

Norbert Wiener (November 26, 1894 – March 18, 1964)

by HEINZ KLAUS STRICK, Germany

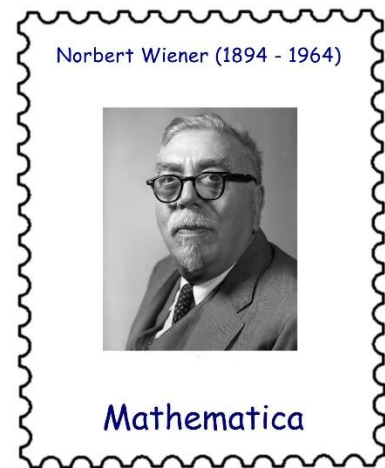
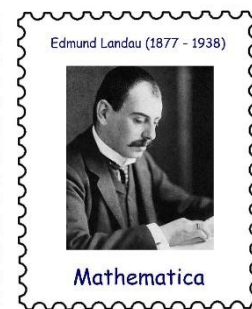
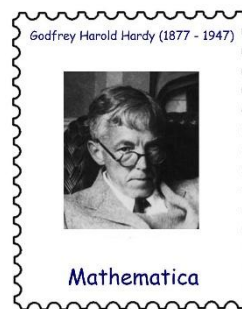
LEO WIENER, a Jew from Białystok (now northeastern Poland), actually wanted to emigrate to Central America after abandoning his university studies in order to join a vegetarian socialist commune there. However, due to lack of money, his journey ended in New Orleans.

Over the next few months, WIENER earned his living doing various jobs in factories and on farms and then he found work as a language teacher (he was said to have mastered thirty foreign languages), and finally he was hired at the University of Missouri in Kansas. (In 1896, LEO WIENER became the first professor of Slavic languages at *Harvard University*. He translated, among other things, the works of LEO TOLSTOY into English).

In 1893 LEO WIENER married BERTHA KAHN, a Jew who had immigrated from Germany and the following year their son NORBERT WAS born. He could read from a very early age and in his father's library the boy found enough reading material that interested him. When NORBERT was due to start school at the age of seven, it was difficult to find a suitable class for him - in many things he was even far ahead of the fourth-grade students, in others he had difficulties, especially in arithmetic, but the boy did not see why he should practise arithmetic.

NORBERT's father therefore took over his further schooling. Problems with the boy's eyesight caused the doctor to forbid him from reading anything for six months, which meant that NORBERT had to do all his exercises in his head during this time. From 1903 onwards, the child prodigy attended high school, which he left at the age of eleven, then *Tufts College*, from which he graduated in 1909 with a bachelor's degree in mathematics.

NORBERT WIENER then decided to study zoology at Harvard, but soon realized that this was the wrong decision. He accepted a scholarship to study philosophy at *Cornell University* (NY), returning to Harvard the following year, where in 1913, at the age of 18, he received his doctorate on a topic in mathematical logic, becoming the youngest doctoral student in Harvard's history.



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Thanks to a travel scholarship, he then continued his studies in Europe: BERTRAND RUSSELL recommended that he should focus more on mathematics, but neither the suggestions of G H HARDY and JOHN ENDENSOR LITTLEWOOD in Cambridge nor those of DAVID HILBERT and EDMUND LANDAU in Göttingen were able to convince NORBERT WIENER to choose *pure mathematics* as the future focus of his research – rather, he came to the conclusion that mathematicians should not simply ignore the outside world, and should therefore always pursue mathematics from the perspective of its applicability.

Back at Harvard, he gave lectures in philosophy, worked for a time for *General Electric*, became a co-author of the *Encyclopedia Americana*, and after the USA entered World War I he took part in OSWALD VEBLER's ballistics studies. After the war, he took a job as an assistant professor in mathematics at the *Massachusetts Institute of Technology*, an insignificant institution at the time. He remained there until his retirement (from 1924 as *assistant professor*, from 1929 as *associate professor*, from 1932 to 1960 as *full professor*) – interrupted by numerous visiting professorships all over the world. WIENER made a significant contribution to Harvard's international reputation through his scientific contributions, but he lacked real recognition within the university.

