fundamental equation,

$$v = \frac{v'}{n} \cdot \left\{ n - F' \left(\frac{1}{p'} + \frac{1}{rp'} + \frac{1}{r^2 p'} + \frac{1}{r^3 p'} + \&c. \frac{1}{r^{n-1} p'} \right) . \right\},$$

supposes that the hypothetic thicknesses of the strata of air are equal, which is not true, for they vary as $\frac{\pi - F}{\pi}$. Considering, however, that until the law of variation of temperature of the atmosphere between the stations be determinately known (which will, perhaps, never take place), the barometric formula for heights can only be approximate, it is lawful to employ the said formula as closely approximate, until, however, a more correct one be obtained.

The mathematic error thus noticed escaped Mr. Renny's attention when, six years ago, he gave the formula to Dr. Apjohn. Mr. Renny hopes, at no distant period, to obtain a formula absolutely correct, if not by series, by the integral calculus.

The Secretary of Council read the following communication from Sir William Rowan Hamilton, on an equation of the ellipsoid.

"A remark of your's, recently made, respecting the form in which I first gave to the Academy, in December, 1845, an equation of the ellipsoid by quaternions,—namely, that this form involved only *one* asymptote of the focal hyperbola,—has induced me to examine, simplify, and extend, since I last saw you, some manuscript results of mine on that subject; and the following new form of the equation, which seems to meet your requisitions, may, perhaps, be shewn to the Academy to-night. This new form is the following:

$$\mathrm{TV} \frac{\eta\rho - \rho\theta}{\mathrm{U}(\eta - \theta)} = \theta^2 - \eta^2. \qquad (1)$$

"The constant vectors η and θ are in the directions of the two asymptotes required; their symbolic sum, $\eta + \theta$, is the vector of an umbilic; their difference, $\eta - \theta$, has the direction of a cyclic normal; another umbilicar vector being in the direction of the sum of their reciprocals, $\eta^{-1} + \theta^{-1}$, and another cyclic normal in the direction of the difference of those reciprocals, $\eta^{-1} - \theta^{-1}$. The lengths of the semiaxes of the ellipsoid are expressed as follows:

$$a = \mathrm{T}\eta + \mathrm{T}\theta\,;\ b = \mathrm{T}\,(\eta - \theta)\,;\ c = \mathrm{T}\eta - \mathrm{T}\theta. \tag{2}$$

"The focal ellipse is given by the system of the two equations

$$\mathrm{S}\,.\,\rho\mathrm{U}\eta = \mathrm{S}\,.\,\rho\mathrm{U}\theta\,; \tag{3}$$

and

$$\mathrm{TV}\,.\,\rho\mathrm{U}\eta = 2\mathrm{S}\sqrt{(\eta\theta)}\,; \tag{4}$$

where $\mathrm{TV}\,.\,\rho\mathrm{U}\eta$ may be changed to $\mathrm{TV}\,.\,\rho\mathrm{U}\theta$; and which represent respectively a plane, and a cylinder of revolution. Finally, I shall just add what seems to me remarkable,—though I have met with several similar results in my unpublished researches,—that the focal hyperbola is adequately represented by the *single* equation following:

$$\mathrm{V}\,.\,\eta\rho\,.\,\mathrm{V}\,.\,\rho\theta = (\mathrm{V}\,.\,\eta\theta)^2.\text{''} \tag{5}$$

In the same note to the Secretary, it was requested by Sir William R. Hamilton that the Academy might be informed of a theorem respecting the inscription of certain gauche polygons, in surfaces of the second degree, which he had lately communicated to the Council. This theorem was obtained by the method of quaternions, and included, as a particular case, the following:—"If the first, second, third, and fourth sides of a gauche nonagon, inscribed in a surface of the second order, be respectively parallel to the fifth, sixth, seventh, and eighth sides of that nonagon, and also to the first, second, third, and fourth sides of a gauche quadrilateral, inscribed in the same surface; then the plane containing the first, fifth, and ninth corners of the nonagon will be parallel to the plane