Fourth Meeting, February 10, 1893.

JOHN ALISON, Esq., M.A., F.R.S.E., President, in the Chair.

Note on Attraction.

By Professor TAIT.

It is well known (see *Thomson and Tait*, §§ 517, 518) that a spherical shell, whose surface-density is inversely as the cube of the distance from an external point, as well as a solid sphere whose density is inversely as the fifth power of the distance from an external point, are centrobaric. The centre of gravity is, in each case, the "image" of the external point.

To show that these express the same physical truth, we may of course recur to the method of electric images from which they were derived. But we may even more easily prove it by a direct process, for it is obviously only necessary to show that a thin shell, both of whose surfaces give the *same* image of an external point, has everywhere its thickness proportional to the square of the distance from that point.

Call O the object, and I the image, point; and draw any radius-vector *IPQ*, meeting the respective surfaces of the shell in P and Q. Then, ultimately,

$$\mathrm{OQ} - \mathrm{OP} = \mathrm{QP}\cos\mathrm{OPI},$$

or, in the usual notation,

$$\delta\left(\frac{r}{e}\right) = \delta r\cos\mathrm{OPI},$$

whence (introducing the new factor r)

$$r^2\frac{\delta e}{e^2} = \delta r\left(\frac{r}{e} - r\cos\mathrm{OPI}\right) = \delta r\,\mathrm{OI}\cos\mathrm{IOP}.$$

But IOP is equal to the angle between IP and the normal at P, so that the thickness of the shell at P is

$$\delta r\cos\mathrm{IOP} = \frac{r^2\delta e}{\mathrm{OI}.e^2}.$$