Book Reviews

ANITA BURDMAN FEFERMAN and SOLOMON FEFERMAN, **Alfred Tarski: Life and Logic**, Cambridge University Press, Cambridge, UK, 2004, pp. 432.*

In the theater, people say, the role of the King is determined not only by how royally an actor plays, but also by how other actors see him. This truism may explain biographers' and everybody's else attitude towards Tarski. This book is a well-written mixture of biography, gossip and work exposition of one of the most important contemporary logicians, Alfred Tarski, born Alfred Tajtelbaum in 1901 in Warsaw and deceased in Berkeley in 1983. This is a book to be read with great interest by logicians, mathematicians, philosophers and people interested in the recent history of science.

The authors are undoubtedly well qualified to write a book like this: Anita Burdman Feferman wrote about logician Jean van Heijenoort, and Solomon Feferman, professor of mathematics and philosophy at Stanford University, had Tarski as his Ph.D. supervisor (having received his degree in 1957). Besides, the Fefermans belonged to the same social milieu as the Tarskis during decades. Perhaps this explains why there is much more "life" than "logic" in the book, while for example, insisting on telling the audience that one fifth of Tarski's twenty-four Ph.D. students were women, and that Tarski maintained love affairs with almost all of them (despite, so the book informs, being married with Maria Witkowska since 1929).

The book is based on several interviews and archival research. The biographical material is organized in fifteen chapters, while six interludes present, even if a bit hastily, Tarski's work in logic, philosophy and mathematics. The balance between the chapters and the interludes (grossly, an interlude every three chapters) sets the tone for the book: the interludes, with a few exceptions, are too short to grasp the attention and to teach something to the interested layman, and a bit too superficial and *déjà vu* to keep the attention of philosophers and logicians. The fact that the interludes were designed to be skipped if the reader is only interested in biographical details and the somewhat excessive insistence on Tarski's love affairs, on what he smoked and drank helps explain the order of the words in the title.

Seventy photographs, including a classical picture of Tarski and Gödel in Vienna in 1935 (p. 90) and another joint picture, taken in Princeton in 1962 (p. 258), make an appropriate scenario, but the cover picture is something special: two portraits, one of Alfred and one of Maria, adorning the back cover; Tarski's is reproduced in bright colors on the front cover, and both were painted by Ignacy Witkiewicz, probably under narcotic inspiration, within the bohemian influence of the atmosphere of Zakopane, an intellectual resort in the Tatra mountains. The book has much more merits than weaknesses, however, and one of them is the opportunity to meet an astonishing number of personalities that helped build the history of logic and philosophy of science in the XX century.

Dodging death

Tarski got his doctorate from the University of Warsaw in 1924, and became, at age 23, a young docent at Warsaw University. To complement his small salary, he also worked at the Polish Pedagogical Institute of Warsaw, but lost the job due to anti-semitic complaints by the students. He had to take a second job as a teacher at another private school, the Żeromski Lycée. In 1937 Tarski lost again a position at the University of Poznań due to anti-semitism. He was promoted to adjunct professor in 1935, but was never a full professor. He was just waiting for such a position in 1939 when when his life took a turn and he ended up starting a new life in the USA, arriving at New York in August of that same year.

The book tells in vivid details how Quine saved Tarski's life at that time. In the US Tarski was unemployed for years, having had temporary positions at Harvard from 1939 to 41, at the College of the City of New York (CCNY) in 1941, and at the Institute for Advanced Study in 1942. Finally through

G. C. Evans, of the Mathematics Department, he obtained a professorship at the University of California, Berkeley, from 1942 to the end of his life.

