# Young, William Henry | Encyclopedia.com



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(*b*. London, England, 20 October 1863; *d*. Lausanne, Switzerland, 7 July 1942)

*mathematics*.

Young was the eldest son of Henry Young and Hephzibah Jeal. The Young family had been bankers in the City for some generations. Young went to the City of London School, of which the headmaster, Edwin A. Abbott, author of the mathematical fantasy Flatland, recognized his flair for mathematics. Young entered Peterhouse, Cambridge, in 1881. In the mathematical tripos of 1884 he was expected to be senior wrangler but was placed fourth. In later years he related that he refused to restrict his interests (intellectual and athletic) to the intensive training in mathematics necessary for the highest place in the order of merit. The first books he borrowed from the College library were the works of Moliere. Instead of writing a mathematical essay for a Smith's prize, he competed for and won a prize in theology. He was of Baptist stock and, at Cambridge, was baptized into the Church of England.

Young was a fellow of Peterhouse from 1886 to 1892, but he held no official position in the college or the university. It is surprising that between the ages of twenty-five and thirty-five he did not turn to research, but deliberately set himself to earn a large income and accumulate savings by private teaching of undergraduates from early morning until late at night.

In 1896 Young married Grace Emily, daughter of Henry W. Chisholm. She had taken the mathematical tripos and was ranked equal to a wrangler; as Grace Chisholm Young, she became a mathematician of international reputation. At the end of their first year together, she said, "… he proposed, and I eagerly agreed, to throw up lucre, go abroad, and devote ourselves to research." They lived mainly in Gottingen until 1908 and then in Switzerland, first in Geneva and later in Lausanne.

In striking contrast with most mathematicians, Young did hardly any research until he was over thirty-five, but between 1900 and 1924 he wrote more than two hundred papers. At the turn of the century, the theory of real functions was subject to artificial and unaesthetic restrictions. For instance, the standard process (Riemann's) of reconstructing an integral from its derivative required the continuity of the derivative. In the late 1890's the Paris school, led by Baire and Borel, laid the foundations of an essentially more powerful theory, based on the concept of the measure of a set of points. Lebesgue's famous thesis, "Intégrale, longueur, aire," appeared in 1902. Young, working independently, arrived at a definition of integration,different in form from, but essentially equivalent to, Lebesgue's. He was anticipated by about two years, and it must have been a heavy blow to one who had become conscious of his power to make fundamental discoveries; but he bore the disappointment magnanimously, and himself called the integral that of Lebesgue.Many aspects of the later development are Young's own, notably his method of monotone sequences as used in the Stieltjes integral.

Young showed supreme power in two other fields of analysis. The first is the theory of Fourier series. Inm 1912 he established the connection between th esum of the qth powers of the Fourier constants of a

function f and the integral of $f^p$,where p and q are conjugate indices and q is an even integer . The completion for unrestricted q was achieved after eleven years by Hausdorff. Young proved many other theorems, some of striking simplicity and beauty, about Fourier series and more general orthogonal series. The second filed–in which lay what was probably Young'most fareaching work–was the basic differential calculus of functions of more than one variable. The best tribute to is that, since 1910, every author of an advanced calculus textbook has adopted Young's approach.

Every word and every movement of Young gave evidence of restless vitality. His appearance was striking; after his marriage he grew a beard red in contrast with his dark hair and wore it very long in later years. Of his three sons and three daughters, Professor Laurence Chisholm Young and Dr. Rosalind Cecily Tanner continued their parents' work in pure mathematics. The eldest son was killed flying in France in 1917

Young held part time chairs at Calcutta (1913-1916)and Liverpool (1913-1919), and he was professor at Aberystwyth from 1919 to 1923. More than once electors to a chair passed him over in favor of men less powerful as mathematicians but less exacting as colleagues. He was an honorary doctor of the universities of Calcutta, Geneva, and Strasbourg; and his honors included the Sylvester Medal of the Royal Society (1928). He was president of the International Union of Mathematicians in 1929-1936

When France fell in 1940 he was at Lausanne, cut off from his family,and he had to remain there, unhappy and restive, for the last two years of his life.

# BIBLIOGRAPHY

I. Original Works. Young wrote more than 200 papers; for a list of the most important of them see the obituary notices below, His books are *The First Book of Geometry* (London, 1905), written with Grace Chisholm young, an excellent and original book doubtless composed for the education of their children; *The Theory of Sets of Points* (Cambridge, 1906), written with Grace Chisholm Young and *The Fundamental Theorems of the Differential Calculus* (Cambridge, 1910).

II. Secondary Literature. See *Obituary Notices of Fellows of the royal Society of London*,**3** (1943), 307–323, with portrait; *Journal of the London Mathematical Society*,**17** (1942), 218–237; and *Dictionary of National Biography,1941-1950*(1959), 984–985.

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