POLISH MATHEMATICIANS AND MATHEMATICS IN WORLD WAR I

STANISLAW DOMORADZKI AND MALGORZATA STAWISKA

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ABSTRACT. In this article we present diverse experiences of Polish mathematicians (in a broad sense) who during World War I fought for freedom of their homeland or conducted their research and teaching in difficult wartime circumstances. We first focus on those affiliated with Polish institutions of higher education: the existing Universities in Lwów in Kraków and the Lwów Polytechnics (Austro-Hungarian empire) as well as the reactivated University of Warsaw and the new Warsaw Polytechnics (the Polish Kingdom, formerly in the Russian empire). Then we consider the situations of Polish mathematicians in the Russian empire and other countries. We discuss not only individual fates, but also organizational efforts of many kinds (teaching at the academic level outside traditional institutions– in Society for Scientific Courses in Warsaw and in Polish University College in Kiev; scientific societies in Kraków, Lwów, Moscow and Kiev; publishing activities) in order to illustrate the formation of modern Polish mathematical community.

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1. Introduction

When thinking about Polish mathematicians during World War I one needs to keep in mind that from 1795 until 1918 there was no Poland on the political map of Europe. The territory of the former Crown of the Kingdom of Poland and the Grand Duchy of Lithuania (also known as the Commonwealth of Poland) was divided among three neighboring powers: Austria (later Austro-Hungary), Prussia (later part of the unified Germany) and Russia. In 1866 the Austro-Hungarian partition (known as the province of Galicia) was granted autonomy and Polish became the official language. Polish-language academic centers (the only ones in the world) were located in Kraków (Jagiellonian University) and Lwów (University and Polytechnic). The Russian partition (the Polish Kingdom) saw periods of struggle for national independence (November Uprising 1830–1831 and January Uprising 1863–64) followed by repressions. All public high schools conducted instruction in Russian and the Main School in Warsaw gave way to the Russian-language Imperial University and Polytechnic. The use of Polish in official communication was forbidden. The administration and courts were staffed by Russians. Educated Poles had to look for career opportunities elsewhere, and many of them established themselves in other places in the Russian Empire. But the end of the 19th century in the Kingdom brought an amazing development of unofficial education in Polish at all levels, including academic. In the Prussian partition Poles were subject to national and religious discrimination; the efforts at Germanization intensified after the unification of Germany in 1871. There were no academic institutions there.\footnote{Wrocław (Breslau) had an university, but the city was not within Polish borders in the 18th century.} So whom do we consider a “Polish” mathematician? As others pointed out before ([Duda 2012], [Tatarkiewicz 1998]), there is no good answer to this question. This article concerns mostly men and women born in the Polish Kingdom or Galicia and educated there (at least up to the high-school level), speaking Polish as one of their primary languages, including a few who were ethnically Jewish. But we also talk about some individuals born in the Russian empire to Polish-speaking families. We organized the article around places where Polish mathematicians found themselves during the war and we discuss each person in connection with the place of his or her main wartime activity. We occasionally extend the discussion beyond November 11, 1918, the date of armistice and proclamation of independent Poland. The borders of the reborn state were not guaranteed, so Poland had to defend itself against the competing interests...
of its neighbors: Germany, Russia, Lithuania, Czechoslovakia, Soviet republics and multiple short-lived Ukrainian states. The fighting continued until 1921 (the Peace of Riga with Soviet Russia and Soviet Ukraine as well as the Third Silesian Uprising against Germany).²

When the World War I broke out on July 28, 1914, it pitched Germany and Austro-Hungary against Russia (backed by France and Great Britain). Poles could either remain passive or take sides in the conflict. Many were drafted into respective armies.³ Some did not believe in fighting a war serving the interests of the occupying powers; a war viewed as fratricidal, given the Polish presence in the enemy states. On the other hand, many saw an opportunity to fight for the independent Polish state aligning themselves with the side of either Central Powers or of Triple Entente. This was particularly true in Galicia, where young men massively volunteered into Polish Legions.⁴ Mathematicians were among those who were drafted or volunteered into military, who served in the trenches or in non-combat units, experiencing wounds, gas poisoning, prisoners’ camps or internment. They were also affected by compulsory evacuations⁵, travel restrictions, food and raw materials shortages. None lost their life as a result of war operations, but two outstanding scholars (Marian Smoluchowski and Zygmunt Janiszewski) died of war-related epidemics. Although the fates we describe were typical in many ways, presenting the realities of war from personal perspectives is not the only goal of our article. Rather, we want to focus on the impact of war on activities considered normal for mathematicians and other scientists: studying, research, teaching, academic administration, publishing and professional organizations. We found it convenient to adopt a somewhat broad definition of a “mathematician”. Besides scholars known

²Stanisław Saks fought in Silesian Uprisings; Antoni Lomnicki and Kazimierz Bartel fought in the Defense of Lwów; Stanisław Leśniewski, Stefan Mazurkiewicz and Waclaw Sierpiński worked in a cryptography group during the Polish-Soviet war.
³The total number of men mobilized by Germany during WWI was 13.2 million, or 41.4% of the male population. In Russia, the number was 13 million men, or 7.4% of the male population, plus 5,000-6,000 women ([Beckett 2001]).
⁴Only those not subject to draft into the regular Austro-Hungarian army were allowed to enlist in the Legions. Some Poles from the Russian partition studying in Galicia did so ([Kutrzeba 1988]).
⁵The Russians evacuated about 130 industrial enterprises and 200 educational institutions— their personnel, equipment etc.—from the Polish Kingdom and part of Eastern Galicia, over 600 thousand people in total.
for their outstanding results in mathematics (prior to the war or afterwards), such as Banach and Sierpiński, we introduce many individuals who made lesser contributions to mathematical knowledge, in particular those (Izabela Abramowicz, Zygmunt Chwiałkowski, Adam Patryn) who did not continue their research after the war. Finally, we mention some physicists, astronomers, engineers and philosophers who in the circumstances of the war engaged in teaching mathematics at the academic level or in the activities of learned societies alongside their mathematical colleagues. It is quite remarkable how much they could accomplish despite the challenges brought by the war. Mathematical societies were established in Moscow, Kiev, Kraków and Lwów and talks were given. Monographs and textbooks appeared, journals were published ("Wiadomości Matematyczne", "Prace Matematyczno-Fizyczne", "Wektor") or planned ("Fundamenta Mathematicae", launched in 1920). Academic courses went on (with inevitable interruptions) even though many students and faculty served in the army, buildings were requisitioned for military purposes and resources (libraries, scientific equipment etc.) were evacuated. Doctorates were awarded (Franciszek Leja, Witold Wilkosz, Antoni Plamitzer, Adam Patryn) or recognized (Zygmunt Janiszewski); habilitations were granted (Hugo Steinhaus, Stanisław Ruziewicz, Antoni Łomnicki, Eustachy Żyliński, Tadeusz Banachiewicz, Stanisław Leśniewski) or denied (Lucjan Emil Böttcher). New Polish academic institutions were organized (University of Warsaw, Warsaw Polytechnics, Polish University College in Kiev). Some mathematicians extended their activity to teaching at a high-school or elementary level when and where the need arose. A few also engaged themselves outside of mathematics and education: in political activities (Wiktor Staniewicz), artistic expression (Leon Chwistek) or writing on cultural and religious Jewish themes (Chaim Müntz).

Did any of the scholars mentioned in this article contribute their specific knowledge to the war effort in the years 1914-18? It does not seem so, at least not directly. Leon Lichtenstein worked for the Siemens company in Berlin, which did support the German military effort, but he dealt with electric cables, not weapons or anything primarily associated with combat. His work, however, was deemed important enough

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6The cryptography work of Mazurkiewicz, Sierpiński and Leśniewski was done in the years 1920-21; see [McFarland, McFarland and Smith 2014] for more information.
to earn him German citizenship in the early days of the war. No other mathematicians mentioned below had ties to industry or institutions of war research. The military service in general did not call for higher mathematical skills, although basic knowledge of mathematics and engineering was required sometimes. Edward Stamm served in the Austrian army as a radiotelegraphist, officially translating cablegrams from French, English and Italian, but unofficially might have been involved in deciphering (we have no direct evidence of this, but in 1921 he published a treaty “On application of logic to the cipher theory” [O zastosowaniu logiki do teorii szyfrów]). Eustachy Żyliński had to learn several engineering subjects in his officer’s training in the Russian army in order to become an instructor to future officers. Stanisława Liliental (later Nikodymowa) taught basic mathematics to Polish army recruits while on leave from her studies at the Warsaw University. While we cannot find evidence of anybody’s research being directed by war needs, we can point out several instances of mathematical interests being influenced by war-related circumstances. The most notable cases are those of Stefan Banach, Bronisław Knaster and Kazimierz Kuratowski. All had to interrupt their studies because of the war—Banach and Kuratowski in engineering, Knaster in medicine— but they found opportunities for pursuing mathematics and later became pillars of Polish School of Mathematics. Banach’s mathematical career was spurred by his serendipitous meeting with Hugo Steinhaus in 1916, which probably would not happen if Steinhaus did not take an administrative job in Kraków after his release from the army. Another interesting case is that of Tadeusz Banachiewicz, an astronomer working in Dorpat, who oriented his research towards theory after the instruments from his observatory were evacuated deeper inside the Russian Empire. We count him here because the interest in computational methods he developed at that time allowed him later to make some lasting contributions to mathematics. There were other cases of changing interests, but none of them suggestive of switching from pure mathematics to war-inspired

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7His fate contrasts with that of Chaim Müntz, another Russian-born German-educated Polish-Jewish mathematician, who, despite being a serious researcher, educator and thinker, lost his job at a school in Hessen during the war.

8We were not able to find a curriculum of these courses. According to [Aubin and Goldstein 2014], such training was also offered in other armies and included distance measurement and elements of ballistics. Popular texts were “Soldaten-Mathematik” by Alexander Wittig (Leipzig 1916) and “Elementary Mathematics for Field Artillery” by Lester R. Ford (Louisville, KY, 1919; first circulating as lecture notes).
applications.

Few individual losses, students developing interests in mathematics as well as arrival of a few promising or already established mathematicians (Kazimierz Abramowicz, Jerzy Neyman, Antoni Przeborski, Wiktor Staniewicz, Eustachy Zyliński) after the fall of the Tsarist Russia and the Bolshevik upheaval meant that Poland did not experience a generational gap in mathematics, unlike France. The so-called Bourbaki thesis (see [Aubin and Goldstein 2014]) claims that the occurrence of such a gap hindered modern development of mathematics. Another statement discussed in [Aubin and Goldstein 2014], Forman’s thesis, claims that the war caused collapse of traditional ways of thinking and hence accelerated progress in physics and mathematics, especially in Germany. We will not argue here whether or how this could be applied to Polish mathematics. But we have to point out one rather audacious proposal made during the war which was crucial for the direction that Polish mathematics took after the war. It was the publication of the article “On needs of Polish mathematics”[O potrzebach matematyki polskiej] by Zygmunt Janiszewski in 1918, answering an appeal of a new journal “Polish Science. Its Needs, Organization and Development. [Nauka Polska. Jej potrzeby, organizacja i rozwój.]”, published by Mianowski Fund. In that article Janiszewski announced his famous program of advancing Polish mathematics by concentrating research on one discipline, possibly in one academic center, and establishing a specialized scientific journal devoted to this discipline. To a large extent the program was carried out by the Polish School of Mathematics, continuing years after Janiszewski’s premature death. However, foundations were laid before. In 1915, a Polish-language university opened in Warsaw, replacing the Russian one. By conducting lectures and seminars at the University of Warsaw since its very beginning Janiszewski practiced his program before officially formulating it, developing research in topology, aided by like-minded colleagues such as Stefan Mazurkiewicz and Wacław Sierpiński, and attracting younger mathematicians to topics of his interest. He understood the importance not only of individual ideas, but also of research collaboration and institutional support. It took many intellectual and organizational efforts of Polish mathematicians before the Polish School of Mathematics emerged. The end of the Great War brought in the independent Polish state, in which the School thrived.
2. Galicja

2.1. Kraków. Kraków, an ancient Polish capital under Austro-Hungarian occupation, was the seat of the oldest Polish university (established in 1364). In the academic year 1913/14, 3736 students were attending Jagiellonian University. Classes in mathematics were taught by professors Kazimierz Żorawski (1866-1953) and Stanisław Zaremba (1863-1942) and docents Antoni Hoborski (1879-1940), Alfred Rosenblatt (1880-1947) and Jan Śleszyński (1854-1931). A course of mathematics for naturalists was taught by Włodzimierz Stożek (1883-1941), who also taught in a gymnasium.