Tarski's arrival in the US is a real movie-like story. He was invited by Quine to attend the Fifth International Conference on the Unity of Science, scheduled to be held in Harvard in the summer of 1939. His interests in the philosophy of science dated 1930, when Karl Menger, professor of geometry at the University of Vienna and member of the *Wienerkreis* (the Vienna Circle) invited Tarski to give a series of lectures in the Circle, where he met Rudolf Carnap and Kurt Gödel. Leśniewski had recently died, and Tarski, afraid of being out of Warsaw when the decision about the replacement was being taken, hesitated to accept the invitation to attend the Conference. He was only moved by the insistence from Quine, who was arranging for a series of lectures at various universities after the conference. When finally Tarski left Poland on 11 August 1939, with a small suitcase and prepared to come back soon, he did not imagine that Poland would be invaded by Germany 20 days after, and that he would be separated from his wife and children for seven years. Several people in Poland I talked to were unanimous in saying that this saved Tarski's life — being a Jew, even if converted to Catholicism, Tarski would not escape the fate of many, like Adolf Lindenbaum and his wife, who had a visa denied only some days after Tarski, and died in a concentration camp.

A promenade in the recent history of logic

The life itinerary of Tarski, which the book depicts very well, meets Karl Menger, Kurt Grelling, Leopold Löwenheim, Otto Neurath, Haskell Curry, Stephen Kleene, J. Barkley Rosser, Willard V.O. Quine, Alfred North White-head, Stanisław Ulam, Carl Hempel, Johan von Neumann, Kenneth Arrow and Karl Popper.

And the list goes on: Samuel Eilenberg and Andrzej Mostowski were Tarski's students (the second got his Ph.D. under Tarski in 1938). Arrow, Nobel Prize in economics, declared that what he had learned from Tarski played a role in his career. Popper in 1935, in Prague, showed Tarski the page proofs of his *Logik der Forschung*, and reciprocally was one of the first to see later, in Vienna, the page proofs of the Tarski's famous paper on the definition of truth. Popper later wrote that Tarski was "the one man whom I could truly regard as my teacher in philosophy. I have never learned so much from anybody else". Tarski wrote in collaboration with Paul Erdös, and authored seminal papers with J. C. C. McKinsey on the calculus

of relations. His 300 publications tell by themselves part of the history of 20th century logic and philosophy.

From Poland to the world

The book also contains a very well-traced itinerary of Polish logic. Tarski's parents, Rosa Prussak and Ignacy Tajtelbaum, came from families established in Łódź, where a flourishing textile industry made many rich families build an astonishing number of big houses; probably one of them belonged to the Prussak family.

Later on the family was wealthy enough to live in a large apartment in a nice neighborhood in Warsaw. Tarski learned Russian in school (Poland was part of the Russian empire by then, and only became independent when he was 16, with the Russian revolution of 1917). He also learned German, Latin and French besides Polish. This explains his unusual diversity of publications in different languages: the papers in the beginning of his career were written in Polish, French and German — English came later.

Names of historical relevance as Zygmunt Janiszewski, founder of *Fundamenta Mathematicæ*, Stefan Mazurkiewicz, Wacław Sierpiński, Kazimierz Kuratowski, Jan Łukasiewicz, Stanisław Leśniewski, and Tadeusz Kotarbiński were Tarski's professors or instructors in measure theory, topology and logic.

Leśniewski was Tarski's supervisor, and his Ph.D. work solved a problem in Leśniewski's system of logic. His results appeared in *Fundamenta Mathematicæ* in two parts: the first in 1923, signed as Alfred Tajtelbaum, and the second in 1924, under the name Tajtelbaum-Tarski. Even if thereafter all his papers were signed just "Alfred Tarski", this originated some confusion at the time when Tarski was not so well-known.

Łukasiewicz, Leśniewski and Kotarbiński had been students of Kazimierz Twardowski in Lvov (now in Ukraine), a second hub of mathematical and logical activity competing with Warsaw. In 1928, a professorship in logic was created at the University of Lvov and Tarski and Leon Chwistek were the candidates. Chwistek was also a painter (two of his portraits can be seen at the Muzeum Sztuki, in Łódź); Tarski did not get the position, due to the fact that Bertrand Russell, being consulted, supported Chwistek's candidature. Ironically, many years later, when Tarski was teaching at CCNY, in New York, in 1941, Russell had an academic appointment cancelled there due to the infamous affair of the "chair of indecency".

