RICHARD VON MISES   (April 19, 1883 – April 14, 1953)

by HEINZ KLAUS STRICK, Germany

The life of the Austrian-American mathematician RICHARD EDLER VON MISES was marked by frequent changes in his place of residence. He was born in Lemberg, the capital of Galicia (today: Lviv in Ukraine). His wealthy family, originally of the Jewish faith, had been raised to hereditary nobility by Emperor FRANZ-JOSEF I three generations earlier.

RICHARD and his 18-month older brother LUDWIG (who would later became famous as an economist) attended the *Akademisches Gymnasium* in Vienna.

In 1901 RICHARD passed his high school diploma with honours in mathematics and Latin and took up studies in mathematics, physics and engineering at the Vienna University of Technology. He then worked as an assistant to GEORG HAMEL and received his doctorate in engineering with the thesis *Die Ermittlung der Schwungmassen im Schubkurbelgetriebe* [Determination of the centrifugal masses in a crank mechanism].

RICHARD VON MISES followed his doctoral supervisor to Brünn (today: Brno in the Czech Republic), where he was able to continue his career. He did his *habilitation* on the theory of water wheels and worked as a private lecturer. In 1909 he became an associate professor of applied mathematics at the University of Strasbourg (in Alsace, which from 1871 to 1919 was part of the German Reich) and so he was a Prussian citizen. As a passionate pilot, he lectured on aircraft construction and aircraft engines as early as 1913.

After the outbreak of World War 1, the staunch patriot returned to Austria-Hungary, trained pilots and headed a team of engineers who were to develop a 600-horsepower aircraft for the army (the so-called MISES large aircraft), which, however, never made it into wartime service.

After the war VON MISES took over the newly established *Chair of Hydrodynamics and Aerodynamics* at the Technical University of Dresden, followed in 1919 by his appointment as director of the new *Institute for Applied Mathematics* at the University of Berlin.

In 1921 RICHARD VON MISES founded the *Zeitschrift für Angewandte Mathematik und Mechanik* (ZAMM). His institute developed into a research centre including applications in probability and statistics and numerical solution methods of differential equations.

When the National Socialists took power in the German Reich in 1933, he sensed the threat posed by the new rulers, even though the Law for the Restoration of the Professional Civil Service provided for exceptions for non-Aryan participants in the war (the so-called front-line combatant privilege). These exceptions were abolished by the Nuremberg Laws in 1935.

At the end of 1933 he was offered the newly established chair of Pure and Applied Mathematics at the University of Istanbul. He still tried to save his pension entitlements from the past 24 years by pointing out the importance of the position for German-Turkish cooperation; but his arguments were not heeded.

(Shortly before his death in 1953, he made another vain attempt with German authorities to claim his rights.)
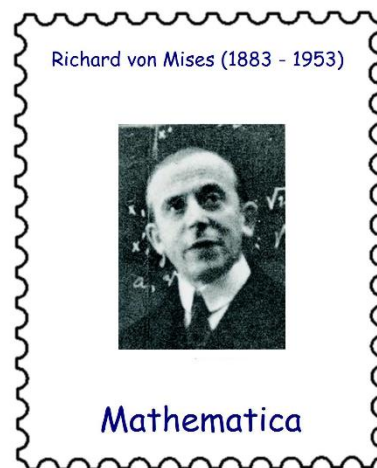
In October 1933, one day before his departure for Istanbul, VON MISES conducted a state examination for the last time. He devoted a lot of time after the end of the examination to this last of his students in Germany. In a long conversation he gives LOTHAR COLLATZ advice on what the latter should focus on in his intended doctorate.

HILDA GEIRINGER, a native of Vienna, had been RICHARD VON MISES's assistant and his closest colleague at ZAMM since 1921. In 1928, after two years of debate in the relevant committees, she succeeded in obtaining her *habilitation* (she was the second woman to be granted this, the first being EMMY NOETHER in 1919).


Emmy Noether (1882 - 1935)

Mathematica
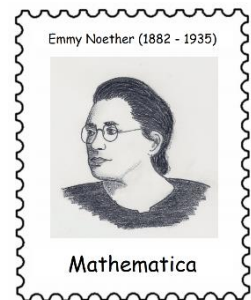
At the beginning of 1933, she was nominated by her faculty for an associate professorship, which would probably have been granted under different political circumstances. But as it was, the single mother of an 11-year-old daughter, a woman of Jewish origin, lost her position as a private lecturer. To earn a living, she had to take a job at the *Institute of Mechanics* in Brussels. VON MISES was then able to arrange a position for her at his Istanbul institute, where she lectured first in French, then after three years in Turkish.