The first year of the Great War proved very difficult for Kraków, which was a major fortress. The commander Karl Kuk ordered closing the gates on October 17, 1914. The Austrians evacuated over 63,000 people from Kraków. The Russian army advanced fast to the west, coming near Kraków and surrounding it. The first and second battle of Kraków took place respectively in the periods of November 18-22, 1914, and December 6-12, with 40 divisions fighting on both sides. Ultimately the Russians were stopped near Lapanów on December 12.

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9Żorawski, born in the Polish Kingdom, got his doctorate in Leipzig under Sophus Lie. He took a chair of mathematics at the Jagiellonian University in 1893. His research was mainly in differential geometry, mechanics and iteration theory ([Ślebodziński 1956]).

10Zaremba, born in the Russian Empire, got his doctorate in Paris. He was appointed a professor of mathematics at the Jagiellonian University in 1900. His research was mainly in differential equations, potential theory and mathematical physics ([Domoradzki 2012]).

11In 1911 Hoborski got habilitation at the Jagiellonian University. Before the war he lectured on descriptive geometry and theoretical arithmetic while also teaching in a gymnasium. After the war he was nominated for an ordinary professor of mathematics at the newly opened Academy of Mining in Kraków. His main achievements were in differential geometry ([Gołąb 1969]).

12Rosenblatt obtained veniam legendi in 1913. He was unsuccessful in getting a university chair in Poland, so in 1936 he emigrated to Lima, Peru. He worked in the fields of algebraic geometry, analytic functions, mathematical physics and many others. ([Ciesielska and Maligranda 2014])

13Śleszyński retired from his chair in Odessa in 1909 and moved to Kraków, where he lectured since 1911. He worked on number theory, probability and logic (proof theory). He used the title of professor, although formally he was appointed to professorship only in 1919. His teaching in the period 1911-19, along with some other classes in mathematics and history of sciences, was financed by the fund of Władysław Kretkowski ([Ciesielska 2016]). His chair was the first chair of mathematical logic in Poland, and possibly in the world. ([Woleński 1995])

14Stożek’s doctorate proceedings, started in 1917, were finalized in 1922.
1914, and forced to retreat after heavy losses. ([Chwalba 2014])

The Jagiellonian University was closed for the winter semester in the academic year 1914/15. Many of the university buildings were requisitioned for military purposes. The Academy of Sciences and Arts, which managed to avoid requisitions, came to help the University. On May 1, 1915, the University restarted teaching activities after a few month break. It was a success: the classes were held during the shortened summer semester, among them two lectures in mathematics by Sleszyński.

Regular academic activities continued after 1915, even though some faculty and students were enlisted in the military. **Marian Smoluchowski (1872-1917)**, who was appointed to the chair of experimental physics at the Jagiellonian University in 1913, was drafted in 1914 as an Austrian reserve officer. He commanded an artillery detachment, but soon he was released and allowed to come to the University of Vienna, and then back to Kraków. The building of chairs of physics was occupied by the military, so he conducted his work in the former private apartment of his colleague Karol Olszewski (1846-1915). In 1916 Smoluchowski was invited to Göttingen to deliver Wolfskehl lectures in June 20-22. His topic was “Drei Vorträge über Diffusion, Brownsche Molekularbewegung und Koagulation von Kolloidteilchen” (Three lectures on diffusion, Brownian motion and coagulation of colloidal particles). In 1917 he was elected the rector, but he died of dysentery before the new academic year began. His duties were taken over by Żorawski ([Gudowska-Nowak, Lindenberg and Metzler 2017], [Fuliński 1998], [Polak 2017]).

**Władysław Nikliborc (1889 - 1948)** passed the wartime maturity exam in Wadowice on December 14, 1916. In the first semester of the academic year 1916/17 he studied law at the UJ, but soon (in December 1916) he joined the Polish Legions. He served in the 19th battery of the combat artillery. After the Oath Crisis he transferred along with the whole regiment to the Austrian army, in which he served until the emergence of the Polish state (he served in France, then in Czech territories in Olomouc). After 2 years he was released from the military and continued his studies, which he interrupted again twice to take part in

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15Smoluchowski, an outstanding physicist, made some lasting contributions to mathematics. The most important ones are the theory of Brownian motions and the Smoluchowski equation, which is a limit case of the Fokker-Planck equation.

16Olszewski was the first, jointly with Zygmunt Wróblewski (1845-1888), to liquefy oxygen and nitrogen.
the wars with Ukraine and Soviet Russia (1918 and 1920). In 1922 he completed his studies at UJ and started working as an assistant to Antoni Łomnicki at the Lwów Polytechnics ([Ślebodziński 1948]).

Stefan Kaczmarz (1895-1939) started studies in mathematics, physics and chemistry in 1913 at the Jagiellonian University. On September 1, 1914 he enlisted in the Polish Legions. He served in the 16th company of the 2nd infantry regiment. From March 1915 to March 1917 he took part in the Carpathian campaign. In July 1917 he was nominated to the rank of plutonowy (platoon sergeant). In 1917 he was transferred to artillery. After the Oath Crisis and dissolution of the Polish Legions he was interned in Huszt and Bustyahaza (Hungary). He escaped, but was caught in Galicja and placed in the internment camp in Witkowice (now part of Kraków). In January 1918 he was assigned to the School of Artillery Ensigns of the Polish Auxiliary Corps (Polski Korpus Posiłkowy) in Walawa (Przemyśl region). Released from the army in March 1918, he resumed his studies in Kraków. From November 1918 to February 1919 he served in the Academic Battalion in Kraków as a private. In July 1920 he voluntarily enlisted in the Polish army. He managed to finish his studies in 1922 ([Maligranda 2007]).

Before the war there were a few Polish paramilitary organizations in Galicja: the Riflemen Union, the “Rifleman” Society, the Bartosz Troops (Związek Strzelecki, Towarzystwo “Strzelec”, Drużyny Bartoszowe). The Austro-Hungarian authorities tolerated them, hoping to use them in a possible conflict with Russia. Soon they were integrated with the Union for Active Struggle Związek Walki Czynnej, started by the immigrants from the Polish Kingdom, Józef Piłsudski (1867-1935) and Kazimierz Sosnkowski (1885-1969), who fought the imperial Russia in 1905 and intended to continue the fight. With the outbreak of war, these organizations gave rise to the Polish Legions (Legiony Polskie), a separate formation within the Austro-Hungarian army. In 1917 they were supposed to become a part of Polnische Wehrmacht (Polska Siła Zbrojna) organized by the German and Austrian authorities occupying the Polish Kingdom. However, most soldiers and officers refused to swear an oath of loyalty to the German emperor. As a result of the Oath Crisis, the former Russian subjects were interned in the camps in Beniaminów and Szczypiorna, and the Austro-Hungarian subjects

\[^17^\text{The possibility of such a conflict arose already in 1910, after Austro-Hungarian annexation of Bosnia and Herzegovina.}\]
were enlisted in the Austro-Hungarian army. The Second Brigade of Legions swore the oath and continue fighting until Austrian command as the Polish Auxiliary Corps (Polski Korpus Posiłkowy) until the Treaty of Brest-Litovsk in 1918. In protest against territorial concessions to Ukraine, the corps, commanded by General Józef Haller (1873-1960), crossed the front lines to the Russian side. Those unsuccessful were interned in Marmaros-Sziget and Huszt ([Kutrzeba 1988]).

The events of war brought to Kraków many people trained in mathematics. Edward Stamm (1886-1940)\textsuperscript{18}, a logician, philosopher and historian of science, a graduate of the University of Vienna, taught mathematics in a private gymnasium in Surochów near Jarosław since 1911. By 1914 he published 23 works on logic and philosophy of mathematics. As the front lines came close, he went first to to Nowy Sącz, then to Vienna. Many refugees from Eastern Galicia were there, among them Kazimierz Twardowski (1866-1938)\textsuperscript{19} and other Lwów philosophers. Stamm came into contact with Twardowski. Then in 1915 he was drafted into Austrian army and served in a radiotelegraphy station in Kraków, translating cablegrams from French, English and Italian. In 1917 he started officer’s training in telegraphy in St. Pölten and after completing it, he commanded a telegraph station in Cheb (Bohemia). He returned to Kraków in 1918 and served as a Polish commander of the telegraph station until his discharge in 1921, promoted to the rank of a captain ([Pabich 2002], [Wachułka 1980]).

Leon Chwistek (1884-1944), a mathematician, philosopher and painter, interrupted his studies of drawing in Paris when the war broke out and joined the First Brigade of Legions. He suffered a wound to his leg, which caused a lasting impairment. After the Oath Crisis Chwistek returned to Kraków, where he devoted himself to his art and art theory. In 1917 he co-founded the group of “Formists” (initially called the “Polish expressionists”), whose goal was creation of a modern national style, merging the achievements of the Western avant-garde (expressionism, cubism, futurism) with native traditions (medieval arts and crafts, primitive reverse glass painting from Podhale).\textsuperscript{20} ([Dawidowiczowa 1989], [Baranowicz 1975], [Rzewuski])

\textsuperscript{18}Stamm was a descendant of German Josephine colonists in Galicia.

\textsuperscript{19}Twardowski was a founder of the Lwów-Warsaw philosophical school.

\textsuperscript{20}Among the members of the group there were a painter and poet Tytus Czyżewski (1880-1945), painters and stage designers brothers Zbigniew Pronaszko (1885-1958) and Andrzej Pronaszko (1888-1961), a sculptor August Zamoyski
Franciszek Leja (1885-1979), after completing his studies in Lwów and obtaining teacher’s licence in mathematics and physics, worked as a teacher in high schools in Kraków and Bochnia. The scholarship from the Academy of Letters enabled him to continue his studies in Paris and London in 1912-13. As a member of Bartosz Troops (Drużyny Bartoszowe), he was enlisted in the Eastern Legion and fought in 1914-15. When the Legion was dissolved, Leja returned to teaching in the Gymnasium V in Kraków and worked half-time as an assistant in the Chair of Mathematics at the Jagiellonian University at the recommendation of Kazimierz Żorawski. Under Żorawski’s supervision he defended his doctorate in 1916. The title of his thesis was “Własność niezmieniczą równań różniczkowych zwyczajnych ze względu na przekształcenia sty- 22 cznościowe [Invariant property of ordinary differential equations with respect to contiguous transformations].”

