

## ELIZAVETA LITVINOVA (September 21, 1845 – 1919)

by HEINZ KLAUS STRICK, Germany

In 1874, the University of Göttingen was the first European university to agree to award a doctorate in mathematics to a woman, but only at the insistence of KARL WEIERSTRASS: SOFIA KOVALEVSKAYA was awarded the doctorate *in absentia* on the basis of three extensive papers.

The first woman to obtain a doctorate in mathematics through a *regular procedure* (i.e. with a *rigorous examination* or *disputation*) in Europe also came from Russia: ELIZAVETA FEDOROVNA LITVINOWA.

Born near Tula (200 km south of Moscow), ELIZAVETA grew up with two siblings on the estate of her wealthy father FJODOR ALEKSEEVICH IVASHKIN. Initially taught by private tutors, at the age of 13 she switched to the MARIINSKI boarding school for girls in St Petersburg. Although the standard of this grammar school was significantly higher than that of other educational institutions for girls, it could hardly be compared with that of schools for boys preparing for university studies.

ELIZAVETA joined a group of young people who sympathised with the ideas of the so-called *nihilists*: At the time, the nihilists were concerned with issues such as *individual freedom* and *education for everyone*, especially for girls and they rejected the authoritarian structure of the state and the overpowering influence of the orthodox church. It was only later that some of the nihilists became radicalised and sought to overthrow society through terrorist acts.

ELIZAVETA told her parents that she wanted to be able to attend a university but they rejected it, quite apart from the fact that women were generally not admitted to Russian universities. Some teachers who supported general access offered preparatory courses for young women in private rooms, including mathematician ALEXANDR NIKOLAYEVICH STRANNOLIUBSKI, who was particularly proud of the progress of his former student SOFIA KOVALEVSKAYA.



ELIZAVETA took part in one of STRANNOLIUBSKI's courses, even after her marriage to Dr VIKTOR LITVINOV in 1866. The following year she took part in a petition to Tsar ALEXANDER II to open the universities to women but – as expected – it was rejected.

When SOFIA KOVALEVSKAYA and her husband VLADIMIR KOVALEVSKI went to Heidelberg in 1869 to study mathematics there, STRANNOLIUBSKI encouraged his other students to do the same. In order to travel abroad, a passport had to be obtained, for which married women needed the permission of their husbands. Although VIKTOR LITVINOV supported her attending private mathematics courses, he rejected all of his wife's requests beyond that. It is not clear why ELIZAVETA had married her husband, because it does not seem to have been a love marriage – in any case, the marriage had not brought her any further in her ambitions.

In order to be able to study at a Russian university, applicants were required to have a certificate of competence, which ELIZAVETA LITVINOVA acquired in 1870 thanks to the successful participation in the preparatory courses – however, as a woman, the licence was useless for her with regard to taking up studies.

When VIKTOR LITVINOV died unexpectedly in 1872, her way was free to leave the country. Like numerous other married or widowed women, ELIZAVETA LITVINOVA travelled to Switzerland, which had already opened up access to the universities for women in 1840. At first, women were only admitted there as students, but from 1867 women could enrol and even get a doctorate. The Russian NADESCHDA SUSLOVA was the first to take a doctorate in medicine.

Unlike most of the other female students, LITVINOVA did not study mathematics at the university in Zurich, but at the *Swiss Federal Institute of Technology* (ETH), so that in some lectures she was the only woman, which – because of the behavior of her fellow students – was not always easy for her.

She had hardly begun her studies when a decree from the Russian Tsar was published: all students from Russia had to return to their homeland by the end of 1873 and they could continue their studies there – including women, for whom university access should be made possible soon. Those who did not follow this instruction were to be excluded from civil service in the future.

The Tsar's apparent change of mind was not due to better insight or a general liberalisation of the state system, but solely because the state apparatus feared that a revolution could be prepared by the numerous people studying outside Russia.

ELIZAVETA LITVINOVA considered the Tsar's decree an empty threat and she therefore decided to continue her studies in Switzerland. Her decision was supported by HERMANN AMANDUS SCHWARZ, whose lectures she attended. He took good care of her, even invited her to his family for dinner and gave her private lessons.



When SCHWARZ accepted a call to Göttingen in 1875, LITVINOVA moved to LUDWIG SCHLÄFLI at the University of Bern.

In 1876 she acquired the general higher education entrance qualification (*baccalauréat*), the formal requirement for her matriculation. In 1878 she passed the doctoral examination (*Dr Phil*) under SCHLÄFLI with the grade *summa cum laude*.

SCHWARZ had given her the topic of her doctoral thesis *Solution of a Mapping Problem*:

*A curve is given of such a nature that the product of the distances between its points and two fixed points, the so-called foci, should be constant. It is required to map the two pieces of the surface bounded by this curve conformally, i.e. similar in their smallest parts, onto a simple circular surface.*

After successfully completing her studies, ELIZAVETA LITVINOVA returned to St Petersburg, where she presented her acquired qualifications to the authorities. However, there were still the consequences threatened in the earlier decree: none of the higher state institutions were allowed to employ her and she was also deprived of every opportunity to study for a degree again.

In order to make a living, she had to be content with teaching the lower classes at a private school – unlike other women who had returned from Switzerland in time and had completed their studies in Russia. The highly qualified ELIZAVETA LITVINOVA was only paid by the hour for her teaching activities – without any pension entitlements.

It was only after nine years and repeated petitions and applications from her supporters that she was allowed – as the first woman ever – to also teach in the upper classes of the Princess OBOLENSKAJA Gymnasium, although without the privileges of her male colleagues. And so she was forced to earn money through additional activities: she wrote numerous biographies of mathematicians and philosophers, e.g. about ARISTOTELES, CONDORCET, D'ALEMBERT, EULER, LAPLACE and LOBACHEVSKY.



As part of her biography of SOFIA KOVALEVSKAYA, she dealt with her self-doubts regarding her own intellectual abilities and those of women in general – in contrast to the self-confidence of men, where even only moderately talented persons rarely questioned their own competence.

The gifted mathematics teacher wrote about seventy contributions to mathematics teaching and philosophy. She was committed to women's rights and took part in an international women's congress in Brussels in 1897 as one of four Russian activists. In the same year the Mathematical Society of St Petersburg accepted her as a member, as did the Philosophical Society in 1901. In 1911 she was sent to Germany and France to learn about the methods of teaching geometry practised there.

In 1917 she gave up teaching and moved with her sister to the countryside around St Petersburg.

In the turmoil of the October Revolution, all trace of her was lost. It is believed that she perished during the devastating famine of 1919.

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Translated 2023 by John O'Connor, University of St Andrews

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