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On mathematics in Lvov from the second half of the 19th century till the end of WWII

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Abstract. A brief outline of the history of mathematics in Lvov from the second half of the 19th century till the end of the Second World War with emphasizing of the role of the Lvov School of Mathematics.

Keywords: history of mathematics, Poland, autonomy period, Lvov University.

The date of establishment of the Academy is considered as the establishment of the Lvov University: 20 January 1661 King Jan Kazimierz signed the act of foundation, which gave the same rights and privileges to the existing since 1608 the College of the Jesuit Fathers and the Academy of Cracow. The Academy was against the approval of foundation act, so it did not really come into effect. Only Pope Clement XIII approved it on 26 March 1759. The Academy has two departments: the philosophical and theological one, but gave no degrees. It functioned until the First partition of Poland in 1773, when Lvov belonged to Austria, and the dissolution of the Jesuit Order followed. The Academy was closed and a high school functioned in its building. In 1784, Emperor Joseph II founded the Lvov University with the Latin language of teaching and four departments. The university, called Joseph's University after the name of the ruler, existed until 1804, when it was transformed into a Lvov high school. In 1817 Emperor Franz I resumed activity of the University with German language of teaching. When Galicia obtained autonomy (in 1861) Polish language of teaching was introduced in 1871. Spring of Nations, the aspiration for freedom opened a new phase of the university (1848-1871). The Philosophy Department obtained permission to conduct independent studies. On September 29, 1848, the authorities in Vienna introduced Polish as the teaching language. German Professors protested, Lvov was bombed, revolutionary sentiments were suppressed and the authorities in Vienna on 4 December 1848 cancelled the previous order and German language again became the teaching language at the university. Attempts to make University Polish in 1858, gradually led to the increase of the number of chairs with the Polish language of teaching. But only since 1871, since the provision of the Austrian authorities about freedom of choosing the teaching language, we can consider that Polish was restored at the Lvov University. The Head of the Department of Mathematics in the period 1872-1889 was Wawrzyniec Żmurko (1824 – 1889), a long-term professor of mathematical analysis and theoretical mechanics. After the death of Żmurko in 1889 Joseph Knyaz Puzyna (1856-1919) became the head of

the Department. Their scientific and organizational activities can be seen as a huge commitment and significant contribution to the development of mathematical culture. Among other things, during Puzyna's activity the Math seminar came into being with two lower and higher departments at the Lvov University (from 1893 to 1894). In Lvov, J. Puzyna published two volumes "Theory of analytic functions", about which S. Saks and A. Zygmund wrote later that: it is a true encyclopaedia of analysis. Puzyna also had a great experience, but his role in the introduction of the set theory in Poland is still unappreciated. It is remembered that W. Sierpiński gave the first lecture on set theory at the Lvov University in 1909 and wrote a book *The outline of the set theory* in 1919 as well as an article in the *Guide for self-taught* in 1915. It is less known however that in Poland Puzyna was the first to write about this theory in the work *Theory of analytical functions* (volume I was published in Lvov in 1898, volume II also in Lvov in 1900). It is worth noting that Puzyna introduced language of set theory and used the language of intuitive topology. In 1910, the Ministry of Education in Vienna agreed to restart the Second Department of Mathematics at the Faculty of Philosophy, of the Lvov University, and Waclaw Sierpiński, who started his work at the Lvov University after his habilitation in 1908 in Lvov. W. Sierpiński directed the II Chair of Mathematics until 1918 (with a break for internment in Russia, 1914-1917), then he moved to the Warsaw University. In the period of the Lvov University he concentrated talented young mathematicians around himself, among others Zygmunt Janiszewski and Stefan Mazurkiewicz (1888-1945), with whom he later cooperated in Warsaw. In the period 1909 to 1914 he conducted a seminar on set theory (one of the first in the world). In 1909 he introduced a series of lectures on the set theory, one of the first university lectures on set theory as a separate subject. On 10 July 1913 Zygmunt Janiszewski got a nomination for the post of assistant in the "ordinary chair of mathematics of professor Józef Puzyna for the period from 1 October 1913 to 30 September 1915." In the same document we can read that the number of professors (faculty council) on the meeting on 11 July 1913 granted him *venia legendi* - the right of teaching mathematics at the Lvov University. He received his doctorate degree on the work "Sur les continus irréductibles entre deux points". Janiszewski in the article *On the needs of mathematics in Poland* suggested "to get independent positions for Polish mathematics". It is worth stressing that topics related to set theory were in the scope of interest of the Lvov group, i.e., Sierpiński, Janiszewski, Mazurkiewicz, later also S. Ruziewicz (1889-1941). At the beginning of the XX century one of the students of the Polytechnic School in Lvov was the most talented Polish mathematician of the XX century, Stefan Banach (1892-1945). When after the outbreak of World War I Banach returned to Krakow, an unusual meeting with Steinhaus took place: There, quite by chance he met Stefan Banach. As he mentioned this fact - "during this walk I heard the words "...Lebesgue measure ..." - I went to the bench and introduced myself to two young students of mathematics. They told me that their companion was also Witold Wilkosz, who was highly praised.

They were Stefan Banach and Otto Nikodym. Since then, we met regularly, and because of fact that Władysław Ślebodziński, Leon Chwistek, and Jan Króo and Władysław Stożek were in Cracow we decided to start a Mathematical Society.

Hugo D. Steinhaus's relation with the university in the period of autonomy was a short one, a bit over a year, and took place in the complicated wartime and post-war situation. Steinhaus studied and obtained a doctorate in mathematics in Goettingen. In March 1917, he went to Lvov to deliver his habilitation lecture at the Lvov University, after which he obtained his *veniam legendi* (Thanks to Steinhaus Banach got a position at the Polytechnic School with prof. Łomnicki (after the Polish-Soviet war in 1920). Afterwards his career developed rapidly. Together with Steinhaus he created after 1920 in Lwow one of significant mathematical schools—the Lvov Mathematical School, for which the ground was prepared by a half-century of achievements of Lvov mathematicians connected with the University and Polytechnic School in Lvov. The theory of Banach spaces, functional analysis, the journal “*Studia Mathematica*” and the Scottish Book changed the mathematics of the XX century. But one should not forget that there were also active mathematicians in Lvov beyond the Lvov School, among them Lucjan Emil Boettcher, a pioneer in iteration theory.

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