Witold Wilkosz (1891-1941) – Stefan Banach’s classmate in the Gymnasium IV in Kraków, showed early interests in mathematics and Oriental languages. A paper on semitology brought him a scholarship to the university of Beirut. Later, in 1912, he enrolled at the Royal University as an ordinary student at the Faculty of Sciences. He took courses in mathematics from Giuseppe Peano (1858-1932), Guido Fubini (1879-1943) and Corrado Segre (1863-1924). Under the direction of Peano he prepared his PhD thesis concerning the theory of Lebesgue integral and in 1914 he obtained his doctoral degree. With the eruption of World War I he was called to return to the Austro-Hungarian Empire. In the first year of the war he fought in the Polish Legions. Then he continued his studies in mathematics at the Jagiellonian University, which he finished in 1917. It was impossible for him to nostrify his diploma after returning to Kraków, but in 1918 he obtained the degree of the doctor of philosophy for the thesis “Z teorii funkcji absolutnie ciągłych i całek Lebesgue’a”. (On the theory of absolutely continuous functions and the Lebesgue integrals). The supervisor Stanislaw (1893-1970), a painter Tymon Niesiołowski (1882-1965), a painter, playwright and philosopher Stanisław Ignacy Witkiewicz (1885-1939)

21Bartosz Troops (Drużyny Bartoszowe) were a military organization active in Lwów since 1908, bringing together the academic youth of peasant origin. In 1914 they were incorporated into the Eastern Legion.

22Leja worked mainly in potential theory, approximation theory in complex domain and topological groups. He was also a pioneer researcher in several complex variables and is considered a founder of Kraków scientific school of complex analysis.

23Italy was a member of the Triple Alliance with Germany and Austro-Hungary, but in May 1915 it revoked the alliance and entered the war on the side of the Allied Powers.
Zaremba noted in his report that the thesis made a valuable contribution to modern analysis. Among other things, Wilkosz corrected a mistake noticed in one of the papers by Charles De la Vallée Poussin (1866-1962). He also included a thank-you note to Banach, reflecting their discussions on mathematics. In the years 1917-18 Wilkosz taught at private gymnasias in Zawiercie and Częstochowa. He also audited courses in law ([Średniawa 1961]).

**Stefan Banach (1892-1945)** got interested in mathematics as a gymnasium student in Kraków. However, he was not convinced that he could make a significant contribution to mathematics. So after finishing gymnasium in 1910 started a course of studies in civil engineering at the Lwów Polytechnics. In the late spring 1914 he obtained the so-called half-diploma, having passed all compulsory exams for the first and second year of studies as well as the first state licensing exam. After the war erupted in August 1914, the main building of the Polytechnics was requisitioned by the Austro-Hungarian army for a war hospital, and when the Austro-Hungarians retreated in September 1914, it was occupied by the Russian army. Banach remained in Kraków until the end of the war, even though the classes at Polytechnics resumed in 1915, after Austro-Hungarians recaptured Lwów. He was rejected in the draft because of being left-handed and having poor vision in his left eye. During the war he first worked as a private tutor in Kraków, then he held a job on road construction, supervising a team of workers. ([Jakimowicz 2011], [Nikonowicz 1992], [Kaluża 1992], [Ciesielska and Ciesielski 2013])

It was in the wartime Kraków that Banach embarked on his amazing mathematical career, when Hugo Steinhaus met him by chance one fall day in 1916 (cf. [Ciesielska and Ciesielski 2017]). Here is how Steinhaus recounted his meeting of two men sitting on a bench in the Planty park surrounding the city center and engaged in an advanced mathematical discussion: ([Steinhaus 1992])

“Even though Kraków was formally a fortress, one could take walks in Planty in the evenings. During such a walk I heard the words ‘Lebesgue measure’ – I went to the bench and introduced myself to two young adherents of mathematics. They told me that they had another companion, Witold Wilkosz, whom they highly praised. They were Stefan Banach and Otto Nikodym. Since then, we met regularly (...).” Banach and Steinhaus started collaborating on mathematical problems. After the war Steinhaus arranged for Banach to work as an assistant.
Hugo Dyonizy Steinhaus (1887 -1972) studied mathematics in Lwów (in 1905 - 1906), then (in 1906 –1911) in Göttingen. In 1911 he received there PhD degree on the basis of his dissertation entitled Neue Anwendungen des Dirichlet’schen Prinzips. Afterwards he traveled over Europe and published mathematical papers as a private scholar. At the beginning of the war he moved with his family to Vienna. Then he went by himself to Cracow, reported to the recruiting office of the Polish Legions and was assigned to the Military Department of the Principal National Committee (Naczelny Komitet Narodowy, NKN). Initially he did some office work in Vienna, but soon he was sent to the front, to the 1st Regiment of Artillery of the Polish Legions. He served along with Zygmunt Janiszewski. In 1915 he participated in the war operations in Volyn. His cousin Władysław Steinhaus was mortally wounded in a battle and Hugo obtained a leave to attend his funeral. He did not come back to his regiment, as his mother managed to have him recalled from the service. In July 1916 he took a job in the Center for Reconstruction of The Country (Centrala Odbudowy Kraju) in Kraków. Then he met Stefan Banach, Otto Nikodym (1887-1974)\textsuperscript{24} and Witold Wilkosz. They started to meet regularly for mathematical discussions in Steinhaus’s rented room, joined also by Władysław Ślebodziński (1884-1972)\textsuperscript{25}, Leon Chwistek, Włodzimierz Stożek and Jan Norbert Króo (1886-?).\textsuperscript{26} Steinhaus wrote in [Steinhaus 1992] “...we decided to start a mathematical society”, referring to these meetings.\textsuperscript{27}

In 1917 Steinhaus got his habilitation at the Lwów University on the basis of the dissertation “On certain properties of the Fourier series” (O niektórych własnościach szeregów Fouriera). He arranged to be transferred to Lwów for his job, which he combined with teaching at the university. His lectures on the Lebesgue integral were poorly attended, as nearly all students enlisted in the military. When the Polish-Ukrainian war started in November 1918, he decided to join his

\textsuperscript{24}Nikodym taught at the Real Gymnasium IV in Kraków during the Great War.

\textsuperscript{25}Ślebodziński studied at the Jagiellonian University in 1903-1908. In 1913 he went to Göttingen, but had to return in 1914 because of the war. In the years 1919-39 he worked in Poznań. He got his PhD in Warsaw under the supervision of Żorawski in 1928. His main research area was differential geometry.

\textsuperscript{26}Króo received PhD in physics in Göttingen in 1913. We were not able to find the date of his death.

\textsuperscript{27}This informal society should not be confused with the Mathematical Society in Kraków, which was founded on April 2, 1919.
parents, in-laws, wife and daughter in Jasło. It took him four days to travel the 230-kilometer distance through Ukrainian and Polish posts as well as no-man’s land. Because of his age, he was exempted from the service in the Polish army. He remained in Jasło working as a mathematical expert at a gas company until normal activities resumed at the University of Lwów in 1920. ([Steinhaus 1992])

There was no specialized mathematical society in Kraków until 1919, but mathematicians were active in other scientific organizations, even during the war. For example, on November 29, 1917, Sleszyński gave a talk “On traditional logic” at the Philosophical Society in Kraków, which he later expanded into a book (published in 1921). Also at the Philosophical Society, on March 1, 1917, Smoluchowski gave a talk “Remarks on the role of chance in physics” [Uwagi o roli przypadku we fizyce] ([Polak 2015], [Polak 2017].

As the Austro-Hungarian empire was collapsing, Kraków became the seat of Polish Commission for Liquidation (Polska Komisja Likwidacyjna), which held the temporary authority over Galicia and Cieszyn Silesia. It was also the first Polish city to be liberated. On October 31, 1918, a group of Polish soldiers and boy scouts under the command of Lieutnant Antoni Stawarz (1889-1955) took over the railway station in Płaszów and the army barracks in Podgórze and then disarmed an Austrian garrison stationed in the City Hall Tower at the Main Market. The military commander Feldzeugmeister Siegmund von Benigni (1855-1922) handed in power to Polish authorities. In the book of doctoral promotions at the Jagiellonian University, the words “Finis Austriae” were entered. Lieutnant Edward Stamm raised Polish white-and-red flag on the radiotelegraph station in Dębinki ([Jakubowski 2008]). Civilians aided the military in the effort of keeping the newly gained freedom. **Tadeusz Ważewski (1896-1972)**[^28], who enrolled as a student at the University in 1915 (first in physics, then in mathematics), served on the Citizen Patrol in Kraków in November and December 1918.

2.2. **Lwów.** Lwów was the capital of the Kingdom of Galicia and Lodomeria since 1772 (the first partition of Poland). In 1914 at the

[^28]: Ważewski’s achievements were in topology and differential equations. He was a professor at the Jagiellonian University since 1933 and is considered the founder of the Kraków scientific school of differential equations.
Polytechnic School, 723 out of 1865 students were studying Civil Engineering, 586 - mechanical engineering, 251 - Technical Chemistry, 243 civil engineering (or architecture), 62 - Engineering Management, which was the first such faculty in Austria. At the University, in the winter semester of the year 1913/14 there were 5871 students enrolled. On September 1, 1914, the city was conquered by the Russians. Eastern Galicia and Lemkovyna were incorporated into the Russian Empire. Count Georgii Bobrinskii (1868-1928) was made the general-governor of the newly acquired territories. In the 1914-1915 academic year lectures were not held. Like in Kraków, some academic buildings were requisitioned for military purposes (e.g., the main building of the Polytechnics served as a hospital). Part of the population was evacuated. Some faculty and students went to Vienna, where teaching and research could be continued. As a result of breaking the front lines in May 1915, the Russians withdrew on June 20, 1915, and the Austrians came back on June 23, starting a military rule and repressions against real or perceived supporters of Russia. The academic institutions reopened. The Polytechnic had 130 students in the academic year 1915/16; 198 in 1916/17, 670 in 1917/18, and 989 enrolled for 1918/19.

On November 1/2, 1918, Lwów was taken over by the Ukrainians serving in the Austro-Hungarian army, who proclaimed independence of the Western-Ukrainian People’s Republic. This started the Polish-Ukrainian war, which lasted until May 22, 1919. Poland reconquered Lwów thanks to the reinforcements from Przemysł under the command of Lieutenant-Colonel (podpułkownik) Michał Karaszewicz-Tokarzewski (1863-1964).

The chair of mathematics at the university were held by Józef Puzyna (1856-1919) and (until 1918) Waclaw Sierpiński (1882-1969). Zygmunt Janiszewski (1888-1920) lectured as a private docent. Janiszewski obtained his doctorate in Paris in 1911 on the basis of the thesis “Sur les continus irréductibles entre deux points”. In 1911-12 he gave lectures in Warsaw at the Society for the Scientific Courses. In 1913 he was nominated to the position of an assistant in the chair of Józef Puzyna at the Lwów University. Also in 1913, he got his habilitation at the Lwów University on the basis of the thesis “On dissecting the plane by continua” (O rozcinaniu paszczyny przez continua, (published in Prace Matematyczno-Fizyczne 26 (1913), str.

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29In 1909 Sierpiński taught the first course in Polish territories on set theory.
11-63. His habilitation lecture was “On realism and idealism in mathematics” (O realizmie i idealizmie w matematyce, published in Przegląd Filozoficzny 19 (1916), pp. 161-170). On August 30, 1914, Janiszewski enlisted in the Polish Legions. He took part in the Carpathian campaign in 1914/15. When the Germans took Warsaw, Janiszewski was summoned to a post there. He related later to Hugo Steinhaus that, when he arrived, his driver from the train station to the command was the geometer Max Dehn (1878-1952).

