

A LETTER FROM SIR WILLIAM ROWAN HAMILTON.*

OBSERVATORY, DUNSINK,
September 9th, 1856.

My dear Lloyd,

I returned to this place only a week ago, having lingered for a quiet fortnight in Cheltenham, after the business and amusement of the Association week; which with me extended from Monday the 11th, to Saturday the 16th of August, for I was asked to several dinners, after the general meetings had closed, and visited the College and other shew-places such as Lord Northwick's splendid Picture Gallery, during that time. Conceive me shut up and revelling for a fortnight in John Graves's Paradise of Books! of which he has really an astonishingly extensive collection, especially in the curious and mathematical kinds. Such new works from the continent as he has picked up! and such rare old ones too! Besides works of Archimedes and Apollonius, which I had read before, he shewed me the original edition of Copernicus's book *De Revolutionibus*, etc., containing an *apologetic preface* by the Editor, which Graves had not observed; and which, while modestly putting forward the motion of the earth as an *hypothesis*, endeavours to deprecate, by anticipation, the displeasure not of the priests, but of the *philosophers*! for no fear seems to have been as yet entertained of awakening the wrath of the Church; and indeed I believe that the work was dedicated to the Pope of the time, but am not quite sure of this.

To descend to more recent times—though on my way to them I lingered for a good while on a charming folio of the works of Wallis, written in part in English first, but afterwards translated into Latin, for the greater ease of the reader; and including a defence of the Sunday against the Saturday, which latter day has (I believe) still some advocates in Christendom as being the Sabbath of the Bible—I was induced to read some modern German publications, chiefly on the Theory of Numbers, which is a favourite study of John Graves, though I have very little attended to it. I scarcely knew, before I was with him lately, that theorems respecting *real integers* have been extended to imaginary integers, such as $3+7\sqrt{-1}$, under the name of *complex numbers*: and that in this extended view the number 2 (for instance) ceases to be prime, because it is = the product $(1+\sqrt{-1})(1-\sqrt{-1})$; though 3 remains a prime number.

Graves pointed out to me that, in a future theory of INTEGER QUATERNIONS, NO REAL INTEGER WILL CONTINUE TO BE PRIME, because in quaternions

$$w^2 + x^2 + y^2 + z^2 = (w + ix + jy + kz)(w - ix - jy - kz),$$

and every real and positive integer is known to be the sum of four square numbers, 0 included. I delighted him by dashing off a solution of a problem which he had supposed would be found difficult: namely to find the greatest common measure of two proposed quaternions. He named at random $1+2i+3j+4k$, and $5+6i+7j+8k$; and I soon assigned (by a general process) $i-k$ as their greatest common measure, multiplied, it is understood, by ± 1 or $\pm i$ or $\pm j$, or $\pm k$. In his first rapture he exclaimed, "I see that quaternions will do everything!" You will remember that these are *his* words, not mine.

(This sheet happens not to have his signature, William R. Hamilton. His signature is shewn in another letter.)

There is a footnote in the margin on Lord Northwick:

"I happened to be introduced to his Lordship who is now old; and he told me that he well remembered the English Sir William Hamilton in Naples, and shewed me a miniature of Lord Nelson, and a gem of *his* Lady Hamilton."

* We are indebted to Canon Wilson for the privilege of printing this interesting letter. The original is in the Library of Clifton College, the gift of Canon Wilson, sometime Headmaster, to whom it was given by J. R. H. O'Regan, O.C., a grandson of the writer, in 1918. The letter is addressed to Dr. Lloyd, Provost of Trinity College, Dublin.