

## Oswald Veblen

In the 1920s Oswald Veblen (June 24, 1880 – August 10, 1960) made significant contributions to mathematics in the areas of projective and differential geometry, and topology and led efforts to collect funds to provide greater support for unfettered mathematical research. His influence in his profession earned him the reputation of “statesman of mathematics.” He played a major role in the development of Princeton University as a major American mathematical center. After Hitler’s rise



to power, Veblen helped relocate many distinguished foreign mathematicians to the United States. As J. Robert Oppenheimer noted, Veblen “provided a real clearing house at the Institute for mathematicians from all over the world”.

Veblen was born in Decorah, Iowa. He was the grandson of a Norwegian cabinetmaker who moved from Valdres, Norway to Wisconsin to take up farming in 1846. Oswald was the nephew of political economist and social theorist Thorstein Veblen whose book *The Theory of the Leisure Class* made him a champion for various progressive movements in early 20<sup>th</sup> century America. Oswald Veblen entered the University of Iowa in 1894, where his father was a professor of both mathematics and physics. After receiving his bachelor’s degree Veblen took a second A.B. at Harvard before earning his Ph.D. from the University of Chicago in 1903 for his dissertation *A System of Axioms for Geometry*. He remained at Chicago as a mathematics instructor for two years. Then Henry Burchard Fine, who was in the process of strengthening the mathematics department at Princeton, heard of Veblen’s work. Fine induced Woodrow Wilson (at the time president of Princeton) to appoint Veblen to the faculty as one of the original preceptors of the mathematics department. Veblen gave Fine much credit for the development of mathematics in the United States, saying he “carried American mathematics forward

from a state of approximate nullity to one verging on parity with the European nations.”

In 1908 Veblen married Elizabeth Richardson of Dewsbury, Yorkshire, England. They met while she was a guest of her brother, future Nobel Prize winning physicist Owen Richardson, then a visiting professor at Princeton. In the spring of 1918 Veblen established a mathematics research laboratory with the army's department of ordnance. It developed new theories of mathematical ballistics for long-range guns and antiaircraft fire. The lab employed sixty mathematicians, including Norbert Wiener, A.A. Bennett and Gilbert Bliss. It also engaged eight women mathematicians who worked as human computers. In 1928 Dean Fine was killed when he was struck by a car while riding a bicycle on a road in the outskirts of Princeton. Veblen largely designed the original Fine Hall, named for the deceased educator. It is an architectural masterpiece with a common room on the first floor on the way to the library. Faculty did not merely have offices, they were given lavish suites to provide a comfortable place to meet and talk with students. Fine Hall served as home to the Princeton mathematics department until 1969 when the growth of faculty and students made it necessary to build a new home, also named Fine Hall. The old building was renamed Jones Hall, to honor the family who had provided the funds for the original building. Veblen began the custom of an afternoon tea at the mathematics department, where faculty and students had the opportunity for informal contacts.

With the exception of 1928-29, when he taught at Oxford as part of an exchange with G.H. Hardy, Veblen remained in the Princeton mathematics department until 1932. That year he helped organize the Institute for Advanced Study at Princeton and became its first professor. He was largely responsible for selecting the other members of the original faculty: James W. Alexander II, Albert Einstein, John von Neumann, and Hermann Weyl. Veblen was instrumental in determining the Institute's policy of concentrating on postdoctoral studies. When he retired from the Institute in 1950 he was selected as

president of the International Congress of Mathematicians.

Veblen worked in topology and established Princeton as one of the world's leading centers for topological research. His *Analysis Situs* (1922) was the first systematic coverage of the basic ideas of topology and contributed to its modern development. In 1905 he gave the first correct proof of the intuitively obvious but extremely difficult Jordan curve theorem. It asserts that a simple closed curve  $C$  in a plane determines two regions, of which  $C$  is the common boundary. One of the regions is bounded and is called the interior of  $C$ ; the other region is the exterior of  $C$ . The difficulty in the argument, which Veblen overcame, is to describe analytically the interior and exterior of a simple closed curve and to show that both are connected sets.

Veblen was one of the foremost theoreticians in abstract geometry in the United States. With the announcement of Einstein's theory of relativity in physics, Veblen took up differential geometry, becoming one of the first developers of generalized affine and projective geometry. His work led to important applications in relativity theory, particularly in atomic physics. His interest in the foundations of geometry resulted in the publication of the standard two-volume textbook *Projective Geometry* (1910-1918), written with John Wesley Young.

In 1957, Veblen and his wife Elizabeth deeded eighty-one acres of the 142-acre Herrontown Woods, where they had their home, to the Mercer County Park System, to be maintained as a wildlife and plant sanctuary with nature trails. The property's solitude provided him with a source of relaxation and he enjoyed strolling through the woods with his colleagues. In his last years, he was partially blind, leading him to develop devices to help him and others with similar reading problems. Veblen died as a

result of a weakened heart in Brookline, Maine, on August 10, 1960. The following year the trustees of the American Mathematical Society established a prize in memory of Veblen, which was funded by the society, his former students and his widow. Since 1964, the award has been known as the Oswald Veblen Prize in Geometry.

**Quotation of the Day:** “Mathematics is terribly individual. Any mathematical act, whether of creation or apprehension, takes place in the deepest recesses of the individual mind.... Mathematical thoughts must nevertheless be communicated to other individuals and assimilated into the body of general knowledge. Otherwise they can hardly be said to exist.” – Oswald Veblen