The military service of Janiszewski (then already at the range of a sergeant) and the internment of Wacław Sierpiński in Russia left Puzyna as the only person to teach courses (analytic geometry of space and higher analysis) and to run the lower and higher seminar in mathematics in the academic year 1915/16. made it very difficult for the university to offer regular lectures and seminars in mathematics. Because of this difficult situation, in October 1916 the Philosophical Faculty petitioned the Rector to apply for Janiszewski’s recall. He was appointed to the post of an assistant for the years 1917 - 1919 and a request was made to the Imperial and Royal Regency in Lwów to apply for approval of this appointment by the Ministry of Religions and Education in Vienna as well as for allocation of funds for his salary. However, Janiszewski did not take this post. After the Oath Crisis he went into hiding to avoid internment. He lived in the Radom region and run (with his own funding) a shelter and a school for homeless children. In 1918 he accepted a chair at the Warsaw University. In the same year he published the article “On the needs of mathematics in Poland (O potrzebach matematyki w Polsce), where he expressed the idea of creating a mathematical school in Poland. He died in the pandemic of the Spanish influenza. ([Knaster 1960], [Domoradzki 2011])

The nostrification of Janiszewski’s doctorate, started in 1914, was delayed because of the war and was finalized only in 1917. It was necessary for the university to award the right to lecture in order to remedy the staffing shortages. Hugo Steinhaus got his habilitation in 1917. Stanisław Ruziewicz (1889-1941) obtained doctorate in philosophy in 1913 at the Lwów University with a thesis “On a continuous, monotone function which does not have derivative in an
uncountable set of points” (O funkcji ciągłej monotonicznej nie posiadającej pochodnej w nieprzeliczalnej mnogości punktów), under the supervision of Józef Puzyna. In July 1918, while on a leave from the army, he got his habilitation at the Lwów University for the work “On the monotonic continuous functions with intervals of constancy almost everywhere”. Waclaw Sierpiński, back from his internment, took part in the proceedings ([Więsław 2004]). Also in 1918, Lucjan Emil Böttcher (1872-1937) made another attempt to get habilitation at the University (he already got one at Polytechnics, where he worked). Like the previous attempts, this one did not succeed. During the wartime (in 1916) one doctorate was awarded at the University: to Adam Patryn (1887-1939), a gymnasium teacher in Stryj. The supervisors were Józef Puzyna and Marcin Ernst (1869-1930). The title of the thesis was “Research on functions solving the identity relation \((1-x)^m \Phi(x) + x^m \Psi(x) \equiv 1\)” ([Prytuła 2013]). In his evaluation of the thesis, Puzyna wrote:

“Mr. Candidate, in his thesis entitled “Research on functions solving the identity relation \((1-x)^m \Phi(x) + x^m \Psi(x) \equiv 1\)”, in his investigations utilized properties in theory of power series, differential equations and combinatorics. He treated the material in a systematic and interesting way, proceeding from details to more general cases.”

During the war the following mathematics faculty were active at the Lwów Polytechnics ([Domoradzki 2011]):

33In 1913-14 Ruziewicz received a scholarship from the Academy of Sciences in Kraków from the foundation of Władysław Kretkowski. He went to Göttingen for the year, which gave him a chance to get acquainted with the problems of contemporary European mathematical research. In June 1915 he was drafted into the Austrian army. At the beginning he was stationed in Kalusz, later was commissioned to Hungary and finally to a unit involved in the military censorship in Lwów. In January 1918, together with the Revision Committee, he was in Bukovina. In February Ruziewicz was assigned to the reserve writers in Löbnitz, and then was called again to military censorship in Lwów. He contracted typhus in Löbnitz and, in April 1918, was placed on leave until the end of the year. He stayed in Łańcut, where he taught in a high school.

34Böttcher got his PhD in 1898 in Leipzig under Sophus Lie (1842-1899). He worked on iteration theory and obtained some pioneering results in holomorphic dynamics. ([Domoradzki and Stawiska 2014])

35Ernst was a professor of astronomy at Lwów since 1907.
Placyd Dziwiński (1851-1936): In 1898 he led the 1st Chair of Mathematics at the Polytechnic and held this position until his retirement in 1925.

Zdzisław Jan Ewangeli Antoni Krygowski (1872 - 1955): In 1908 he became an associate professor and in 1909 ordinary professor of mathematics in the Polytechnic School in Lwów, of which he was the rector in 1917-1918. In the years 1913-1915 he was the dean of the Department of Water Engineering of the Lwów Polytechnics. In the independent Poland he became a professor at the newly created University of Poznań.

Kazimierz Bartel (1882-1941): After graduating from the Polytechnic School he worked there as an assistant (1907-1911), then Privatdozent of the I Chair of Descriptive Geometry (1911-1912), associate professor (since 1912) and full professor of this chair (since 1917); in 1912-1939 he led this chair. During the war he served in the Austro-Hungarian army. In 1919 he took part in the Polish-Ukrainian war as the commander of the 1st Railway Battalion. He commanded the defense of the Lwów Main Railway Station. In the independent Poland he held many important political functions, including that of the prime minister.

Antoni Łomnicki (1881 - 1941) From 1903 to 1919 he worked as a school teacher in Lwów and Tarnów. In the academic year 1913-1914 he was lecturing as a Privatdozent at the Polytechnic in Lwów in the Department of Machine Construction, and at the Department of Mechanical Engineering at the Lvov Polytechnic. In 1917 - 1918 he published two works, “The systems of necessary and sufficient rules for the definition of the concept of quantity” and “On the univalued explicit functions of real variable.” He also got the title of a docent and then became a professor of mathematics, succeeding Zdzisław Krygowski. In 1918-19 he fought in the Polish-Ukrainian war.

Antoni Karol Plamitzer (1889-1954) worked as the assistant at the Polytechnic since 1911. In 1913 he passed the exam for a secondary school teaching licence in mathematics and descriptive geometry. In 1914 he obtained a doctorate degree in technical sciences at the Lvov Polytechnics on the basis of a thesis A Contribution to the theory of flat and curved surfaces under the direction of Kazimierz Bartel (published in “Wiadomości Matematyczne 1915, v. 18, 19).
On December 3, 1917, Polish Mathematical Society in Lwów had its inaugural meeting. It was established at the initiative of Puzyna, Janiszewski, Steinhaus, Lomnicki, Dziwiński, Krygowski, and Tadeusz Czeżowski (1889-1991), a philosopher whose work had mathematical character. The goals of the Society were: support for research in mathematics and related areas, dissemination of mathematical knowledge by scholarly meetings (organized usually every 2 weeks), talks, competitions, publications and collecting the means for learning. The first president was Józef Puzyna. On the board there also were Eustachy Żylinski, Antoni Lomnicki and Stanisław Ruziewicz. After Puzyna’s death in 1919, Marcin Ernst became the president. In the years 1917-1918 he following talks were given at the meetings of the Lwów Mathematical Society: H. Steinhaus: “Solved and unsolved problems in the theory of Fourier series”; L. Grabowski “The harmonic analyzer of Henrici” (in 1917); J. Puzyna: “On the zero traces of power series; A. Maksymowicz: “On Cesàro series”; Z. Krygowski: “On Tschebyschef maps in algebra”; W. Sierpiński: “Recent studies on measurable functions”; H. Steinhaus: “On linear and continuous operations in a function field”; W. Sierpiński: “On the continuum hypothesis”; W. Sierpiński: “Definition of the Lebesgue integral without the measure theory”; H. Steinhaus: “Power series in the disk of convergence” (in 1918).

The activities were disrupted by the Polish-Soviet war. In 1920 the Society was dissolved and re-constituted as the Lwów branch of the Polish Mathematical Society.

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36Lwów mathematicians were members of other professional organizations before and after World War I. They were particularly active in the Scientific Society in Lwów (Towarzystwo Naukowe we Lwowie).

37Czeżowski taught mathematics and physics in Gymnasium VI in Lwów from 1912 to 1914. In 1915-18 he held a post of the director of the University Chancellor’s Office. In 1914 he obtained his doctorate under the supervision of Kazimierz Twardowski with a dissertation on the Theory of Classes (Teoria klas). In the independent Poland he first worked for the Ministry for Religious Confessions and Public Education, and in 1923 he took a chair of philosophy at the Stefan Batory University in Vilnius (Vilnius).

38Lucjan Grabowski (1871-1941) studied astronomy and physics in Kraków, Bonn and Munich; a professor of the Lwów Polytechnics: of surveying in 1909-12 and of spherical astronomy and higher geodesy since 1912.

39Adam Maksymowicz (1880-1970), taught mathematics in Lwów gymnasia and the Polytechnics
3. The Russian empire

3.1. Warsaw. At the beginning of the 20th century two academic-level schools existed in the Polish Kingdom where mathematics was taught\(^{40}\): the Imperial University in Warsaw and the Polytechnic Institute in Warsaw. The language of instruction was Russian.\(^{41}\) A few future Polish mathematicians graduated from the University, e.g. Kazimierz Żorawski (in 1888) and Waclaw Sierpiński (in 1903). In the later years some Poles boycotted these institutions, but those who could not go to other provinces of the Empire or abroad still sought their education in the Kingdom. **Zygmunt Chwiałkowski (1884-1952)** graduated from the Imperial University in 1913 and stayed there to prepare for an academic career. He published a monograph on functional equations in Russian in 1914.([Nalbaldian and Nalbaldian 1995], [12])\(^{42}\)

At the same time, the Society for Scientific Courses (Towarzystwo Kursów Naukowych) organized education in Polish at pre-academic and academic level in multiple disciplines, which was not officially recognized, just tolerated. The mathematician **Samuel Dickstein (1851-1939)**, a graduate of the Imperial University, was an active promoter of Polish education and scientific organizations. He published at his own expense two mathematical journals, the first such ones in Polish: “Wiadomości Matematyczne” since 1897 and “Prace Matematyczno-Fizyczne” since 1888. He co-founded the Warsaw Scientific Society (Warszawskie Towarzystwo Naukowe) and donated a library of mathematical books to be used by the Mathematical Study within the Society. In the years 1906-16 he was active in the Mathematical and Physical Circle, which brought together over 100 teachers from the Polish Kingdom.

\(^{40}\)There were 4 institutions of higher education in the Kingdom in 1914; see [Bartnicka 2014].

\(^{41}\)Mathematics in the Russian institutions in the Polish Kingdom represented quite a high level. The most prominent mathematicians were Dmitri Dmitrievich Mordukhai-Boltovskoi (1876-1952), who worked at the Warsaw Polytechnic, and Georgy Feodosievich Voronoi (1868-1908), who worked at the University. Nikolai Yakovlevich Sonin (1849-1915) spent his entire career at the Imperial University, starting in 1871. Vsevolod Ivanovich Romanovskii (1879-1954), who worked in Warsaw in the years 1911-15, followed as a professor to Rostov-on-Don, and in 1918 to Tashkent. ([Duda 2016], [Nalbaldian and Nalbaldian 1995])

\(^{42}\)In the independent Poland Chwiałkowski taught mathematics at high schools and co-wrote a geometry textbook in 1935 with Waclaw Schayer (1905-1959) and Alfred Tarski (1901-1983). [McFarland, McFarland and Smith 2014]
The strife of Poles for restoration of Polish higher education in the Russian partition and liberalization of education in general culminated in the massive school strike in the years 1905-08. At that time the authorities made only small concessions, but the break of the war in 1914 brought a mitigation of the Russian policies towards the Polish society. As early as August 14, 1914, the Grand Duke Nikolai Nikolaevich issued an address in which he pledged unification of “self-governing” Poland under the rule of tsars. With the hopes for freedom rekindled, the newly established Warsaw Civic Committee (Komitet Obywatelski Miasta Warszawy) set up a proposal of restoring the University of Warsaw, which would continue the traditions of the Royal University (1816-1831) and the Main School (1862-1869). Meanwhile, as the Central Powers advanced in the spring and summer of 1915, the Imperial University was evacuated. The files, libraries and equipment went first to Moscow, where they were followed by the personnel. Then the University moved to Rostov-on-Don, where it remained ever since.

