XVI. "On the Lunar-diurnal Magnetic Variation at Toronto." By Major-General Edward Sabine, R.A., D.C.L., Treas. & V.P.R.S. Received June 13, 1856.

(Abstract.)

This paper contains the results of an investigation into the moon's diurnal influence on the horizontal and vertical components of the magnetic force at Toronto, and the consequent deduction of the lunar-diurnal variations of the inclination and of the total force at that station. The observations from which the results were obtained consisted of five years of hourly observation of the bifilar and vertical force magnetometer, ending June 30, 1848, from which the disturbances of largest amount had been separated as described in a paper previously communicated (Phil. Trans. 1856, Art. XV.). The results derived from the mean of the five years are confirmed by the accord which is shown of the means of each of the half-periods into which the observations of the five years are divided for that purpose.

To complete the view of the moon's diurnal influence on the magnetic elements at Toronto, a recalculation has been made of the lunar-diurnal variation of the declination from the mean of *six* years of hourly observation, ending June 30, 1848, employing the more perfect normals derived from the exclusion of the larger disturbances, as described in the paper above referred to (Phil. Trans. Art. XV. 1856); and the confirmation is shown of the mean result of the six years by the accordance of three separate portions of two years each, into which the whole period of six years has been divided for that purpose.

From these premises the author draws the following conclusions:

1. The three magnetic elements concur in showing that the moon exercises a sensible magnetic influence at the surface of the earth, producing in every lunar day a variation which is distinctly appreciable, in each of the three elements, by the instruments adopted and recommended in the Report of the Committee of Physics of the Royal Society, when due care is taken in conducting the observations, and suitable methods are employed in elaborating the results.

2. That the lunar diurnal variation in each of the three elements constitutes a double progression in each lunar day; the declination having two easterly and two westerly maxima, and the inclination and total force each two maxima and two minima between two successive passages of the moon over the astronomical meridian; the variation passing in every case four times through zero in the lunar day. The approximate range of the lunar-diurnal variation at Toronto is $38''$ in the declination, $4''{\cdot}5$ in the inclination, and ·000012 parts of the total force.

3. That the lunar-diurnal variation thus obtained appears to be consistent with the hypothesis that the moon's magnetism is, in great part at least if not wholly, derived by induction from the magnetism of the earth.

4. That there is no appearance in the lunar-diurnal variation of the *decennial* period, which constitutes so marked a feature in the solar diurnal variations.

XVII. "On Autopolar Polyedra." By the Rev. Thomas P. Kirkman, M.A. Communicated by Arthur Cayley, Esq., F.R.S. Received June 19, 1856.

(Abstract.)

An autopolar polyedron is such, that any type or description that can be given of it remains unaltered, when summits are put for faces, and faces for summits. To every β-gon B in it corresponds a β-ace b (or summit b of β edges), which may be called the pole of that β-gon; and to every edge AB, between the α-gon A and the β-gon B, corresponds an edge ab, between the α-ace a and the β-ace b. Two such edges are called a *gamic pair*, or *pair of gamics*.

The enumeration of autopolar p-edra is here entered upon as a step towards the determination of the number of p-edra. The theorems following are established, and shown to be of importance for the solution of the general problem.

Theorem I.—*No polyedron, not a pyramid, has every edge both in a triangle and in a triace.*