

Logic in Poland in the 20th Century

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Abstract:

After Poland gained independence in 1918, logic developed very quickly both as a scientific direction and as a taught discipline. This introduction to the special issue “Logic in Poland in the 20th Century,” published in Volume 13:1 (2024) and Volume 13:2 (2024), provides the historical context for the development of logic in the interwar period.

Keywords: Logic, Lviv-Warsaw School, Jan Łukasiewicz, Stanisław Leśniewski, Kazimierz Twardowski.

Zbigniew Semadeni recounts an intriguing moment when, at a mathematics conference towards the end of the 20th century, Benoit Mandelbrot posed the question: “What is the most significant date in 20th-century mathematics?” To the audience’s astonishment, he declared it to be the year 1918, marking Poland’s resurgence as an independent nation. This period heralded a rapid and remarkable ascent of Polish contributions to mathematical logic on the global stage. Heinrich Scholz, in 1931, had already acknowledged Warsaw as a pivotal center for logic (Scholz, 1931, p. 85), a sentiment echoed by Abraham Fraenkel and Yehoshua Bar-Hillel in 1958, who noted Poland’s outsized contributions to mathematical logic and set theory relative to its population (Fraenkel & Bar-Hillel, 1958, p. 185).

The re-establishment of the University of Warsaw in 1916, under German occupation consent, saw Jan Łukasiewicz joining as a philosophy professor, soon followed by Stanisław Leśniewski in 1918, marking their tenure in the Faculty of Mathematics and Physics despite their philosophical backgrounds. This unique positioning was a direct outcome of Zygmunt Janiszewski's vision for Polish mathematics to concentrate on set theory, topology, and their mathematical applications, which naturally extended into the realms of mathematical foundations and logic.

The Warsaw School of Logic (Woleński, 1989) was born from this vision, with notable contributions from mathematicians like Waclaw Sierpiński, Stefan Mazurkiewicz, and Kazimierz Kuratowski. Łukasiewicz and Leśniewski's involvement in the editorial team of *Fundamenta Mathematicae* underscored the strategic role of logic within Janiszewski's program. The establishment of the Polish Logic Society in 1936 by Łukasiewicz and the publication of *Collectanea Logica* were pivotal in asserting logic as a distinct discipline, meriting its own academic platforms separate from mathematics and philosophy.

While Warsaw embraced logic as a core component of its mathematical identity, Lviv recognized its value without positioning it at the center. Logic departments flourished across various Polish universities, with logic's prominence further reflected in its advanced level of instruction, even within secondary education, and specialized university curricula in Warsaw that included engagement with contemporary mathematical logic challenges.

This vibrant logic scene was not confined to mathematicians; philosophers, notably Kazimierz Twardowski and his disciples, significantly influenced the field. Twardowski's emphasis on the formal qualities of philosophical discourse fostered a conducive environment for logic's advancement. His students, including Leśniewski and Łukasiewicz, later pioneers of Warsaw logic, and others like Alfred Tarski, further cemented Poland's legacy in mathematical logic. Tarski, reflecting on this heritage, acknowledged the pervasive influence of Twardowski's teaching across the philosophy of exact sciences in Poland, indicating the intertwined evolution of mathematical logic with both philosophy and mathematics in Poland.

The professors of philosophy in Warsaw, including Tadeusz Kotarbiński who significantly contributed to logic's popularization from one of the University of Warsaw's philosophy departments, embarked on vigorous educational initiatives. They nurtured a cadre of mathematical logic specialists, notably Alfred Tarski, Adolf Lindenbaum, Mordechai Wajsberg, Moses Presburger, Bolesław Sobociński, Jerzy Słupecki, Stanisław Jaśkowski, Andrzej Mostowski, Czesław Lejewski, and Henryk Hiż. Others, such as Zygmunt Kozłowski and Zygmunt Kruszewski, though less central, were also part of this circle. This collective effort gave rise to the Warsaw School of Logic, an unparalleled assembly of logicians during the interwar years, bridging the Polish Mathematical School and the philosophical tradition of the Lviv-Warsaw School.