On August 5, 1915, the German army entered Warsaw. The Polish Kingdom was divided into two occupational zones, German and Austro-Hungarian. On September 4, the Germans created the Warsaw general governorate with General Hans von Beseler (1850-1921) as the Governor-General. An idea emerged of creating a Polish state as one of buffer states in Mitteleuropa under political, economical and military control of Germany. Efforts were made to Polonize the administration and court system. Władysław (Ladislaus von) Bortkiewicz (1868-1931), a professor of statistics at the Friedrich-Wilhelm University in Berlin since 1901 (born in St. Petersburg to a Polish family and educated there), was a “scientific statistical support worker” for the Civil Administration of the General Governorship of Warsaw (Zivilverwaltung des Generalgouvernements Warschau) from November 1916 to February 1917. ([Sheynin 2011])

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43 One of the postulates was admission of women to academic education.
44 The address did not have tsar’s authorization.
45 Dickstein contributed to this plan.
46 Even though officially renamed in 1917, it used the name “Warsaw University” until 1924.
47 It later gave rise to the Nizhny Novgorod State Technical University.
48 The idea was officially announced in a joint declaration by the two respective Governors-General, von Beseler and Karl Kuk (1853-1935) on November 5, 1916.
Opening Polish institutions of higher education was important. Such institutions would prepare future specialists and administrators for the new state in a way that would suit the controlling powers and keep young people out of trouble. Moreover, their existence would improve the attitude of Poles towards the German Empire, so the Central Powers could mobilize Polish men and use resources from the occupied territories. In these favorable circumstances, the Civic Committee’s project was revisited. The Section for Higher Schools (Sekcja Szkół Wyższych) was created, divided into two commissions: the University Commission and the Polytechnic Commission. The mathematician Stefan Mazurkiewicz (1888-1945), a native of Warsaw, who studied in Kraków, Göttingen and Lwów, was a member of the sub-commission for mathematics and natural sciences. In the fall of 1915 a Polish university and a Polish polytechnic school were established. Count Bogdan Hutten-Czapski (1851-1937), a Polish aristocrat in German state service, was named a curator, whose function was to act as an official contact between the General-Government and the administrative structures of the new schools. Józef Brudziński (1874-1917), a physician, became the rector of the University. The rector of the Polytechnic School was Zygmunt Straszewicz (1860-1927), a graduate in mechanical engineering of Eidgenössische Technische Hochschule in Zürich and a former student of mathematics at the Imperial University, who until 1916 lectured on differential and integral calculus in the Technical Section of the Society for Scientific Courses and until 1919 taught mathematics and mechanics at the private Mechanical-Technical School of Hipolit Wawelberg (1843-1901) and Stanisław Rotwand (1893-1916). ([Bartnicka 2015], [Kauffman 2015], [Garlicki 1982], [Duda 2016], [Kutrzeba 1988], [Chwalba 2014])

According to [Kauffman 2015], in the 1915-1916 academic year, the university’s teaching staff included thirty-six lecturers (wykładający), the highest rank afforded to teaching staff at that time, twenty-three assistants (asystenci), and six foreign-language instructors (lektorzy). There were 1,039 students enrolled in 1915-1916. The polytechnic school comprised four departments, where 25 teaching staff instructed about 600 students. Kazimierz Kuratowski (1896-1980), a Warsaw native who had to interrupt his engineering studies in Glasgow because of the war, was one of the first students at the University. The introductory courses in mathematics he took in 1915 were the following:

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49Stefan Straszewicz’s uncle.
50Expelled in 1883 in connection with so-called apuchtinada.
projective geometry taught by Stefan Kwietniewski (1874-1940) (in Kuratowski’s reminiscence, his lecture was very modern and thorough), analytic geometry by Juliusz Rudnicki (1881-1948), and algebra by Samuel Dickstein. Along with Kuratowski, the freshman class included, among others, Bronisław Knaster (1893-1980), who studied medicine in Paris before the war, but in Warsaw switched his interest first to logic (he translated Louis Couturat’s *L’Algèbre de la logique* into Polish), then to mathematics; as well as Stanisław Saks (1897-1942), a graduate of the private gymnasium of Michał Kreczmar in Warsaw. ([Kuratowski 1973], [Duda 1987], [Zygmund 1982]). The lectures in mathematics at the Polytechnic also included some advanced contents. Szolem Mandelbrojt (1899-1983), who started his studies there in 1917, recalled Rudnicki presenting Weierstrass’ example of a continuous nowhere differentiable function. However, Mandelbrojt found mathematics at the University more attractive, appreciating both lectures and the possibility of private interaction with the faculty, in particular with Zygmunt Janiszewski. He spent two years as a student in Warsaw, published a paper on number theory in 1919, and continued his education in Kharkov, Berlin and Paris. ([Mandelbrojt 1985])

The number of students was rising through years, reaching about 4,500 in 1918. Antoni Zygmund (1900-1992), who as a gymnasium student in 1914 was evacuated with his family to Poltava, returned to independent Poland in 1918, completed his education in Kazimierz Kulwieć’s Gymnasium and entered University of Warsaw in 1919. Zygmund became a student of Aleksander Rajchman (1890-1940), a graduate of Sorbonne, who before the war gave private lessons (to Szolem Mandelbrojt, among others), spent the year 1914/15 in Vienna on a scholarship from Władysław Kretkowski’s fund ([Ciesielska 2016]), and then worked at the University of Warsaw.

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51 In 1914 Knaster married Maria Morska (1895?-1945), later a renowned actress, a columnist, and a muse to the Skamander poetic group, [Koper 2011]

52 The Russians allowed private Polish schools, but their number was limited and they were subject to frequent inspections. After the school strike the situation eased. Kreczmar’s school was known for its patriotic atmosphere.

53 Kazimierz Kulwieć (1871-1943), a naturalist and explorer, organized a Polish gymnasium in Moscow in 1915, which he directed for 3 years. After returning to Warsaw he established a school for re-immigrants from Russia.

54 Władysław Kretkowski (1840-1910), a mathematician and a benefactor of science, graduated from Sorbonne, got a PhD from Jagiellonian University and taught as a private docent at Lwów Polytechnics and Lwów University.
since 1919, starting at the rank of a junior assistant ([Domoradzki, Pawlikowska-Brożek and Węglowska 2003]).

Finally, women gained full access to higher education. Stanisława Nikodym (née Liliental, 1897-1988) enrolled at the University in 1916, but took a break in the year 1918-19 to teach mathematics to army recruits. She returned to her studies and went on to receive her PhD in mathematics in 1925 as the first woman in Poland, to work as an assistant at the Warsaw Polytechnic and to publish several research papers in mathematics ([Ciesielska 2017], [5]).

Many of the faculty had previous connection to the Society for Scientific Courses. Kwietniewski, who got his PhD at the University of Zürich in 1902, concentrated his activities on popularizing mathematics, especially geometry, as well as translating and editing foreign textbooks and monographs. In the years 1907-09 he taught at the Society for Scientific Courses and later contributed to the “Guide for the self-study”. In the independent Poland he continued his university lectures in geometry on a basis of yearly contracts. Rudnicki, a graduate of Sorbonne and later a PhD recipient from Jagiellonian University, taught in private Warsaw schools for men and women since 1912. At the same time he conducted lectures in mathematics at the Society for Scientific Courses (TKN) and at higher pedagogical courses for women. After the Russians’ retreat from Warsaw he was a member of the Polytechnic Commission of the TKN (the electrotechnical-mechanic sub-commission). After creation of the Warsaw Polytechnic he taught mathematics and (briefly) physics there. He was also active in the Society for Aid to the Victims of War (Towarzystwo Pomocy Ofiarom Wojny). Later he became a professor in Vilnius University. ([Królikowski 1989])

Among the faculty of the University there also were Stefan Mazurkiewicz and Zygmunt Janiszewski (1888-1920) (later the recipients of the first two chairs in mathematics). This was remarkable on two accounts. First, both of them were rather young; second, both were previously connected to Lwów (Janiszewski taught there as a docent and Mazurkiewicz got his doctorate under Sierpiński in 1913) and Bessel (contrary to the wishes and efforts of the Civic Committee) did not

55 Since 1926 Rajchman was a docent at the University and an extraordinary Professor at the Free Polish University (Wolna Wszechnica Polska). He worked on functions of a real variable and probability.

56 Otto Nikodym’s wife.
want too many professors from Austrian universities coming to War-
saw. However, they had significant mathematical achievements and
scholarly output: Mazurkiewicz published 16 works and Janiszewski 20
works before 1916. Janiszewski was available only part-time, as he was
still serving in the military. Since 1916 Janiszewski and Mazurkiewicz
conducted a seminar in topology at the university, possibly the first
one in the world in this new discipline. Kuratowski, Knaster and Saks
participated as students. ([Kuratowski 1979]).

Student organizations played a major role in the academic life. For
example, the analysis of Stanislaw Zaremba’s “Theoretical Arithmetic”
by Jan Łukasiewicz (1878-1956)\textsuperscript{58} in his course on methodology of
deductive sciences prompted a discussion involving professors and stu-
dents. The discussion of related issues continued in the meetings of
Mathematical and Physical Circle of the Warsaw University, with Ku-
ratowski giving a two-part talk on December 6 and 13, 1917, “On the
definition of a quantity”, which soon became his first scholarly pub-
lication (see [Kuratowski 1979]). On a larger scale, events related to
Polish history and Polish national heroes were commemorated. How-
ever, the arrest of two students after celebrating the anniversary of the
3rd of May Constitution, led to the students’ strike in 1917 and tem-
porary closing of the schools. The occupational authorities transferred
the control of the schools to the Temporary Council of State, the first
government of the Kingdom of Poland. Józef Piłsudski, who held the
authority over the military matters, resigned from the Council, which
led to the so-called Oath Crisis. The Council was ultimately disbanded
in August 1917. In the fall of 1918 Polish army started to organize it-
self and students were joining in great numbers. The Academic Legion
(Legia Akademicka) – a unit comprised entirely of students was formed.

The creation of Polish academic institutions did not eliminate the
need for the Society for Scientific Courses. There still were many people
aspiring to higher education with insufficient credentials for admission,
so the Society continued its activity during the war. The Department

\textsuperscript{57}According to Kuratowski, [Kuratowski 1979], Mazurkiewicz supported the can-
didacy of the Polonized archduke Karol Stefan Habsburg-Lotaryński (1860-1933)
for the throne of the Polish Kingdom under the auspices of Austro-Hungary and
Germany.

