

ations that are desirable. There is little need to say anything about arithmetic. In this subject there is freedom ; there is no stereotyped system ; the best methods, on the whole, prevail, and the views of particular teachers differ mainly on mere points of detail. But of the mutual relations of arithmetic, algebra and geometry, there is need to say very much, and it will be, perhaps, the best introduction to the subject of this paper to sketch the origin and progress of a great mathematical war that went on, during the last part of eighteenth and the beginning of the nineteenth century, between the supporters of different views as to what algebra really is, and how it is related to arithmetic.

Every one who reads the "Arabian Nights" knows something of the Caliph Haroun Al Raschid and the magnificence of his court. He was not only great in war, but was a zealous promoter of literature and the arts. He opened communications with Charlemagne, and sent him presents—among these a curious water-clock, the description of which shows to what height mechanical skill must have attained in those times. Golden balls fell down at the completion of the hours, and twelve knights came out of as many doors, while the hour was sounded by attendants clashing cymbals. After the death of Al Raschid there was for some time a contest for the succession between Amin and Mamun, two of his sons. Mamun ultimately succeeded, and his reign was the Augustan age of Arabia. Colleges were founded, literature and science were advanced, and, under the auspices of the Caliph, a treatise was written by Mahommed Ben Musa, which he entitled "Al Jebr e al Mokabalah." According to Dr. Rosen, the translator, this means completion and reduction ; according to De Morgan, in the Eng-

lish Cyclopedia, it means restoration and reduction. The words are intended to signify the completion of the square in a quadratic equation and the subsequent determination of the solution. Scarcely anything except the solution of quadratic equations is contained in this treatise, and these equations are applied to answer questions concerning commercial matters and legacies. There are no signs or letters used, and an average section of the treatise is similar to what would now be an attempt to put the solution of a problem in quadratic equations from Hamblin Smith' or Todhunter into plain English words without signs or symbols, but illustrated by a figure of the same kind as those in the Second Book of Euclid.

Far away in India, there were at this time treatises on the same subject, much more advanced, comprising nearly all that is usually read in schools, except the Binomial Theorem, and some things beyond, such as indeterminate equations, not merely of the first, but also of the second degree. But, as these Indian treatises were not known in Europe till comparatively recent times, it is from Ben Musa's work that we derived the name Algebra, and the general characteristics of the science as then understood.

Vieta, who was born in 1540 and died in 1603, after devoting the greater part of his life to public business under Henry III. and Henry IV. of France, turned his attention to mathematics. To him we owe the representation of numbers by letters and the wonderfully increased power given by this notation. Following him, our English mathematician Harriot laid the foundations of the theory of equations, receiving from the Earl of Northumberland a pension of £300 a year to enable him to prosecute his researches. After Harriot