

minus their scalar product. The change suggested would enable students to gradually accustom themselves to the notation of the calculus, which would in fact then form an abridged notation for the cartesian expressions and operations which enter into physical investigations.

I would ask Prof. Knott to give this suggestion his careful consideration, as I am sanguine enough to believe that in it, simple as it appears, lies the possible reconciliation of the new school of vector analysts with the quaternionists. Possibly some symbol other than S would have, at any rate at first, to be employed for this new scalar product. Perhaps, with Prof. Macfarlane, it might be called the cos-product, though that notation properly belongs to the scalar product of two vectors only, and loses its significance if applied to the scalar product of three or more vectors. No single letter symbol could be better than S, as it is distinctive and quick to write. However, the first question is whether there is any possibility of the modification being adopted.

The quaternionic product of a vector by itself would be minus its scalar square, but without any mystery attached to the fact. For the product of two vectors = vector product - scalar product, and therefore, if the vector product is zero, the quaternionic product = - the scalar product. Hence, instead of having

$$(\alpha + \beta)^2 = \alpha^2 + 2S\alpha\beta + \beta^2,$$

we should have

$$S(\alpha + \beta)^2 = S(\alpha^2 + 2\alpha\beta + \beta^2).$$

Reciprocal vectors satisfy the equation $\beta^{-1}\beta = 1$, so that $S\beta^{-1}\beta = -1$, i.e. β^{-1} , β are oppositely directed vectors.

The quaternion

$$\alpha\beta^{-1} = \frac{\alpha\beta}{\beta^2} = \frac{V\alpha\beta - S\alpha\beta}{-S\beta^2} = -\frac{V\alpha\beta}{S\beta^2} + \frac{S\alpha\beta}{S\beta^2},$$

showing clearly that both the vector and scalar products of $\alpha\beta^{-1}$ are opposite in sign to those of $\alpha\beta$, as must, of course, be the case since β^{-1} and β are oppositely directed vectors. This fact is obscured with the orthodox notation. In fact, so far as I have been able to test the proposed change, I have found no drawbacks, but rather an improvement. ALFRED LODGE.

Sagacity in Horses.

FROM the window opposite, as I write, I have just witnessed an interesting performance on the part of two horses. Bordering the park is a strip of land, doomed to be built upon, but meanwhile lying waste, and used for common pasturage, on which the horses under notice were leisurely grazing. A pony in a cart, having been unwisely left by the owner for a time unattended on the grass, suddenly started off, galloping over the uneven ground at the risk of overturning the cart. The two horses, upon seeing this, immediately joined in pursuit with evident zest. My first supposition, that they were merely joining in the escapade in a frolicsome spirit, was at once disproved by the methodical and business-like manner of their procedure. They soon reached the runaway, by this time on the road, one on one side of the cart, and one the other; then, by regulating their pace, they cleverly contrived to intercept his progress by gradually coming together in advance of him, thus stopping him immediately in the triangular corner they formed. Until the man came up to the pony's head they remained standing thus together quite still; when the two horses, evidently satisfied that all was now right, without any fuss trotted back again together to their grass.

The sagacious conduct of the horses, acting in such perfect cooperation, formed a pretty sight; and it was apparent that, instead of making the pony more excited, they really pacified and calmed him. Why should they not receive "honourable mention" as much as if they were proud human beings?

WILLIAM WHITE.

The Ruskin Museum, Sheffield, June 20.

TERCENTENARY OF THE ADMISSION OF WILLIAM HARVEY TO GONVILLE AND CAIUS COLLEGE, CAMBRIDGE.

BORN at Folkestone, and educated at the King's School, Canterbury, William Harvey was admitted to Gonville and Caius College as a minor scholar in his sixteenth year, on May 31, 1593. The tercentenary of

this event was celebrated by Harvey's College on Wednesday, June 21, this being the earliest day after the date of his admission at which rooms were available for those coming from a distance. The guests were received and welcomed by the Master and Fellows, at five o'clock, in the large Combination Room, where tea was provided. In the smaller adjacent room were exhibited a number of objects of interest connected with Harvey, including his pestle and mortar, from the Museum at Folkestone, a rubbing from his mother's tomb, an autograph letter of Harvey, lent by the Master of Sidney Sussex College, and a coloured drawing of Harvey's coat-of-arms, recently discovered on the walls of the buildings of the University of Padua. The latter was presented to the College by the University of Padua, followed on the day of the festivity by a long congratulatory Latin telegram from the Rector, on behalf of the University, which ran as follows:—"Universitatis Patavinæ quæ cum aliis Britannis discipulis tum Harveio Caioque gloriatur, quorum alterius merita insigne Collegium vestrum i unce recolit nomenque ex altero invenit, festi in Harveii honorem indicti participem se profitetur et in renovanda cum celeberrima Universitate Cantabrigiensi vetere studiorum amicitiaque memoria summo pere lætatur, pro Academico Senatu, Ferraris Rector." Also an autotype of the panel portrait of Harvey from Rolls Park, Chigwell, Essex, presented to the College by Sir Andrew Clark, as one of a series of eight, consisting of a central portrait of Harvey's father, surrounded by those of his seven sons. Some early editions of the works of Harvey and of some of his more immediate predecessors and followers were also displayed, together with the admission book of the College, containing the original record of his admission. At seven o'clock the guests assembled once more in the Combination Room, whence they proceeded to dinner in the College Hall, led by the butler, bearing the original "caduceus," as used by Dr. Caius when President of the College of Physicians. The dinner was presided over by the Master of Gonville and Caius College, the Rev. N. M. Ferrers, D.D., F.R.S., above whose chair were displayed a copy of the bust from the Harvey Memorial, crowned with a laurel wreath, and the much-prized portrait of Harvey from the Master's Lodge. After dinner the Grace Anthem of the College, composed by Mr. C. Wood, was sung. The Master then proposed the usual loyal toasts, after which Sir James Paget proposed the toast of the evening, "The Memory of William Harvey."

He remarked that the reason why he had the honour of being asked to propose that toast was his relationship to his brother, who, he believed, made the proposal that there should be that tercentenary of the admission of William Harvey. He desired to remember that, and to speak as he thought his brother would have spoken if he had had the opportunity. He was sure that if he had been present he would have referred to the honour which was due to the college which Caius founded. He would have done that out of the deep sense of gratitude which he had for the College. For it was the Fellowship founded by Caius that led his brother to the study of medicine, and, on the occasion of that Fellowship which he held becoming vacant, to give himself entirely to it. To that he owed a great part of the happiness of his life, and he hoped he (the speaker) would not be deemed wrong if he said that indirectly he himself was also deeply indebted to Caius College, for it was through the large income which was associated with that Fellowship that his brother was enabled, out of his abundant generosity, to help him greatly in the study of his profession at St. Bartholomew's Hospital, of which Harvey was so great an ornament and honour. He wished that they knew more of the time and the work he did in Caius College. Indirectly Harvey owed to Caius himself the opportunity of being a student of the College. It was not, he thought, known whether Harvey