\textsuperscript{58}Lukasiewicz was a philosopher and a logician whose work was taking more
and more mathematical character. He was a pioneer of multi-valued logic and an
inventor of the Polish notation.
of Mathematics and Physics separated from the Department of Mathematics and Natural Sciences in 1915. In 1915/16 it run the following compulsory courses: descriptive and projective geometry, taught by Waclaw Gniazdowski (1864-1938)\(^{59}\); analytic geometry, taught in the fall by Romuald Witwiński (1840-1937)\(^{60}\) and in the spring by Tadeusz Gutkowski (1881-1962)\(^{61}\); introduction to analysis by Władysław Wójtowicz (1874-1942)\(^{62}\). The optional courses in the first semester were differential and integral calculus, taught by Juliusz Rudnicki, and vector calculus, by Waclaw Werner (1879-1948).\(^{63}\)

Lectures by Stanisław Leśniewski and Stefan Mazurkiewicz were also planned, but did not run. In the first and second semester there were respectively 27 and 19 students. In 1916/17, Franciszek Włodarski (1889-1944), a geometer with doctorate from the University of Fribourg, started to lecture.

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59 Gniazdowski, a textile engineer, taught mathematics and technological subjects at the Technical School of the Warsaw-Vienna Railway (Szkoła Techniczna Drogi Żelaznej Warszawsko-Wiedeńskiej). After the school’s evacuation he founded his own private 7-grade school of technology and transportation ([Majewski 2007]). He also taught mathematics at the Real 7-Grade School directed by Witold Wróblewski (1839-1927) with instruction in Polish in the years 1915-18. Later he was a docent at the Warsaw Polytechnics, teaching principles of perspective at the Department of Architecture. ([4])

60 Witwiński authored several papers and problem books in geometry.

61 Tadeusz Gutkowski, an optical engineer, graduate of Institut d’Optique in Paris, taught mathematics in Warsaw high schools, and later worked in the optical industry. ([Gutkowski 2012])

62 Władysław Wójtowicz – an editor of the journal “Wektor” for teachers, editor of a series published by the Mianowski Fund, author of high school geometry textbooks and logarithmic tables for the school use.([Domoradzki 2012])

63 Waclaw Werner studied electrotechnology in Darmstadt, mathematics and physics in Kraków, Göttingen and Fribourg. He received a doctorate from the Faculty of Mathematics and Natural Sciences in Fribourg. In 1909-39 he taught physics in high school in Warsaw. In 1916/17 he was the dean of the Department of Mathematics and Physics in the Society for Scientific Courses. During that time he co-managed family-owned metal works. Since 1915 he worked at Warsaw Polytechnic, lecturing and conducting experiments; named a titular professor in 1948.([Werner 1998])
Mathematical subjects were also taught at the Department of Technology, among them trigonometry by Tomasz Świętochowski, algebra with geometry by Bruno Winawer (1883-1944) and analytic geometry by Lucjan Zarzecki (1873-1925). The recitation classes were taught by F. Lazarski (differential and integral calculus), R. Świętochowski (descriptive geometry), A. Winawer (high school mathematics), W. Wójtowicz (higher mathematics as well as analytic geometry, together with the lecture). Later the Society also gave rise to the Free Polish University (Wolna Wszechnica Polska), a fully accredited private university operating in the years 1918-1952 in Warsaw and Łódź ([Maligranda 2017], [6]).

The publication of the series “Guide for the self-study” (Poradnik dla samouków) continued during the war. A volume on mathematics, starting the second series, was published in 1915. It contained chapters written by Jan Łukasiewicz (On Science), Zygmunt Janiszewski (General Introduction; Introduction to Level III; Ordinary Differential Equations; Functional, Difference and Integral Equations; Series Expansions; Topology; Foundations of Geometry; Logistics; Philosophical Issues of Mathematics; Conclusion; Informational Section), Stefan Kwietniewski (Level I; Level II; Methodology of Teaching; Analytic Geometry; Synthetic and Descriptive Geometry; Differential geometry; History of Mathematics: History of Mathematics in General; History of Mathematics in Poland), Waclaw Sierpiński (Arithmetics; Number Theory; Higher Algebra; Set Theory; Theory of Functions of a Real Variable; Differential and Integral Calculus; Differential Calculus and

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Świętochowski taught mathematics at the Real 7-Grade School directed by Witold Wróblewski with instruction in Polish in the years 1915-1919.[3]

Bruno Winawer— a physicist, writer and popularizer of science, a graduate of University of Heidelberg.

Lucjan Zarzecki—a mathematician and educator, a graduate of St. Petersburg University in 1897.

We were not able to find the full first name and the dates of birth and death for him.

Born 1882 ([Kiepurska 1881]): probably a misprint of the initial.

Probably a misprint of the initial.

The series appeared in several cycles in the years 1898-1932, financed by the Mianowski Fund. It was meant as an educational aid at an academic level. Each volume presented the development and the state-of-the art of a given scientific topic, along with exhaustive bibliography. The editors were Aleksander Heflich (1866-1936) and Stanislaw Michalski (1865-1949).
Summation), Stanislaw Zaremba (Theory of Analytic Functions; Differential Equations with Partial Derivatives; Theory of Groups of Transformations; Calculus of Variations) and Stefan Mazurkiewicz (Theory of Probability) ([Pawlikowska-Brożek 1992b]). Marian Smoluchowski contributed a chapter on physics to the 1917 volume.

3.2. St. Petersburg (Petrograd). Polish presence was very strong in the Russian capital. In 1910 the number of Poles living there reached its historical maximum of about 65 000 (3.4% of the total population of the city). Polish nationals could be found among officers, civil servants, artists and scholars. ([Garczyk 2016]) Julian Karol Sochocki (Yulian Vasilievich Sokhotsky, 1842-1927), born in Warsaw, was educated at the University of Saint Petersburg and was a professor of mathematics there. His results in the field of one complex variable (Sochocki-Casorati Weierstrass theorem, Sochocki-Plemelj formula) became classic. Jan Ptaszyncki (1844-1912) was a professor of mathematics at the University of Saint Petersburg and at the Mikhailovskaya Military Artillery Academy. His work dealt with elliptic functions and algebraic differentials. Wiktor Emeryk Jan Staniewicz (1866-1932), born in Samara, educated in St. Petersburg, held the chair of mathematics at St. Petersburg Polytechnic Institute since 1902. He worked in number theory and mathematical analysis. In 1909 his state service was suspended for three years, because illegal political activities were discovered to go on in dormitories that he supervised. In that period he lectured as a contract professor. In the years 1915-17 he was the dean of the Faculty of Civil Engineering, in 1917-18 a vice-rector. Polish mathematicians in St. Petersburg did not form a separate learned society, but were active in the Polish Union of Physicians and Naturalists (Związek Polski Lekarzy i Przyrodników). Sochocki also presided over St. Petersburg Mathematical Society in the years 1984-1927. ([Domoradzki and Pawlikowska-Brożek 1999])

The year 1917 brought dramatic political and social changes to the Russian Empire. The (changing) authorities were trying to win the support of Poles. In December 1916 Tsar Nicholas II as the commander in chief issued an order number 870 to land and maritime armed forces, which among the goals of further campaign mentioned the “creation of free Poland”. In March 1917 the Provisional Government stated that it counted on forming a “free military union” with Poland in the future, while the Petrograd Soviet of Workers’ and Soldiers’ Deputies
(later taken over by the Bolsheviks) announced Poland’s right to complete political independence, and the general right of nations to “self-determination” ([Zasorin 2017]). In the circumstances favorable to the Polish cause, in July 1917 Staniewicz became a president of the Polish Radical-Democratic Union in Lithuania and Belarus (Polski Związek Radykalno-Demokratyczny na Litwie i Białorusi) and took part in the attempts to form the Polish National Executive Commission (Polska Narodowa Komisja Wykonawcza) in Russia. In October 1919 he moved to independent Poland and became a professor of mathematics at Stefan Batory University in Wilno (Vilnius). He was the first president of the Polish Mathematical Society ([10], [Iwiński 1975]).

3.3. Moscow. According to the census from 1897, there were 9236 Poles living in Moscow, 0.89% of its population. The massive evacuations from the Polish Kingdom at the beginning of war raised this number.

Bolesław Młodziejowski (Boleslav Kornel’jevich Mlodzeewskii, 1858-1923) was born in Moscow in a physician’s family. He graduated from Moscow University in 1880 and became a professor of mathematics there in 1892. His research interest was in geometry. In 1902 he served as an opponent in the doctoral defense of Antoni Przeborski. In 1911 he resigned from his position in protest against decisions of the enlightenment minister Lev Aristidovich Kasso (1865-1914). He continued his teaching activities at the Higher Courses for Women as well as at Moscow City People’s University. At the latter, he conducted lectures in differential geometry and introduced modern-style seminars. In January 1914, he chaired the organizing committee of the Second All-Russian congress of lecturers in mathematics, in which 20 speakers from Polish territories took part. After the February revolution in 1917 Młodziejowski returned to the university.

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71Młodziejowski’s maternal grandfather was a Czech musician Vincenz (Vikenti) Lemoch (1792-1862?), a brother of Wojciech Ignacy Lemoch (1802-1875), who was a professor of geometry and a rector of the Lwów University. ([7], [8])

72Other faculty refused, citing anti-Polish regulations from 1864.[Odincts 2014]

73Kasso proposed new ways of staffing vacant chairs at Russian academic institutions, which met with disagreement of the professors.

74The People’s University was also referred to as Shanyavskii’s University, after its founder Alfons Lvovich Shanyavskii (Alfons Fortunat Szaniawski; 1837-1905), a general of Polish origin in the Imperial army. It was a research-oriented university, open to anyone regardless of their origin, education, gender, age, nationality, or religious beliefs. It operated in the years 1908-1918. ([Ragulsky 2011])
In 1921 he became the first director of the newly created Research Institute in Mathematics and Mechanics at the Moscow University. ([Zverkina and Pugina 2009], [Odinets 2014])

**Stanislaw Leśniewski (1886-1939)**, born in Serpukhov in the Moscow governorate and brought up in Irkutsk, studied philosophy and mathematics in Germany, Switzerland and Russia. He completed his doctorate in philosophy in 1912 at the Lwów University under the direction of Kazimierz Twardowski. Afterwards he taught at a school in Warsaw. When the war broke out, he went to Moscow.\(^75\) He taught mathematics at a Polish gymnasium and at the Real School of the Polish Committee of Aid to the War Victims (Szkoła Realna Polskiego Komitetu Pomocy Ofiarom Wojny), founded for boys from families that were evacuated from the Polish Kingdom.\(^76\) Leśniewski was also active in the Polish Scientific Circle (Polskie Koło Naukowe). Through the Circle, he published his book “Foundations of general set theory, part I” in 1916. The second part was planned for 1917, but never came out. Despite the title, the book treated Leśniewski’s own theory of parts, wholes and concrete collections, which was later developed into his system of Mereology. In 1918 he returned to Warsaw and on December 14 he submitted his habilitation dissertation in logic and philosophy of mathematics to be evaluated by Waclaw Sierpiński.\(^77\) In 1919 Leśniewski became a professor of philosophy of mathematics at the University of Warsaw. In 1920, along with Stefan Mazurkiewicz and Waclaw Sierpiński, he contributed to breaking Soviet codes in the Polish-Soviet war. ([9], [McFarland, McFarland and Smith 2014], [Betti])

**Waclaw Sierpiński (1882-1969)** – a native of Warsaw, a graduate of the Imperial University (under the direction of Georgy Voronoi) and a PhD recipient from the Jagiellonian University, was an extraordinary professor of mathematics at the Lwów University since 1910. The

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\(^{75}\) It is not clear why Leśniewski went there. It could be as a result of an evacuation or in connection with his political activities as a member of Social Democracy of the Kingdom of Poland and Lithuania (Socjaldemokracja Królestwa Polskiego i Litwy).

