

RICHARD COURANT (January 8, 1888 – January 27, 1972)

by HEINZ KLAUS STRICK, Germany

RICHARD COURANT grew up as the eldest of three sons of the Jewish businessman SIEGMUND COURANT and his wife MARTHA in Upper Silesia. When he was 9 years old, his parents moved to Breslau (now Wrocław), where he attended a secondary school.

Due to the low standard of the primary schools he had previously attended, RICHARD initially had some transition problems, even in mathematics.

At the age of 14, however, he was already able to give regular private lessons, even to students who were older than him. When his parents left Breslau and moved to Berlin after tragic bankruptcy proceedings – one of his father's brothers involved in the business even committed suicide – he stayed there and covered his own living costs.

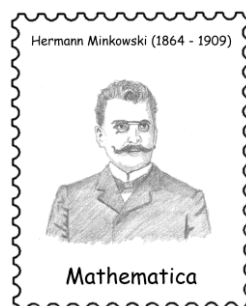
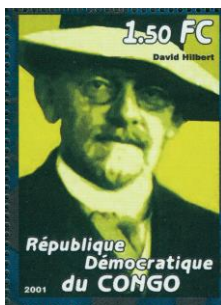
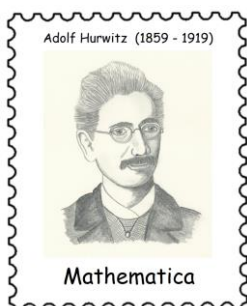
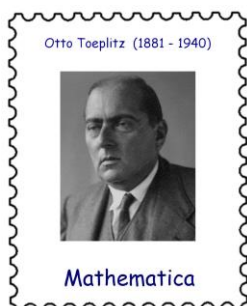
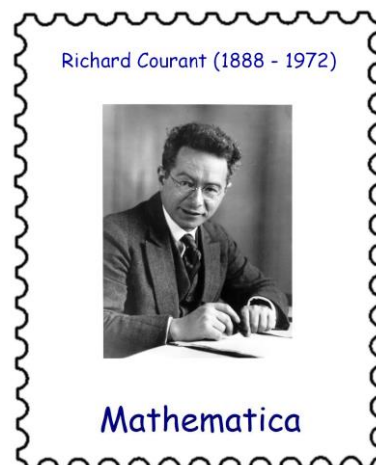
In the 1904/05 school year, some of his students entered the final year – one level higher than his. The teachers at his school then put massive pressure on him to stop tutoring. It would be detrimental to the public image of the girls' secondary school if the prospective school graduates were prepared for their exams by a younger student and not by their teachers.

RICHARD, who had recently been bored in class, then signed out of school and attended mathematics and physics lectures at the University of Breslau. A year later he took the *Abitur* exam as an “external student” – he was the only candidate to pass. Now he could officially continue his studies.

COURANT was not satisfied with the lectures given by his professors at the University of Breslau and he worked out the content on his own.

OTTO TOEPLITZ, a friend and fellow senior student who had meanwhile enrolled at the University of Göttingen, encouraged COURANT to change his place of study. Together with NELLY NEUMANN (one of his former "students") he went to ETH Zurich, where they both attended ADOLF HURWITZ's lectures, which were perfectly organised but still did not inspire them.

While NELLY NEUMANN returned to Breslau, COURANT moved to Göttingen in October 1907, where he settled in very quickly. He attended lectures with DAVID HILBERT and HERMANN MINKOWSKI and was even admitted to their joint seminar on *mathematical physics*.



In order to earn money, he gave private lessons again, including to HILBERT's son, and quickly found a “family connection”. As early as the end of 1908 he became HILBERT's assistant. His tasks included, among other things, preparing the manuscripts of his lectures and editing the contributions submitted to the *Mathematische Annalen*, which was published by HILBERT.

COURANT received his doctorate under HILBERT on the topic *On the application of DIRICHLET 's principle to the problems of conformal mapping*, a topic from the so-called *calculus of variations* (not to be confused with DIRICHLET's *pigeonhole principle*).

Before his *habilitation* in 1912, COURANT did his compulsory one-year military service. He gave his inaugural lecture as a private lecturer on the topic of *Existence proofs in mathematics*. In the summer he married NELLY NEUMANN . The marriage did not last long and they divorced in 1916.