WIENER's first research focus was BROWNIAN motion, for which he found a surprisingly simple model (the so-called WIENER process). This was followed by the investigation of general stochastic processes and FOURIER series, for whose results he was awarded the BÔCHER Prize of the *American Mathematical Society (AMS)* in later years.

During the Second World War, he worked on the automatic control of anti-aircraft guns by modelling the expected flight behaviour of pilots. He also investigated – in parallel with and independently of CLAUDE SHANNON and ANDREI KOLMOGOROV – how noise suppression of communication signals (e.g. radar signals) can be optimally achieved (so-called WIENER filter).

NORBERT WIENER is considered the father of so-called *cybernetics*, the scientific discipline that deals with the control and regulation of machines - in analogy to processes in living organisms and social organizations, whose actions are influenced by observation and communication (as feedback). The term coined by WIENER comes from the Greek word *κυβερνήτης*, which means *helmsman*.

The birth of *cybernetics* is considered to be an interdisciplinary meeting of mathematicians, engineers and neuroscientists in 1943, initiated by JOHN VON NEUMANN, which was about researching the similarities between the brain and the computer. After the war, WIENER popularized the topic with his sensational book *Cybernetics or Control and Communication in the Animal and the Machine*. In it he discussed, among other things, the analogy between thought processes in the human brain and the hoped-for future work with electronic computers and compared the natural regulation of body temperature with the technical control circuit of a thermostat.



In his scientific contributions, WIENER had great difficulty adapting to his readers - as if by chance, he changed the level of sophistication of his explanations between what was more suitable for laypeople, for students, for professional mathematicians, or for people of his genius. His train of thought in his lectures and presentations was often just as erratic as in private conversations. He himself was not aware of the impression he made on his conversation partners or his audience. Nevertheless, negative reviews of his popular books (*God and Golem, Inc.: A Comment on Certain Points Where Cybernetics Impinges Religion* and his autobiographies *Ex-Prodigy* and *I am a Mathematician*) had little influence on sales figures, as they contained a wealth of fascinating trains of thought that made it possible to overlook contradictions and technical errors.

Numerous episodes characterize WIENER as a textbook example of an absent-minded scientist who forgot his surroundings while he was occupied with a current idea. For example, after a conference at Yale, he is said to have taken the 150-mile bus ride home and was surprised to find his garage empty. Even after reporting the theft to the police, he did not remember that he had driven to the conference in his car. Another time, he forgot what his car looked like and had to wait several hours until his was the last one left in the parking lot. In addition to his absent-mindedness, he was extremely short-sighted, which made it difficult for him to recognise people, even those he actually knew well.

In the years after World War II, the generally friendly and communicative scientist came under observation by the American security authorities because he did not pay attention to the nationality of his conversation partners. After the atomic bombs were dropped on Hiroshima and Nagasaki, the researcher, who was a strict vegetarian, stopped all involvement in military projects, which led to a falling out with JOHN VON NEUMANN. WIENER also increasingly saw the danger that the progress that would be made through automation based on cybernetic principles could be misused.

Although WIENER was of Jewish descent, neither he nor his parents and grandparents were practising Jews. Nevertheless, his parents chose a Jewish wife for him, with whom he had two daughters.

Even though the focus of his research was on applications, the wealth of theorems in various areas of *pure mathematics* should not be overlooked; many of them now bear WIENER's name. WIENER was twice invited to give keynote lectures at the meetings of the International Congress of Mathematicians (ICM) (1936 Oslo, 1950 Cambridge/Mass.). In 1963 he was honoured with the *National Medal of Science*, which was presented to him by President JOHNSON shortly before his death. WIENER died of a heart attack at the age of 69 during a meeting in Stockholm.



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Translated by John O'Connor, University of St Andrews
