Douglas, Jesse | Encyclopedia.com

(*b*. New York, N.Y., 3 July 1897; *d*. New York, 7 October 1965)

mathematics.

Douglas became interested in mathematics while he was still a high school student; in his freshman year at the City College of New York he became the youngest person ever to win the college's Belden Medal for excellence in mathematics. He graduated with honors in 1916 and began graduate studies with Edward Kasner at Columbia University. From 1917 to 1920 (in which year he was awarded the doctorate) he also participated in Kasner's seminar in differential geometry; here he developed his love for geometry and first encountered the problem of Plateau.

From 1920 to 1926 Douglas remained at Columbia College, teaching and doing research, primarily in differential geometry. Between 1926 and 1930 he was a National Research fellow at Princeton, Harvard, Chicago, Paris, and Göttingen; during this period he also devised a complete solution to the problem of Plateau, of which the essential features were published in a series of abstracts in the *Bulletin of the American Mathematical Society*, between 1927 and 1930, while a detailed presentation appeared in the *Transactions of the American Mathematical Society* for January 1931. This solution won Douglas the Fields Medal at the International Congress of Mathematicians in Oslo in 1936.

Douglas was appointed to a position at the Massachusetts Institute of Technology in 1930 and taught there until 1936; he was a research fellow at the Institute for Advanced Study at Princeton in the academic year 1938–1939 and received Guggenheim Foundation fellowships for research in analysis and geometry in 1940 and 1941. From 1942 until 1954 he taught at Brooklyn College and at Columbia University, then in 1955 returned to City College, where he spent the rest of his life.

Douglas' work with the problem of Plateau was again rewarded in 1943 when he received the Bôcher Memorial Prize of the American Mathematical Society for his memoirs "Green's Function and the Problem of Plateau" (in *American Journal of Mathematics*, **61** [1939], 545 ff.), "The Most General Form of the Problem of Plateau" (*ibid*., **61** [1939], 590 ff.), and "Solution of the Inverse Problem of the Calculus of Variations" (in *Transactions of the American Mathematical Society*, **50** [1941] 71–128). The problem of Plateau was apparently first posed by Lagrange about 1760, and had occupied many mathematicians—most notably Riemann, Weierstrass, and Schwarz—in the period from 1860 to 1870. The problem is concerned with proving the existence of a surface of least area bounded by a given contour. Prior to Douglas' solution, mathematicians had succeeded in solving a number of special cases, as when, in the nineteenth century, a solution was obtained for a contour that is a skew quadrilateral having a plane of symmetry. Douglas' solution of 1931 is highly generalized; indeed, it is valid when the contour is any continuous, closed, nonintersecting curve whatever (Jordan curve)—it may even be in space of any number of dimensions. (R. Garnier in 1927 and T. Radó in 1930 had succeeded in solving the problem with less generality by using alternative methods.)

Having disposed of the most fundamental instance of the problem of Plateau—a single given contour and a simply connected minimal surface—Douglas went on to consider surfaces bounded by any finite number of contours and to consider surfaces of higher topological structure—as, for example, one-sided surfaces or spherical surfaces with any number of attached handles or any number of perforations. Between 1931 and 1939 he gave solutions to such problems as these and formulated and solved other general forms of the problem.

The problem of Plateau did not represent Douglas' sole mathematical interest, however. In 1941 he published a complete solution of the inverse problem of the calculus of variations for three-dimensional space—a problem unsolved until then, although in 1894 Darboux had stated and solved the problem for the two-dimensional case. In addition to publishing some fifty papers on geometry and analysis, Douglas' work in group theory is notable; in 1951, he made significant contributions to the problem of determining all finite groups on two generators, A and B, which have the property that every group element can be expressed in the form $A^r B^s$, where r and s are integers.

BIBLIOGRAPHY

I. Original Works. *Scripta mathematica*, **4** (1936), 89–90, contains a bibliography of Douglas' publications prior to 1936. A complete bibliography of his works is on file in the mathematics department of the City College of New York.

II. Secondary Literature. Some information on Douglas' life prior to 1936 may be found in *Scripta mathematica*, **4** (1936), 89–90. In the near future the National Academy of Science will publish a biography of Douglas, including a complete bibliography of his publications. An obituary of Douglas can be found in the *New York Herald Tribune* (8 Oct. 1965).

Norman Schaumberger