In January of 1931, Tarski received a letter from Gödel where he announced the proof of his incompleteness results. Probably unaware of the possibilities of formalizing semantics in precise mathematical terms (a topic which Tarski was already working on), or perhaps because he was influenced by another milieu, Gödel used proof-theoretical means; Tarski immediately noticed how close he himself was to obtaining the same results by semantical means, which he later published in his classical theorem on the undefinability of truth.

The book probably overstresses the role of anti-semitism as a universal explanation for everything that happened to Tarski in Poland. There is no doubt that Tarski suffered the effects of anti-semitic opposition, but his conversion to Catholicism was more a political choice, being a socialist, since he was always an atheist. The change of his name from Tajtelbaum to Tarski was encouraged by Łukasiewicz and Leśniewski, who found that name better tailored for professional reasons. According to the Fefermans, Tarski would have complained that, around 1935, neither Łukasiewicz nor Leśniewski, would welcome him to their café table, due to fear of being seen in public with a Jew, but several Polish colleagues tell me that Tarski, with his strong personality, would not like to sit with them, on the one hand because the relationship between Tarski and his teacher Leśniewski had been tense for years, and on the other hand because of the ultra-catholicism of Łukasiewicz's wife, that made her avoid Jews.

The last chapter mentions that one of the voyages that meant most to Tarski was his long visit to Chile and Brazil in 1974 and 1975. Although a good amount is dedicated to his visit to Chile arranged by Rolando Chuaqui, the Brazilian part is totally neglected. He came to Brazil in 1976, invited by Ayda Arruda, and gave several lectures, carefully taped and kept at the archives of the University of Campinas; they are such nice and clear lectures on the whole development of the Algebra of Logic that I usually recommend my students to see the 30-year-old tapes.

Tarski's work in the Interludes

The six Interludes intend to give an overview of the Tarski's so many achievements, though not departing from the "life" style. Three of them are more informative. The first interlude discusses the Banach-Tarski Paradox, set theory, and the Axiom of Choice. In 1924 Banach and Tarski independently discovered paradoxical decompositions using spheres and wrote a joint paper. Solovay subsequently showed that the Banach-Tarski Paradox requires

the Axiom of Choice, which made evident the peril of trusting intuition in the foundations of mathematics.

The second Interlude explains the question of completeness and decidability of algebra and geometry, briefly touching the important Tarskian method of eliminating quantifiers.

The third interlude, the best in my opinion, carefully explains Tarski's formalized correspondence theory of truth, recognized, as noted by the Fefermans, as one of the most important cases of conceptual analysis in contemporary logic. Semantic questions on natural language, computer science and non-classical logics could be profitably analyzed in Tarskian style.

The sixth Interlude explains the role of relation algebras, emphasizing the parallel between the representation theorem for relation algebras and the famous representation theorem for Boolean algebras by Marshall Stone of 1930. In particular, relation algebras help to formalize the idea of set theory without variables, which resulted in the last book, finished just before Tarski died in 1983 and published in 1987, *A Formalization of Set Theory without Variables* (by A. Tarski and S. Givant). If we accept that logic, as we know it today, had started with G. Boole and A. de Morgan around 1850, followed by G. Frege, A. Whitehead and B. Russell; Tarski, besides Gödel, is a key figure in the standardization of syntax and semantics of first-order logic. If, from a historical perspective, logic inherits from questions as how many angels can dance on the head of a pin, formal logic shows that this question, having to do with complete infinities, could only be answered by using the Axiom of Choice. Moreover, the formal logic prospect guarantees that to adopt or not such an axiom is an act of complete freedom, as it is independent of all other relevant reasoning principles. Regarding things from this perspective, there is a great philosophical relevance in the work on logic developed by Tarski, and this book is a valuable support to illuminate his trajectory.

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