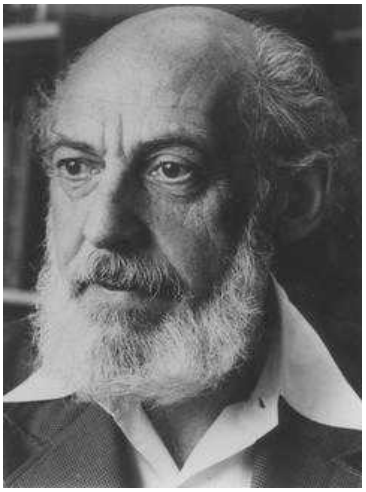
SAMUEL EILENBERG

Samuel Eilenberg (September 30, 1913 – January 30, 1998), who was renowned for his work in the fields of algebraic topology and homological algebra, was born in Poland into a family of brewers. He attended the University of Warsaw, which was blessed with outstanding topologists Stefan Mazurkiewicz, Kazimierz Kuratowski, Wacław Sierpiński, and Karol Borsuk. In 1936, Eilenberg received his doctorate for a thesis concerned with the topology of the plane. The second great mathematical center in Poland of the time was at Lvov. Eilenberg joined this community of mathematicians who worked and drank together in the Scottish Café, and produced the "Scottish Book," the famous book of unsolved mathematical problems.



In 1939, his father told him, "Sammy, it doesn't look good here in Poland. Get out!" As Hyman Bass, Henri Cartan, Saunders MacLane, and others noted in the memoirs that they wrote at the time of his death in 1998, all who had the good fortune to know Eilenberg always called him "Sammy." Sammy took his father's advice, left Poland and emigrated to the United States. Princeton professors Oswald Veblen and Solomon Lefschetz welcomed refugee mathematicians to the United States and found them positions in American universities. As Eilenberg's work was well known in the U.S., they arranged a position for him at the University of Michigan, where Raymond Wilder led a team of very active topologists, including Norman Steenrod. In 1948, Eilenberg moved to Columbia University, where he taught for more than 35 years.

Eilenberg helped create a new branch of mathematics, algebraic topology, in which algebra is used to describe and explain how certain properties of multidimensional forms remain unchanged even when

they are twisted, bent, or stretched. Eilenberg is well known for his collaborations with other mathematicians. In 1949, André Weil asked Eilenberg to collaborate on writing about homotopy groups and fibre spaces as part of a Bourbaki project. John Morgan, a mathematician colleague at Columbia, said of Eilenberg at the time of his death: “He fit in well with the Bourbaki, because both he and they were trying to lay the foundations for new disciplines.” Eilenberg remained an active member of the Bourbaki group for fifteen years.

Eilenberg and Saunders MacLane produced fifteen papers on a wide range of subjects, collaborating to invent category theory, which is ubiquitous in modern mathematics. In 1952 Eilenberg and Norman Steenrod published *Foundations of Algebraic Topology*, one of the primary sources in the field, in which their axioms for homology theory (the algebraic study of closed curves, closed surfaces, and similar geometric arrangements in a given topological space) brought order to the subject. Eilenberg and Henri Cartan further developed these ideas and founded an area of mathematics called homological algebra, a term that they invented. Their book on the subject that was published in 1956 became a classic. Homological algebra is less concerned with the intrinsic structure of the objects of abstract algebra, such as groups, rings, and fields, as with the pattern of structure preserving mappings between such algebraic objects and the various ways of constructing new ones from existing ones. Eilenberg published a major two-volume text *Automata*, *Languages, and Machines* (1974, 1976), which a reviewer described as: “… one of the most important events in the mathematical study of the foundations of computer science and in applied mathematics.”

Eilenberg was awarded Guggenheim and Fulbright Fellowships and in 1986 he was a co-winner, with Atle Selberg of the Institute for Advanced Study in Princeton, of the $100,000 Wolf Foundation Prize in Mathematics. He was a member of the American Academy of Arts and Sciences among other professional groups. John W. Morgan said “The theme that runs through Sammy’s mathematics is

always to find the absolutely essential ingredients [concepts] in any problem and work it out with those ingredients and nothing else – in other words to get rid of superfluous information." To illustrate this Morgan recalled an occasion when someone asked Eilenberg if he could eat Chinese food with three chopsticks. He answered, "Of course." When asked how he would do it, Eilenberg announced he would set one of the sticks aside on the table and eat with the other two.

Eilenberg became interested in art collecting on a trip to Bombay in the mid-1950s. For 30 years he collected South Asian art from Indonesia, Pakistan, India, Nepal, Thailand, Cambodia, Sri Lanka, and Central Asia dating from the 3rd century BCE to the 17th century. His collection was valued at more than $5 million dollars. In 1989, he donated more than 400 sculptures to the Metropolitan Museum of Art, which put on a show titled "The Lotus Transcendent: Indian and Southeast Asian Art from the Samuel Eilenberg Collection." At that time, as a sort of quid pro quo, the Metropolitan raised most of the $1.5 million needed to create the Samuel Eilenberg Visiting Professorship of Mathematics at Columbia. In 1996, Eilenberg was felled by a stroke that made it difficult for him to talk. He fell into a coma in June 1997 and died of cardiac arrest on February 6, 1998.

Quotation of the Day: "Progress in algebraic topology is usually not achieved by going forward and applying the already existing tools to new problems, but by constantly going back and forging new, more refined tools which are necessary to achieve further results. The outcome of this is that the whole field changes radically over every ten-year period, and someone who has been away from it for any length of time might not understand a single word if he tries to read a paper." – Samuel Eilenberg