COURANT was also caught up in the general enthusiasm for war. However, before he could be deployed to the front, he contracted typhoid fever. After his recovery, he experienced the hell of being an infantry soldier in the trenches on the Western Front. During a short home leave, he contacted physicists at Göttingen University to carry out experiments on the transmission of messages via so-called earth telegraphy. He suffered a serious wound at the front, but after his recovery, he was deployed again – this time behind the lines to train soldiers in the use of earth telegraphy equipment.

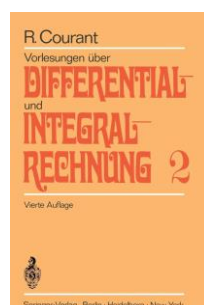
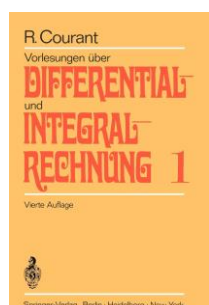
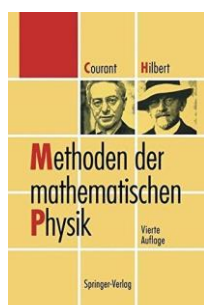
While he was still in the military, he made contact with the publisher FERDINAND SPRINGER and agreed – for the period after the World War – to be the editor of the so-called *Yellow Series – Basic teachings of the mathematical sciences in individual presentations with particular attention to the areas of application*.

After the end of the war, COURANT returned to Göttingen. In January 1919 he married NINA RUNGE, daughter of the Göttingen mathematician CARL RUNGE – in a civil ceremony, as neither of them saw any reason to convert. The marriage was not necessarily approved of in the family of the (Christian) bride (“*A Jew from a not particularly good family; moreover, divorced and not yet established professionally ...*”).

COURANT found that in the meantime many positions had been filled by people who had not been drafted into military service. Although he was able to continue to work as a private lecturer, it was not possible to be appointed full professor at the same university where his doctorate and habilitation took place. Therefore, HILBERT and KLEIN recommended a diversion: COURANT accepted a vacant position at the University of Münster, and was then, in the winter semester of 1920/21, able to be appointed as an “external” applicant to the full professorship in Göttingen, which FELIX KLEIN had previously held. As an innovation, he introduced weekly exercises for his lectures; the students' solutions were corrected and discussed.

In the 1920s, COURANT wrote several books that – even if there is another author in the title – were written by him alone:

- *Function Theory* (1922, based on the lectures of ADOLF HURWITZ , who had already died in 1919),
- *Methods of mathematical physics* (1924, an expansion of lectures by DAVID HILBERT – a second volume followed in the 1930s),
- *Lectures on Differential and Integral Calculus* (2 volumes, 1924) – the two volumes were repeatedly reprinted until the 1990s because of their careful, motivating and clear approach to analysis.



When mathematics and natural sciences were combined into a separate faculty in 1922 (previously they had belonged to the Faculty of Philosophy), the busy organiser COURANT was finally able to implement a long-held plan: the establishment of a *Mathematical Institute* at the university. At first it was just a name, but in 1927, thanks to financial support from the *Rockefeller Foundation*, it moved into its own building and COURANT became the first director, with the mathematical historian OTTO NEUGEBAUER as his deputy.

In 1932, COURANT embarked on a lecture tour to the USA and visited all the renowned universities. He was warmly welcomed everywhere by former graduates of Göttingen University.

After the National Socialists came to power and the *Law for the Restoration of the Professional Civil Service* came into force in April 1933, numerous employees of the Faculty of Mathematics and Natural Sciences at the University of Göttingen also lost their jobs, including EMMY NOETHER.



RICHARD COURANT and the physicists MAX BORN and JAMES FRANCK thought about a joint protest (like the “Göttingen Seven” in 1837).

(The “Göttingen Seven” were a group of seven liberal professors at University of Göttingen. In 1837, they protested against the annulment of the constitution of the Kingdom of Hanover by its new ruler, King ERNEST AUGUSTUS, and refused to swear an oath to the king, among them the BROTHERS GRIMM. GAUSS hesitated to join the protest unlike his colleague, the physicist WILHELM EDUARD WEBER.)

BORN and COURANT hesitated, but Nobel Prize winner FRANCK publicly protested against the discrimination against Germans of Jewish descent as alleged enemies of the fatherland and demanded his own dismissal.

COURANT was placed on leave, even though the exemption for former frontline fighters should have applied to him: a signature campaign by numerous current and former employees was ignored by the state.

