

rapidly came a succession of mathematicians by whom the science of algebra was further developed, and its meaning and objects enlarged, till Newton at last gave it the extent and form which, until quite recent times, it has steadily retained.

This development and enlargement did not, however, remain unchallenged. The new wine could not be kept in the old bottles, and there were some men of eminent attainments who were pre-Harriotites, just as we have had pre-Rafaellites in art. The two most representative men in this reactionary movement were William Frend and Baron Masères. Frend was second wrangler and second Smith's prizeman in 1780. Masères was fourth wrangler and first Chancellor's medallist in 1752, and was afterwards Baron of the Exchequer. The arguments of these men had best be stated in their own words. The following are extracts from the Preface to Frend's "Principles of Algebra," 1796:—

"The first error in teaching the principles of algebra is obvious on perusing a few pages only in the first part of Maclaurin's 'Algebra.' Numbers are there divided into two sorts, positive and negative; and an attempt is made to explain the nature of negative numbers by allusion to book debts and other arts. Now, when a person cannot explain the principles of a science without reference to metaphor, the probability is that he has never thought accurately on the subject."

"To attempt to take a number away from a number less than itself is ridiculous. Yet this is attempted by algebraists who talk of a number less than nothing—of multiplying a negative number into a negative number, and thus producing a positive number—of a number being imaginary. Hence they talk of two roots to every equation of the second order,

and the learner is to try which will succeed in a given equation; they talk of solving an equation which requires two impossible roots to make it soluble; they can find out some impossible numbers which, being multiplied together, produce unity. This is all jargon, at which common sense recoils; but, from its having been once adopted, like many other fignments, it finds the most strenuous supporters among those who love to take things upon trust, and hate the labour of a serious thought."

"Again, we should do worse by writing down any of the above marks without numbers. Thus, $- \times - = +$ is as nonsensical in algebra, as in common language to say, 'Take-away into take-away equals add.'"

In the Preface to the "True Theory of Equations," 1799, also by Frend, we find the following:—

"From the age of Vieta, the father, to this of Masères, the restorer of algebra, many men of the greatest abilities have employed themselves in the pursuit of an idle hypothesis, and have laid down rules not founded in truth, nor of any sort of use in a science admitting in every step the plainest principles of reasoning. If the name of Sir Isaac Newton appears in this list, the number of the advocates for error must be considerable. It is, however, to be recollected that, for a much longer period, men scarcely inferior to Newton in genius, and his equals probably in industry, maintained a variety of positions in philosophy which were overthrown by a more accurate investigation of nature, and if the name of Ptolemy can no longer support his epicycles, nor that of Des Cartes his vortices. Newton's dereliction of the principles of reasoning cannot establish the fallacious notion that every equation has as many roots as it has dimensions."

Masères, in one of his mathematical tracts, speaking of Euler's "Alge-