\(^{76}\) The school was directed by the distinguished educator Władysław Giżycki (1875-1947). Among the students there was the future poet Konstanty Ildefons Galczyński (1905-1953) ([Galczyńska 2003]).

\(^{77}\) The dissertation consisted of the works “Problems of the General Theory of Sets, I” and “A Criticism of the Logical Principle of the Excluded Middle”.

outbreak of the war found him in Belarus, in the estate of his parents-in-law. As an Austro-Hungarian citizen, and hence an enemy alien, he was interned in the city of Vyatka (nowadays Kirov). Thanks to the efforts of Moscow mathematicians (mainly Dmitri Fyodorovich Egorov, 1869-1931) he was allowed to relocate to Moscow in 1915. The Rectorate of the Lwów University was notified of Sierpiński’s internment in Moscow through the American consulate\(^7\) in Vienna in February 1916. The university administration made efforts to transfer to Sierpiński his overdue (since 1914) salary using the same diplomatic channels, but they were unsuccessful.

The Moscow period was very fruitful for Sierpiński. It marked a beginning of his deep studies of the axiom of choice and its role in mathematics. He gave a talk on the subject at the meeting of the Moscow Mathematical Society on February 21, 1917.\(^7\) He also started a collaboration and friendship with Nikolai Nikolaevich Lusin (1883-1950).\(^8\) In the years 1915-1918 he published 41 papers, 4 of them jointly with Lusin and 3 on problems related to Lusin’s research ([Sierpiński 1974]). While interned, Sierpiński was active in the Polish Scientific Circle (Polskie Kolo Naukowe) established in November 1915 in Moscow. Through the Circle he published the first volume of “Mathematical Analysis”, which he dedicated to the Polish University in Warsaw.\(^8\) He also gave talks in the Moscow Mathematical Society. In February 1918 he returned to Poland through Finland and Sweden. He resumed his lectures in Lwów in the summer semester 1918, but in the fall he moved to Warsaw. He was nominated for an ordinary professor of mathematics at the philosophical faculty of the Warsaw University by the decree of the Chief of State from March 28, 1919. He announced his resignation from the chair in Lwów in a letter dated May 19, 1919, thanking his colleagues for the kindness they offered him during his stay in Lwów.

\(^7\)The United States of America remained neutral in the war until April 6, 1917.
\(^7\)It was preceded by a note in “Comptes Rendus” of the French Academy in 1916. The expanded version of the talk was later published in French as “L’axiome de M. Zermelo et son rôle dans la théorie des ensembles et l’analyse” in “Bulletin International de l’Académie des Sciences de Cracovie. Classe des Sciences Mathématiques et Naturelles, Série A” 1918, s. 97-152 and in Russian as as “Aksioma Zermelo i eio rol’ v teorii mnozhestv i analize”, Matematicheskii Sbornik 1922, tom 31:1, 94-128. See also [Lewandowska 2013].
\(^8\)The scientific relations later also extended to Lusin’s students, who visited Poland and published in Polish journals.
\(^8\)Like in the case of Leśniewski, the second volume was planned, but never appeared.
Kazimierz Jantzen (1885-1940) got a doctorate in astronomy in Munich in 1912. In the years 1912-14 he was at the astronomical observatory in Potsdam. The outbreak of the war found him in Warsaw. As a German citizen, he was interned by the Russian authorities in Vyatkta, and then transferred to Moscow. He taught in Polish high schools and was active in the Polish Scientific Circle. He published a book “On the influence of the spectral type of stars on determining the apex of the Sun” (O wpływie typu widmowego gwiazd na wyznaczanie apeksu słońca). He returned to Poland in 1918, worked at the astronomical observatory in Warsaw, Warsaw Polytechnics (lecturing on advanced surveying and the error theory) and the Military Geographical Institute. Then he took a chair of astronomy at the University of Wilno (Vilnius), where he also lectured on analytic geometry, statistics and mathematics for naturalists. ([Domoradzki 2017], [Rybka])

3.4. Kharkov. The University of Kharkov was established in 1805 by a Polish aristocrat, Seweryn Potocki (1762-1829). In 1897 there were 3969 Poles living in Kharkov, 2.28% of its population. The distance from the front lines of the World War I allowed for the university activities to go on as usual, at least at the beginning of the war. Jerzy (Yuri Cheslavovich) Neyman (1894-1981), born in Bendery, in the Bessarabia governorate, entered his second year of studies at the University of Kharkov in 1914/15. Rejected in the draft because of poor eyesight, he was preparing a paper on Lebesgue integral to enter a university-wide competition at the encouragement of his professor Cezary Russjan (1867-1935). 82 His 580-page work won and he received a monetary equivalent of the gold medal (the actual medal could not be awarded because of wartime restrictions on metals). In 1917 Neyman finished his course of studies and, on Russjan’s recommendation, was granted a government stipend to prepare himself for an academic career. At the same time he started working in the Kharkov Institute of Technology as an assistant to Antoni Przeborski (1871-1941) 83, in analytic geometry and introduction to analysis, and as a

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82 Russjan got his doctorate in Odessa in 1900. For some time he held lectures at the Lwów Polytechnics and the Jagiellonian University. In 1907 he took the chair of mathematical analysis at the University of Kharkov. His main interests were differential equations and probability.

83 Przeborski got his doctorate in 1902 at Moscow University. In 1908 he became an ordinary professor at the University of Kharkov. He also taught at Kharkov
The wartime situation in the Russian empire was complicated by the outbreak of 2 revolutions: in February and October 1917, and by the Ukrainian-Soviet war. Ukrainian People’s Republic of Soviets formed in 1917 in Kharkov fought Ukrainian People’s (or National) Republic proclaimed in January 1918 and based in Kiev, which was aided by the Germans after the Brest-Litovsk peace treaty between Germany and Russia was signed on February 9, 1918. The fightings continued after the Germans withdrew. The University and Polytechnic Institute in Kharkov continued to operate under the Bolshevik rule (with some interruptions), opening their doors to many more people from underprivileged background. Neyman was assigned a task of teaching remedial classes in mathematics to these new students. In addition, he taught mathematics and physics in a newly opened Polish high school in Kharkov. He also spent a brief time in prison, arrested for bartering matches for food in the black market. It was during the wartime that Neyman got interested in statistics (which later became the field of his highest achievements), through discussions he had with Sergei Natanovich Bernstein (1880-1986), newly promoted to professorship at the University of Kharkov.

In the years 1919-1920 Przeborski was the rector of the university, reorganized into the Academy of Theoretical Sciences. Neyman recalled that in the time of severe deprivations Przeborski arranged for the professors to obtain permission to chop trees in the nearby park for fuel. Due to a misunderstanding about legitimacy of the permission several professors were arrested, including Przeborski himself. He was released, later made the dean, and then the rector again. Eventually, Neyman and Przeborski left for Poland after the Polish-Soviet war (in 1921 and 1922, respectively). Russjan remained in Kharkov until his death in 1935.\(^{84}\)([Reid 1998], [Kijas 2011])

3.5. Kiev. The Imperial St. Vladimir Kiev University, established in 1843, could be viewed as continuation of the Krzemieniec Lyceum, since

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Polytechnic Institute, Women’s Higher Courses and the Workers’ University. His main interests were analytic functions, differential equations and variational calculus. In the independent Poland he was a professor of universities in Warsaw and Vilnius; he also taught mathematics and mechanics at the Warsaw Polytechnics.

\(^{84}\)He was dismissed from his university position by the Soviet authorities in 1934.
it started with the Lyceum’s assets and its Polish faculty. It was a popular destination for Polish students; the poets Bolesław Leśmian (1877-1937) and Jaroslav Iwaszkiewicz (1894-1980) studied there. Overall, there were 16 579 Poles in Kiev in 1897, 6.69% of its population. In 1919 the number went up to 36 800, or 6.77%. Eustachy Żyliński (1889-1954), born to a Polish family in the Podolia district, graduated from the St. Vladimir University as a student of Dmitrii Alexandrovich Grave (1863-1939). He passed his exams for master’s degree in 1914 in Kiev after taking a study trip to Göttingen, Cambridge and Marburg, then completing his exams and presenting a thesis “On the field of p-adic numbers”. From 1912 to 1915 he worked at the St. Vladimir University. On April 16, 1916 he was drafted into the Russian army as a Praporshchik (ensign). As part of his officer’s training, he completed several courses in engineering subjects and in radiotelegraphy in Kiev and Petersburg. On February 7, 1917, he was nominated to the rank of Podporucznik (Second Lieutenant). He became the Head of Radiotelegraphy of the South-Western Front, then he commanded an officers’ class. He did not engage in combat; his main task was to teach electrotechnical subjects to the Staff of 103rd Front in Kamenets-Podolskii (Kamieniec Podolski; Kamianets-Podilskiy) and Berdichev.

On July 24, 1917, Polish I Corps was formed in Belarus from Polish soldiers serving on Northern and Western Fronts, under the command of General Józef Dowbór-Muśnicki (1867-1937). Żyliński reported to the commander of the Corps in November 1917. In the period from December 1917 to February 1919 he worked in the Polish University College, Ukrainian State University and Higher Private Polytechnic Institute in Kiev. He taught classes in analytic geometry, set theory, higher algebra and introduction to analysis. He got his habilitation at the Polish University College. He published one paper, “O zasadach logiki i matematyki” (“On the principles of logic and mathematics”) in the Reports of Polish Scientific Society in Kiev (Sprawozdania Polskiego Towarzystwa Naukowego w Kijowie) in 1918. He also wrote 2 extensive works in the fields of algebra and logic during the period of war (both probably remained unpublished). On February 19, 1919, Żyliński went to Warsaw as an officer in the Polish army. He taught in the Officers’ School of Communication. He remained in the military service until September 1919, still as a second lieutenant (podporucznik) in a radio-telegraph battalion. He was released to become an extraordinary professor of mathematics at Jan
Kazimierz University in Lwów.\(^{85}\) Earlier, he rejected an offer to take a chair of mathematics at the Kamianets-Podilsky State Ukrainian University (formed in 1918 under a law signed by Pavlo Skoropadskyi (1873-1945), Hetman of Ukraine). In Lwów he soon became the head of the Chair A. He initiated a revival of algebra in Lwów ([Maligranda 2009],[Domoradzki, Stawiska and Zarichnyi 2016]).

**Kazimierz Abramowicz (1888-1936)**, born in the Polish Kingdom, finished his course of studies in mathematics at St. Vladimir’s University in Kiev in 1911, receiving a gold medal for his work “On hypergeometric functions with one removable singular point”. He worked under direction of Boris Yakovlevich Bukreev (1859-1962). In 1914 he passed his master’s degree exams and went to Berlin and Göttingen for further studies. Because of the outbreak of the war, he returned to Kiev. In the academic years 1914/15 and 1915/16 he lectured at the Kiev Polytechnic Institute. He was delegated as a docent to the Perm branch of the Petrograd University for the year 1916/17.\(^{86}\) As the branch became an independent university in 1917, Abramowicz was nominated an extraordinary professor in the chair of mathematics. Because of the war operations he could not return to Perm in the fall of 1918, so he taught recitation classes in mathematics at the Polytechnic Institute in Kiev. He returned to Poland in June 1920 and started working at the newly established University of Poznań in 1921. ([Maligranda 2016])

**Izabela Abramowicz (1889-1973)**\(^{87}\) was the first woman to receive the 1st degree diploma at the Faculty of Mathematics and Physics of the St. Vladimir University in Kiev and a gold medal for the thesis “On double integrals on algebraic surfaces.”. Like her brother, she worked under direction of Boris Bukreev. She stayed at the university,

\(^{85}\)Zyliński’s candidacy was supported by a mathematical committee, consisting of an astronomer Marcin Ernst (1869-1930), a physical chemist Roman Negrusz (1874-1926), a philosopher Kazimierz Twardowski (1866-1938) and a physicist Ignacy Zakrzewski (1860-1932).

