

Sir William Rowan Hamilton

This brief bio is culled from a well-known but somewhat over-wrought book, “*Men of Mathematics*”, by E.T. Bell (Simon and Schuster, New York, 1937).

Hamilton was the greatest Irish mathematician of the nineteenth century, and perhaps of all time. He was born in the night of August 3-4 1805, in Dublin, and died September 2, 1865. He was the youngest of three brothers and one sister. His parents died when he was 12 and 14, and he was taken then to live with an uncle, Rev. James Hamilton, the curate of Trim, some 20 miles from the city. Uncle James was an accomplished linguist and had set about transferring that passion to young William.

Hamilton showed great promise when very young. He read English at age 3, and by 5 could translate Latin, Greek and Hebrew. By age 10 he had learned Persian, Arabic, Chaldee and Syrian; Hindustani, Bengali, Malay and others. By age 13 he could claim to have one language for each year he had lived. That was when he became attracted to mathematics, which set his path for the remainder of his life. By age 17 he knew the calculus, read Newton and Lagrange, and was able to calculate eclipses of the sun.

In 1823 he entered Trinity College, Dublin, passing first of 100 candidates on the entrance exam. As an undergraduate he won top honours in both classics and mathematics and wrote part one of his famous paper on rays in optics. In 1827, the Professor of Astronomy resigned to become Bishop of Cloyne. The position was advertised and attracted many candidates including G. B. Airy (who later became Astronomer Royal of England). Such was Hamilton’s reputation that the Governing Board appointed him to the position, even though he had not applied. He spent the rest of his life at Trinity College, or more precisely at the Observatory in Dunsink.

Hamilton was no observer, and he did no astronomy as such. Rather he spent his time working on mathematical physics. His greatest achievements lay in optics and mechanics, where he made major advances. He predicted the existence of conical refraction of light in biaxial crystals, a wholly unexpected phenomenon. He enunciated Hamilton’s principle in mechanics, and developed the Hamilton-Jacobi theory which we will study in this course.

After 1847 he devoted himself to developing the theory and applications of quaternions, which are a generalization of complex numbers to a field with non-commutative algebra, a concept which he invented. A quaternion is a variable of the form

$$z = a + b\mathbf{i} + c\mathbf{j} + d\mathbf{k};$$

where the \mathbf{n} are anti-commuting symbols whose squares are -1 . He hoped that quaternions would do for 3D space what complex numbers do for the plane, but after Einstein all that was replaced by tensor algebra. Apparently Maxwell originally wrote his equations in terms of quaternions, but nowadays very few people study them.

Hamilton was unlucky in his personal life. He was turned down by the first two young women he pursued. Eventually he married a young widow, who was not a strong enough personality to keep his personal life in order. At one stage he was an alcoholic. In later years he became a recluse, shut up in his study. It is reported that after his death they had to sort through massive piles of paper, in which were found untouched but mummified dinner plates he had ignored.