIT from the mid 1920s to the 1940s executed under the leadership of Vannevar Bush and about his own contribution to it. It tells about his collaboration with Y. W. Lee, an engineering student from China which has lead to the Lee-Wiener network and has continued at Tsing Hua University, where Wiener was visiting professor for 1935–36. It informs also about Wiener's less known memorandum in 1940 (as a special topic for war research) on an electronic computer for partial differential equations, which was to be a digital computer. Even if it was not followed at this time, it shows the far-sightedness of its author. Chapter 14 deals with Wiener's work in the field of servomechanisms for anti-aircraft fire control carried out in 1940–1945 at MIT. Wiener has developed the theory of statistical flight prediction. Due attention is paid to the parallel independent development of the prediction theory by A. N. Kolmogorov in USSR and by N. Wiener in the USA. Chapter 15 is concerned with Wiener's work in Physiology and his collaboration with Dr. Arturo Rosenblueth, a Mexican physiologist of Hungarian descent. Their work was directed to find out how muscular contractions during epileptic convulsions are related to movements of the heart, then to the study of spasmodic vibrations known as muscle clonus, then to the determination of the spike potential of axons, to the statistics of synaptic excitation a o.m. Chapter 16 deals with the evolution of Wiener's neurophysiological ideas in the context of the work of Warren McCulloch and Walter Pitts. Chapter 17 informs about the Teleological Society as of 1943 led by J. von Neumann and N. Wiener and brings the text of a letter of the former to the latter of November 29, 1946 on the direction of cybernetical research. This letter can be read with appreciation even today. Chapter 18 is specially devoted to Cybernetics, to its historical origins and its subject-matter. The point of view of the eminent medical cybernetician W. Ross Ashby is stressed. Detailed explanation is given of Wiener's thought of phylogenetic learning in biological evolution and about the possibility of its simulation by non-linear networks. In Chapter 19 is shown how Wiener's thinking on automatization and its educational, economic and social challenges was far ahead of its time. Chapter 20 considers Wiener's views on global policy and military science, which were ponderate, scientifically well founded and respecting humane aspects. Evidence is given of, alas, a fully different a position of J. von Neumann in these matters. Chapter 21 bears the title: Wiener's excursion into the religious domain. It seems that in the problem of evil Wiener has detected a connection between entropy and evil. The author of the book tries to develop his own concept of the Fall of Man as a transition that took the hominid from animal-hunt to the man-hunt, the sin being exemplified by atomic bombing. Chapter 22 concerns Wiener's predilections and initiatives and his concept of Art. Chapter 23 tries to characterize Wiener as a personality and teacher. It does not conceal some of his peculiar attitudes, as e.g. an unobjective one towards Harvard University or that expressed by his resignation from the National Academy of Sciences in 1941. Chapter 24 forms the Epilogue.

The book is certainly a tribute to the work of a great personality of science and may be recommended to specialists in all topics entering Cybernetics and to the general scientific reader.

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