

BO1 History of Mathematics  
HT 2020 reading course: The gradual acceptance of complex numbers

Christmas Vacation Reading

The subject of this year's reading course is a topic that we touched upon during the lecture course: the slow acceptance of complex numbers as valid mathematical entities. In particular, we will look at the ways in which some mathematical writers tried to justify the use of complex numbers by providing new geometrical interpretations of them — with such 'concrete' representations available, complex numbers began to seem less exotic, and were gradually accepted into the mathematical mainstream.

In this reading course, we will consider extracts from the writings of John Wallis (1616–1703), Jean-Robert Argand (1768–1822), and William Rowan Hamilton (1805–1865). As you may recall from the lecture course, Wallis provided some of the earliest geometrical interpretations of complex numbers in his *Treatise of algebra* of 1685. Argand is of course famous for the diagram that carries his name, and which he described in an essay of 1806. Finally, we owe to Hamilton the more 'symbolic' representation of complex numbers as pairs of real numbers subject to certain operations, which he introduced in a paper of 1831, published in the *Transactions of the Royal Irish Academy*. Your reading for the course will start from, but will not be limited to, the texts mentioned here: as during the lecture course, the emphasis will be on the use of *original sources* (in translation where necessary). It should be noted that the recommended reading that will appear on the OI course page will represent the bare minimum of reading needed: you will be expected to uncover further material for yourselves, which will then be the subject of discussion during our classes.

As preparation for the reading course, please read biographical material on the various figures mentioned above. A good starting point for this is the MacTutor History of Mathematics Archive <<http://www-history.mcs.st-and.ac.uk/>>, which features short biographies of mathematicians. If you scroll down to the bottom of each biography, you will find a link to further published biographies and other relevant secondary sources, many of which are available electronically through SOLO. You should go beyond the basic MacTutor biographies and explore the available material, particularly if certain parts of it grab your interest. You should be alert to the accuracy (or otherwise) of the materials that you read. We will discuss and compare the sources you have found in the first class of Hilary Term.

As further preparation, you should refresh your memory about the other aspects of the early history of complex numbers that we dealt with in the lecture course. For example, what were the attitudes of figures like Cardano, Bombelli, Harriot, etc.? Beyond Wallis, Argand, and Hamilton, are there any other mathematicians whom you feel should receive attention during the reading course? If so, please come to the first class of Hilary Term with suggestions that you are prepared to defend! A useful resource here (and throughout the reading course) may be the book *An Imaginary Tale* by Paul Nahin (various different editions are available).

Finally, as practice in locating online resources, and as practical preparation for the reading ahead, you should track down the main primary sources that we will be using throughout the reading course, namely:

- John Wallis, *A treatise of algebra, both historical and practical*, London, 1685;
- Jean-Robert Argand, *Essai sur une manière de représenter les quantités imaginaires dans les constructions géométriques*, Paris, 1806; reprinted with additional material by Gauthier-Villars, Paris, 1874; English translation by A. S. Hardy: *Imaginary quantities: their geometrical interpretation*, van Nostrand, New York, 1881;
- William Rowan Hamilton, Theory of conjugate functions, or algebraic couples; with a preliminary and elementary essay on algebra as the science of pure time, *Transactions of the Royal Irish Academy* **17** (1831) 293–423.

All of these are available online, via SOLO or otherwise.