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Inexplicable? The status of complex numbers in Britain, 1750–1850. (English. English summary)

Around Caspar Wessel and the geometric representation of complex numbers (Copenhagen, 1998).

Mat. Medd. Danske Vid. Selsk. **46** (2001), *no.* 2, 147–180.

Complex numbers appeared in several areas of research on the Continent in the first half of the nineteenth century. They were fundamental entities in algebra in the work of Carl Gauss (1777–1855) and others, and they were given the familiar modern geometric representation in the complex plane by Jean Argand (1768–1822) and Gauss. Meanwhile the theory of functions in the complex domain became established as a new branch of analysis in the writings of Gauss, Augustin Cauchy (1789–1857) and Joseph Liouville (1809–1882).

The article under review surveys the study of complex numbers in Britain between 1750 and 1850, a development which took place largely independently of and at a lower level than work on the Continent. In the first half of this period there were debates about the validity of negative and imaginary numbers, discussions somewhat limited in scope but indicative of the state of British mathematics at the time. In the first part of the nineteenth century complex numbers became acceptable within the formal perspective adopted by the algebraist George Peacock (1791–1858). John Warren (1796–1852) in 1828 presented a construction similar to Argand's geometric representation of complex numbers, and John Graves (1806–1870) in 1829 developed a coherent if somewhat idiosyncratic conception of the logarithm of a complex number. In the 1840s William Rowan Hamilton (1805–1865) hit upon the idea of quaternions in an attempt to generalize complex numbers (which he conceived of as ordered pairs) to three dimensions. Although Hamilton rejected Peacock's formalism and required that the objects of algebra exist in a meaningful sense, his invention of the new number system stimulated the development of a more abstract and structural conception of algebra. (Hamilton adhered to a traditional point of view, asserting that he had "discovered" quaternions.) Hamilton's researches were continued by Augustus De Morgan and by Graves and his younger brother Charles Graves (1812–1899).

An important aspect of the work of Peacock and Warren was to place complex numbers within a larger system of mathematics. Rice (pp. 161–162) writes that Warren's paper "marks the genesis of a change in attitude amongst British mathematicians—an attitude completely shared by Peacock—in which the justification of complex numbers is only part of a broader framework which is more concerned with how mathematics can be extended once their use is permitted". *Craig G. Fraser*