Review of

JOSEPH WARREN DAUBEN, *ABRAHAM ROBINSON: THE CREATION OF NONSTANDARD ANALYSIS, A PERSONAL AND MATHEMATICAL ODYSSEY*

Princeton, New Jersey: Princeton University Press, 1995
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The book under review is a biography of Abraham Robinson (1918–1974), one of the most prominent mathematicians of the twentieth century, who discovered and developed nonstandard analysis. Its author, Joseph Warren Dauben, is Professor of History and the History of Science at Herbert H. Lehman College and at the Graduate Center of the City University of New York. He is known for his biography of Georg Cantor (*Georg Cantor: His Mathematics and Philosophy of the Infinite*, Harvard University Press, Cambridge, MA, 1979; repr. by Princeton University Press, Princeton 1990).

In 1979, shortly after Dauben's book on Cantor appeared, W.A.J. Luxemburg called Dauben and asked him whether he would be interested "in writing a biography of the mathematical logician, Abraham Robinson" (p. xiii). After their meeting at Yale University, in which Robinson's wife, Mrs. Renée Robinson took part as well, Dauben decided to undertake the task. So began his fifteen years of work on the book. In the course of it he systematically interviewed Robinson's colleagues, former students and friends (more than seventy persons) all over the world, visited major institutions with which Robinson was affiliated and studied their local archives, examined administrative records (the impressive list of those persons and institutions is given in the acknowledgments and at the beginning of the bibliography) and, last but not least, studied published as well as the Nachlaß of Abraham Robinson. The present book is a fascinating story of the personal life of Abraham Robinson and of his mathematics.

Robinson lived at a difficult time, full of tragic events. Born on October 6, 1918 in Waldenburg, Prussia (now Wałbrzych, Poland), he never saw his father who died suddenly in Berlin of a heart attack on May 3, 1918. In 1933 Abraham, with his mother and brother Saul,

fled to Palestine. In January 1940 he moved to France where in June he narrowly escaped from Paris as the Germans invaded France. The rest of the war he spent in England where he was at the Royal Aircraft Establishment in Farnborough. Here he began his teaching career at the Royal College of Aeronautics. In 1951 Robinson left Europe and moved to universities in Canada (1951–1957), Israel (1957–1962) and finally in the United States. In 1962 he received a joint appointment in mathematics and philosophy at University of California in Los Angeles. In 1967 he became Sterling Professor of Mathematics at Yale University where he served until his untimely death at the age of fifty-five in 1974.

The periods of Robinson's life mentioned above are reflected in the organization of the book. It consists of nine chapters devoted to the stages of his life: Chapter 1 — Family and Childhood: Germany 1918–1933, Chapter 2 — Life in Palestine: 1933–1939, Chapter 3 — Robinson in Paris: January–June 1940, Chapter 4 — Robinson and the War: London 1940–1946, Chapter 5 — Robinson after the War: London 1946–1951, Chapter 6 — The University of Toronto: 1951–1957, Chapter 7 — The Hebrew University: Jerusalem 1957–1962, Chapter 8 — UCLA and Nonstandard Analysis: 1962–1967, Chapter 9 — Robinson joins the Ivy League: Yale University 1967–1974. The book is closed by an epilogue: "Abraham Robinson. The Man and His Mathematics" as well as by an extensive bibliography and index (they occupy together 64 pages). In the bibliography are listed all the interviews which Dauben had in the course of writing the book as well as manuscripts from the Robinson papers (Department of Manuscripts and Archives, Yale University Library) and all works by A. Robinson and works by other authors quoted in the text. One also finds in the book many photographs (mostly from Renée Robinson's personal collection) illustrating various periods and events of Robinson's life.

Benoit B. Mandelbrot wrote the forward to the book. His links with the Robinsons were manifold: personal and scientific links with Abraham Robinson (they planned to work together on a presentation of fractals in terms of nonstandard analysis — plans that were not realized because of the untimely death of Abraham Robinson), and friendship with Renée Robinson. Currently B. Mandelbrot is Abraham Robinson Professor of Mathematical Sciences at Yale University.

The book under review is not only a story of the life but also of the work of Abraham Robinson. He made remarkable contributions to at least three fields: airplane design, symbolic logic and mathematical analysis. The first was his field of activity especially during his days in England. His interests in symbolic logic concerned mainly model theory

— in fact Robinson showed the power of it for mathematics, in particular for algebra. Probably his greatest contribution to mathematics is nonstandard analysis. This rigorous theory of infinitesimals provided (after 300 years!) a consistent foundation for Leibniz's differential and integral calculus. It showed also that methods of mathematical logic, in particular of model theory, can be successfully used in solving foundational problems of real mathematics. The infinite has always been regarded as troublesome in mathematics and infinitesimals especially so. They were key elements of the calculus since Leibniz and Newton but their legitimacy was not clear. Works by Cauchy, Weierstrass and others helped to bar infinitesimals from mathematics by promoting the method of limits, but the basic idea of arbitrary small quantities remained. Robinson's nonstandard analysis provides a rigorous foundation for infinitesimals showing that Leibniz's original ideas could be formalized in a consistent theory. On the other hand, nonstandard analysis turned out to be a powerful tool in certain contexts. The book reviewed here is the first to give the history of development of this branch of mathematics.

J. W. Dauben has written a fascinating, well-organized and well-crafted book on the life and work of one of the great mathematical logicians and mathematicians of the twentieth century. Though it contains many technical details of Robinson's works (they may be rather difficult to appreciate, especially for a reader without an appropriate mathematical and logical background), it can be read as a good novel. Based on deep and serious mathematical and historical research this book can be a valuable source for future research in the history of mathematical logic and of mathematics.[1]

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[1]If I wanted to formulate some critical remarks about the book under review I would indicate the strange term "Zidovske Institute" on p. 16. It is neither the Polish name (in Polish it should be: Instytut Żydowski) nor the English translation of it (it would then be: Jewish Institute). Also, Robinson's visit to Warsaw in 1973 (he was the guest of the Logical Semester at the Stefan Banach Mathematical Center) was not mentioned in the book, though all of Robinson's other travels and visits are described in detail (it was the first, and the only time, when I, then a young logician, saw the famous Robinson known to me only by his works).