After KEMAL ATATÜRK's death (at the end of 1938), many of the German exiles no longer felt safe in Turkey either. VON MISES was relieved when he was offered a professorship at Harvard.

Worried that HILDA GEIRINGER would not find an opportunity to emigrate to the USA as well, they both thought about a *pro forma* marriage. However, she found a job as a lecturer at *Bryn Mawr College* for Young Women near Philadelphia – like EMMY NOETHER years before – for which she has to learn another foreign language.

In 1943 RICHARD VON MISES and HILDA GEIRINGER married. All efforts to find a suitable position at a university for the highly qualified woman scientist proved futile. In a letter to HERMANN WEYL, who had also campaigned for her, she stated with resignation that the time was probably not yet ripe for women in higher education.

Hermann Weyl (1885 - 1955)

Mathematica
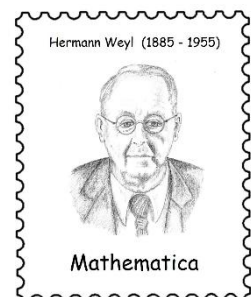
There were only a few positions for women even at colleges. HILDA GEIRINGER had to be content with a position at *Wheaton College*, 45 miles from Harvard, which she held until she retired. This way she could at least discuss her current research projects with her husband at weekends, while she continued unimpressed by the prevailing gender discrimination.

In 1953, RICHARD VON MISES died of cancer; and all of a sudden it was possible to establish a position for the widow as a *research fellow* at Harvard. In addition to her work at *Wheaton College*, she was given the opportunity to organise the scientific estate and hand it over to the university archives. In 1958 and 1964, VON MISES's books *Mathematical theory of probability and statistics* and *Mathematical theory of compressible fluid flow* were published posthumously.

In 1956, HILDA GEIRINGER was appointed *Associate Professor Emeritus* with full retirement pay by the *Free University of Berlin* – a later attempt to make amends for what her husband had been denied three years earlier, or perhaps just a political measure in the Cold War, since the East Berlin *Academy of Sciences* had offered VON MISES honorary membership of the *Academy* on the occasion of its 250th anniversary, which he had to decline for political reasons.

RICHARD VON MISES wrote numerous trend-setting papers in almost all fields of applied mathematics; in doing so, he always attached importance to the statement that the mathematical methods of engineering must fulfil the same claim to exactness as those in pure mathematics.

From his criticism of LAPLACE's assumption of an *a priori* probability, he developed a frequency-theoretical approach to the concept of probability as an empirical scientist (*Wahrscheinlichkeit, Statistik und Wahrheit* [Probability, statistics and truth], 1928).

For him, probabilities were limit values of infinite sequences of relative frequencies, whereby an *Axiom of Randomness* demanded that the limit value was independent of the choice of the infinite sequence.

Initially, this approach was not able to assert itself in the scientific debate against the measure-theoretical approach of ANDREI NIKOLAEVICH KOLMOGOROV. However, KOLOMOGOROV himself never tired of emphasising the importance of VON MISES's considerations.

During his time in Istanbul, VON MISES wrote the paper *Über Aufteilungs- und Besetzungs-Wahrscheinlichkeiten*, [On allocation and occupation probabilities] which triggered a plethora of investigations into the so-called *birthday problem*, including:

- *Among n randomly selected persons, with what probability do at least two have their birthday on the same day?*

(It is known that for *n* ≥ 23 the probability is greater than 50 %, see the graphic on the left.)
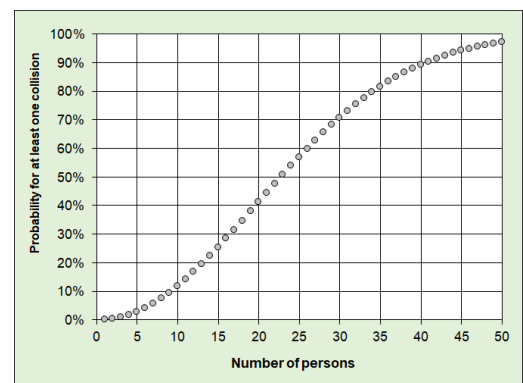
- *On average, how many people do you have to ask about their birthday before you find two with matching birthdays?*

(VON MISES determined the expected value of 29 for this; the correct value is approximately 24.617).

Less known than VON MISES's works on applied mathematics are his publications on RAINER MARIA RILKE (1875-1926), especially on the correspondence of the German-speaking poet born in Prague.