The story of the Warsaw School of Logic is also woven into the tragic tapestry of Poland's World War II history. Members such as Kozłowski were killed due to resistance activities, while Lindenbaum, Presburger, and Wajsberg perished in the Holocaust. Others, including Łukasiewicz, Tarski, Sobociński, Lejewski, and Hiż, were compelled to emigrate during or in the aftermath of the war, leaving only Jaśkowski, Mostowski, and Słupecki in Poland. This narrative underscores the school's significant losses, including promising students like Jerachmiel Bryman or Jerzy Billich, whose potential was cut short by the war's devastation.

The logic's evolution in Poland throughout the 20th century extends beyond its mathematical community. Philosophers, notably Kazimierz Twardowski, the progenitor of the Lviv-Warsaw School, and his disciples, played a crucial role. Twardowski's metaphilosophical approach emphasized the formal attributes of philosophical discourse, advocating for clarity, precision, and the eschewing of speculative queries while focusing on the substantiation of arguments. This methodological stance

fostered a conducive environment for engaging with logical inquiries.

Many among Twardowski's followers, including Stanisław Leśniewski and Jan Łukasiewicz, who would later pioneer the "Warsaw" approach to logic, dedicated themselves primarily to this field. Other notable students of Twardowski who significantly influenced the development of logic in Poland include Kazimierz Ajdukiewicz in Lviv, Tadeusz Czeżowski in Vilnius, Tadeusz Kotarbiński in Warsaw, and Zygmunt Zawirski in Poznań and then Kraków. Alfred Tarski, swiftly becoming a central figure and the most renowned member of the Warsaw School of Logic, later reflected, "Almost all researchers who pursue the philosophy of exact sciences in Poland are indirectly or directly the disciples of Twardowski, although his own works could hardly be counted within this domain" (Tarski, 1992, p. 20). This statement underscores the profound influence Twardowski had on the field, making mathematical logic in Poland a product of both philosophy and mathematics. Tarski's use of "almost" acknowledges contributions from individuals outside Twardowski's direct lineage, including Chwistek and Sleszyński, indicating the diverse origins of Poland's logical scholarship.

This special issue is a postproceeding of the National Scientific Conference "Logic in Poland in the 20th century" accompanying the publication *Leksykon logików polskich 1900-1939 (Lexicon of Polish logicians 1900-1939)*, (Woleński et al, 2022), which took place on September 22, 2022 in Rzeszów, Poland. It consists of the following recent researches in the field of logic in Poland, published in Volume 13:1 (2024): *From the History of Lesniewski's Mereology* (Andrzej Pietruszczak); *The Warsaw School of Logic: Main Pillars, Ideas, Significance* (Urszula Wybraniec-Skardowska); *100 Years of Logical Investigations at University of Poznań* (Roman Murawski); *Logic and Metalogic: a Historical Sketch* (Jan Woleński); *Proof of the Existence of Hell: An Extension of the Stone Paradox* (Piotr Łukowski). This issue also includes the following three researches, published in Volume 13:2 (2024): *Characterizing Context-Independent Quantifiers and Inferences* (Stanisław Krajewski); *Jan Łukasiewicz and his German Ally. A History of Łukasiewicz-Scholz Cooperation and Friendship* (Anna Brożek); *The Nature of the Anti-Psychologistic Turn in Kazimierz Twardowski's Philosophy* (Krzysztof Nowicki); an interview about the development of logic in Belarus in the 20th century: *The Past and Future of High Technology* (Arkady Zakrevsky), an interview with a Ukrainian logician about the situation of the development of logic in Ukraine in the context of Russian military aggression: *Philosophy and Logic in Time of War* (Yaroslav Shramko), and an interview about the responsibility of Russian philosophers for this terrible war: *Living in Illusion is Dangerous* (Marina F. Bykova). The issue published in Volume 13:2 (2024) also contains the review: *Libertarian Autobiographies: Moving Toward Freedom in Today's World. Edited by Jo Ann Cavallo and Walter E. Block. Palgrave Macmillan, 2023* (Robert W. McGee).

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