Following a meeting in Zurich, COURANT and FRANCK travelled to Istanbul to examine offers from the Turkish government to help set up the new state university, but rejected them.

FRANCK went to *Johns Hopkins University* in Baltimore and BORN and COURANT officially took a leave of absence in order to be able to take up visiting professorships at Cambridge in England. COURANT's deputy NEUGEBAUER (a non-Jew) refused to swear loyalty to the new rulers and found a new position, first in Copenhagen and later at *Brown University* (in Rhode Island).

It was not until early 1934 that COURANT received an offer from *New York University* (NYU), initially for two years, which he had to accept despite the low pay – due to a lack of alternatives. Thanks to FERDINAND SPRINGER's intervention, COURANT was allowed to take his extensive private library and household effects with him.

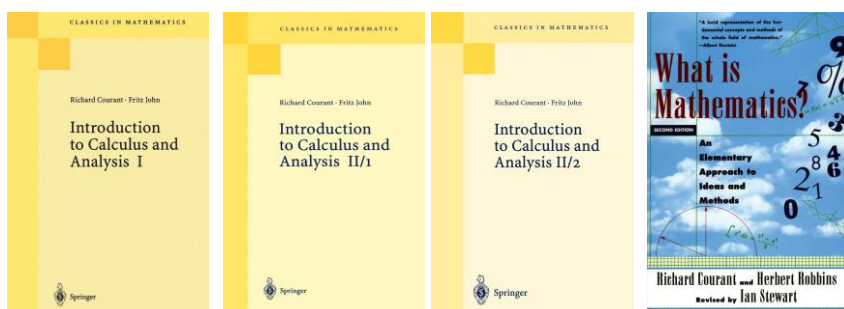
After overcoming major initial difficulties (students who were poorly prepared academically and limited work opportunities, such as the lack of a library), COURANT gradually managed to improve working conditions with the help of sponsorship money.

Thanks to his connections from his time in Göttingen, lecturers from other universities regularly came to NYU to give guest lectures.

In 1937 he raised the funds for an additional professorship in *applied mathematics*, to which KURT FRIEDRICHS was appointed. He had been COURANT's assistant in Göttingen in the years 1927-29 and then professor at the TH Braunschweig. FRIEDRICHS managed to leave Germany in 1936 when he (as a so-called "Aryan") was forbidden to have any contact with his Jewish girlfriend – marriage would have been out of the question anyway. His bride also managed to escape to the USA.

COURANT, who was only able to acquire American citizenship in 1941, also tried in the following years to find jobs for emigrants from Germany, which became increasingly difficult.

After the English translations of the above books (written in German), in 1941 – after 10 years of preparation – COURANT published the book *What is Mathematics?* (with the participation of HERBERT ROBBINS, a lecturer at NYU from 1939 to 1941).



The ambitious, compactly written book, which is still worth reading today, became a bestseller. It was not published in German translation until 1962.

COURANT's aim was

... to lead the reader from a completely elementary level without detours to vantage points from which one gains an insight into the substance of modern mathematics ... the reader (cannot) be spared every effort: a certain degree of intellectual maturity and willingness to think for yourself is required ...

The individual chapters dealt with natural numbers (including induction, prime numbers, congruences, FERMAT's last theorem, continued fractions), with the real and complex numbers (including the fundamental theorem of algebra, infinite sets and set algebra), with geometric constructions (including constructability) and the algebra of number fields, with projective and non-Euclidean geometry, with topology (polyhedral formula, classification of surfaces), with functions and limits (including continuity), with maxima and minima (including isoperimetric problems, soap-film experiments) as well as with infinitesimal calculus (including series expansions and differential equations).

The busy COURANT succeeded in developing the *Graduate Center for Mathematics* into a *Research Center for Applied Mathematics* based on the model of the Göttingen Institute he once headed.

After the war began, he was able to expand the programme with research funding from the military. In the 1950s, the *Atomic Energy Commission's* first computing centre was established at NYU (the first UNIVAC computer). Even after his retirement in 1958, he continued to support the work of the institute he founded, whose name was changed in 1964 to the *Courant Institute of Mathematical Sciences*.

At the end of 1972 COURANT suffered a stroke from which he never recovered. The much honoured man died at the age of 84 in New Rochelle (New York).

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<https://www.spektrum.de/wissen/richard-courant-vermittelt-mathematik-in-buechern-und-hochschullehre/2200094>

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