\(^{86}\)The branch was established in 1916 as a result of evacuation of the Petrograd University deep into the territory of the Empire, to safeguard people and to alleviate provisional shortages. Mathematicians Yakov Davidovich Tamarkin (1888-1945), Alexander Alexandrovich Friedmann (1888-1925), Abram Samoilovich Besicovitch (1891-1970), Nikolai Maximovich Gjunter (1871-1941), Rodion Osievich Kuzmin (1891-1949) and Ivan Matveevich Vinogradov (1891-1983) taught there in the early years. ([Demidov 2015])

\(^{87}\)Kazimierz Abramowicz’s sister.
by permission of the education minister, but without a stipend, to prepare herself for exams towards her master’s degree. She also taught at three gymasia in Kiev. In the years 1917-1920 she lectured on introduction to mathematics (as a docent) at the Polish University College in Kiev. She joined the College when it expanded its course offer to mathematics and sciences. She was one of two women among the faculty members; the other one was Antonina Dylewska (1883-1951), a mineralogist. In addition to her teaching activities, Abramowicz was also a member of the short-lived Polish Scientific Society in Kiev. The College faculty and students started to leave as the fightings continued. Even after the Great War had ended, Kiev changed hands, passing from Germans to Ukrainians to Bolsheviks to White Russians to Ukrainians and Poles to Bolsheviks again. Abramowicz was supposed to leave Kiev in 1920 with the retreating Polish army. In August 1923 she arrived to Poznań. During the Second Republic and after World War II she taught mathematics in high schools in Poznań. ([Maligranda 2016])

3.6. **Yuryev (Dorpat; Tartu).** The University of Dorpat continued the traditions of a Jesuit college established by the Polish king Stefan Batory in 1583 and attracted many Polish students. Among distinguished graduates there were Tytus Chałubiński (1820-1889), a physician and promoter of tourism in Tatra mountains, and Wincenty Łutosławski (1863-1954), a philosopher. **Tadeusz Banachiewicz (1882-1954)**, a native of Warsaw, took a position of a junior assistant in

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88The College was established at the initiative of Wacława Peretiatkowiczowa (1855-1939), a headmistress of two women gymasia in Kiev. It started in 1916 as Higher Polish Learning Courses, initially allowed to offer only a program in humanities. It continued in 1917-1919 as the Polish University College. The faculty was recruited from Poles teaching at Russian institutions of higher education as well as academics from the Polish Kingdom and Galicia who for various reasons found themselves in the Russian Empire. About 40 people overall taught there. Some of them, including Eustachy Żyliński, obtained their habilitation at the College. The students—mainly Polish nationals from the Kiev Governorate, along with some incomers from the Polish Kingdom or Galicia—were interested in getting higher education and preparing themselves for professional specialization or teaching in Polish schools in the Western Ukrainian territories. The majority of them—572 out of 718 in the first semester—were women. The College’s activities were financed mainly by the Society for Supporting Polish Culture and Learning in Ruthenia (Towarzystwo Popierania Polskiej Kultury i Nauki na Rusi). ([Różewicz and Zasztowt 1991])

89Until 1893 the language of instruction was German. Then the university was fully Russified. The city itself was renamed Yuryev.

90Banachiewicz studied at Warsaw, Kazan, Moscow and Göttingen. He was involved in the activities of the Society for Scientific Courses. He was primarily
September 1915 at the Astronomical Observatory there, moving from the University of Kazan. He also submitted his thesis “Three essays on refraction theory”, for which he got habilitation and became a privat-dozent at the Yuryev University. It was difficult for him to carry out his observations as planned, because some instruments were evacuated to places further inside the Russian Empire. However, his theoretical work (on orbit determination, involving high-precision solutions to Gauss’ equation) was going well and brought him the master’s degree in 1917, which in turn led to nomination for a docent, winning the competition for a professor position in 1918 (a vacancy was created by the transfer of Konstantin Dorimedontovich Pokrovskii, 1868-1944, to Perm) and the appointment as the director of the observatory. The university was being transferred to Voronezh and Banachiewicz got a nomination for a professor’s position there, which he did not accept. He was allowed by the German occupying authorities to go to Warsaw in September 1918. The end of war and proclamation of independent Poland found him there. From October 1918 to March 1919 he was a deputy professor of geodesy at the Warsaw Polytechnic. In 1919 he took a chair of astronomy at the Jagiellonian University, which he was offered in May 1918 ([Flin and Panko 2011], [Bujakiewicz-Korońska and Koroński 2016]).

4. Poles in other countries

Leon Lichtenstein (1878-1933) held PhD degrees in engineering and mathematics (from Technische Hochschule Berlin-Charlottenburg and Friedrich-Wilhelm University, respectively) and was active both as a mathematician and an engineer in Berlin. From 1910 (veniam legendi) to 1919 he taught at the Technische Hochschule Berlin-Charlottenburg, lecturing on synthetic and descriptive geometry, graphic static, vector calculus, trigonometric series, integral equations, potential theory and other subjects. At the same time (from 1902 to 1920) he worked for Siemens & Halske (later renamed Siemens-Schuckert Werke), becoming a head of the electric laboratory in the factory of an astronomer, but made a lasting contribution to mathematics by inventing the (non-associative) algebra of Cracovians. He is also credited with a proof of Schur’s determinant formula.

91 The independent Republic of Estonia was declared on February 24, 1918. The Germans withdrew from the territory and handed over control to the Estonian Provisional Government in November 1918.
electric cables in 1906 and a mathematical expert in 1918.\textsuperscript{92} The electrical industry was important for German economic growth.\textsuperscript{93} The Siemens company was also active in the arms industry \textsuperscript{94} and contributed to the war effort of the German Empire (it developed, among other things, a type of a rotary aircraft engine). The usefulness of his work was probably the reason why Lichtenstein, who was born in Warsaw and completed one-year “voluntary” service in the Russian army (in 1897), was able to obtain German citizenship in the first days of the war. ([Przeworska-Rolewicz 2005])

Chaim (Herman) Müntz (1884-1956), born in Łódź, obtained his doctorate in mathematics at the Friedrich-Wilhelm University in Berlin in 1910. He was unsuccessful in getting habilitation and academic position in Germany, so after a period of supporting himself with private lessons he became a teacher of mathematics in a boarding school called the Odenwaldschule near Heppenheim in southern Hessen.\textsuperscript{95} He was given ample time to work on his mathematical research. In 1915 he left and took a position at another boarding school, also in Hessen (having only Hessian residency but no German citizenship he could not move freely), from which he was dismissed in 1917 as a “little Polish Jew”. Müntz was able to write and publish 5 mathematical research papers while teaching. Also in 1915, he met and befriended the philosopher Martin Buber (1878-1965). He contributed to a journal Der Jude founded and co-edited by Buber (under the pseudonym Herman Glenn). ([Ortiz and Pinkus 2005])

Mieczysław Biernacki (1891-1959): In the years 1909-11 he studied chemistry at the Jagiellonian University. He was expelled for taking part in students’ protests. Then he continued his studies at Sorbonne, switching to mathematics. When the war broke out, he voluntarily enlisted in the French army. He fought at the Western

\textsuperscript{92}Some of Lichtenstein’s engineering papers are mentioned here: \textit{High tension cable manufacture, present state and future}, London Electrician, June 2, 1911; \textit{Testing high-tension cables}, Elek. Zeit., October 8, 1914.

\textsuperscript{93}According to [Eksteins 1989], by 1913 the value of German electrical production was twice that of Britain and almost ten times that of France, while Germany’s exports in this area were the largest in the world, almost three times those of the United States.

\textsuperscript{94}This activity resulted in January 1914 in the so-called Siemens Scandal involving bribes for supplying the Japanese navy.

\textsuperscript{95}It was a renowned modern co-educational school, founded and run by the innovative educator Paul Geheeb (1870-1961).
front, suffering gas poisoning and a severe wound. For his service he received the distinction of the Officer’s Cross of the Legion of Honour. On June 4, 1917, the president of France issued a decree about forming an independent Polish army in France. Biernacki transferred to the Polish units. He returned to Poland with the Polish army under the command of General Józef Haller (1873-1960), also known as the “Blue Army”. In 1928 Biernacki obtained a doctorate in Paris under the direction of Paul Montel. ([Montel 1962], [Radziwiłłowicz 1997], [Domoradzki 2013]).

**Juliusz Paweł Schauder (1899-1943):** He graduated from Gymnasium VIII in Lwów in 1917, was drafted into the army and sent to the Italian front. He was taken a prisoner. While in the camp, he learned about a Polish army being formed in France under the command of Gen. Haller. On January 24, 1919, he reported to the local recruitment office and was enlisted into a company of ensigns in the rank of corporal. He returned to Poland with Haller’s army and wore his blue uniform long after being discharged, because of material hardship ([Derkowska 1990]).

**Stefan Straszewicz (1889-1983)** - He taught at the Society for Scientific Courses (fundamental notions of set theory, among other things). In summer 1913 he went to Zürich, thanks to the scholarship from the Mianowski Fund. He got his PhD at the University of Zürich in 1914 under the direction of Ernst Zermelo (1871-1953) on the basis of the thesis “Beiträge zur Theorie der konvexen Punktmengen” (Research on the theory of convex sets). He continued his research in geometry and topology and translated into Polish the book “Stetigkeit und irrationale Zahlen” (Continuity and the irrational numbers) by Richard Dedekind (1831-1916). He belonged to the Union of Societies of Polish Youth for Independence (Unia Stowarzyszeń Polskiej Młodzieży Niepodległościowej), commonly called Filarecja. He returned to Poland in 1919. He fought in the Polish-Soviet war, then taught in Warsaw, first at the University and then at the Polytechnic. ([11])

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96 The most important operations on the Italian front took place in the Isonzo valley. Ultimately the Italians prevailed and the armistice with Austro-Hungary was signed on November 3, 1918.

97 According to [11], Stefan Straszewicz’s studies were financed by Zygmunt Straszewicz, his uncle.
Acknowledgments: This article originated from the lecture “Mathematicians from Polish territories in WWI” given by the first author at the conference “Mathematics, Mathematicians and World War I”, 20 May 2015 - 25 May 2015, Scuola Normale Superiore Pisa, Italy. It started taking its present shape during the second author’s visit to Jagiellonian University in Kraków on her study leave from American Mathematical Society in February-June 2017. The work of both authors is partially supported by the project 18-00449S of Czech Science Foundation. The work of the first author was also partially supported by the Centre for Innovation and Transfer of Natural Sciences and Engineering Knowledge, University of Rzeszów.

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Faculty of Mathematics and Natural Sciences, University of Rzeszów, Ul. Prof. S. Pigionia 1, 35-959, Rzeszów, Poland
E-mail address: domoradz@ur.edu.pl

Mathematical Reviews, 416 Fourth St., Ann Arbor, MI 48103, USA
E-mail address: stawiska@umich.edu