

IX. *Extract of a Letter from Dr. Brook Taylor, F. R. S. to Sir Hans Sloan, dated 25. June, 1714. Giving an Account of some Experiments relating to Magnetism.*

AFTER having given an Account of an Experiment made with the large Magnet in the Repository of the *Royal Society*, (which Experiment is described in *Philosoph. Transact.* No. 344. Article 4.) The Letter goes on with the same Subject as follows. -- If it were known what point within the Stone, and what point in the Needle are the Centers of the Magnetical power, it would be easy to find the true powers of the Magnet at all the distances observed. For want of that Knowledge, I have computed the Forces from the Center of the Needle, and the Extremity of the Loadstone, and find, that at the distance of nine Feet, the Power alters faster, than as the Cubes of the distances, whereas at the distances of one and two Feet, the Power alters nearly as their Squares. To try whether the Law, by which the Magnetism alters, could be reduced at all distances to any one certain power of those distances, I sought those points in the Needle and Stone, which being used as the Centers of the power, might have that property. But in that case, I found the Center of the Stone must be carried quite out of its Figure, to make the distances large enough for this purpose. From whence it seems to appear, that the power of  
Magnetism

Magnetism does not alter according to any particular power of the distances, but decreases much faster in the greater distances, than it does in the near ones.

This seems to be confirmed by other Experiments I made. The first Experiment was thus; I made a Needle  $\frac{1}{2}$  of an Inch long, of very fine Steel-wire (a Foot length of which weigh'd but a Grain) which I lengthen'd by sticking a light piece of Rush to it, so that I could observe the Direction of the Needle in all the trials with a *Radius* of two Inches. Instead of a Magnet I used a touch'd Needle of Steel-wire, which I set on a perpendicular to the Horizontal Plane I made the Observations on, by means of a Frame I made to transport it from one place to another; the North end of the Needle being placed downwards, and made a little sharp, that it might mark the Paper it was set upon in every position, by pressing the top of the Needle gently with the Finger. The Observations were made in this manner; after having taken notice of the natural direction of the small Compass Needle, I brought the perpendicular Needle as near to it as I conveniently could, setting it in such a manner, that a Line from the upright Needle to the Center of the Compass might be perpendicular to the Compass Needle. Then observing the same caution (which was convenient to make the Center of the Compass serve sufficiently well to be esteem'd its Center of Power) I placed the upright Needle at several greater distances, every time marking the place in the manner already described, and observing the Variation of the Compass. By this means I got a Curve pretty regularly and fairly drawn by points on the paper. And by examining this  
Curve

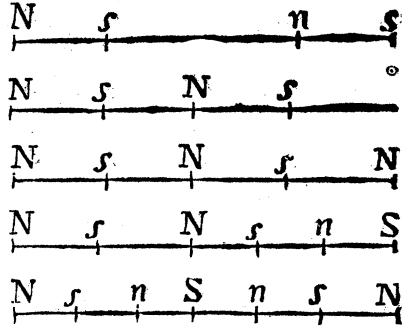
Curve, compared with the Variations of the Compass corresponding to its respective points, I found that the Magnetical power decreased faster at the greater distances than at the nearer. It is of little use to be very particular in the account of the several Observations. I shall only take notice, that at about two Inches and a quarter distance, the Force did not alter so fast as the Squares, and at ten Inches distance (where the Variation was one degree only) it alter'd faster than the Cubes, the Index of the Power being about  $3\frac{1}{4}$ . The Needle of the Compass was so short, that to suppose its Center of Force to be either in the middle or at the extremity of it, would not alter the Index of the Powers of the distances  $\frac{1}{2}$  of an Unite.

I made another Experiment to the same purpose, with a Compass Needle made of a slight piece of Straw, with a small piece of Steel-wire fasten'd to one end of it, which was always kept in the same position, being balanced between two perpendicular Needles, one of which was moveable, and the other fix'd. The Event was much the same as in the former Experiment.

Endeavouring to find the true Poles, or Centers of the magnetical Power in touch'd Needles, I made a Needle of two Inches long, of the fine Steel-wire, which I touch'd with the South point of a small cap Loadstone, applying the point of the Cap only to the Extremity of the Needle, without drawing it along. The Needle so touch'd, being laid gently on the Surface of a stagnant Water, floated. I then applied to it successively the two ends of a touch'd Needle,

Needle, as near as I could, without letting the Needles touch. The result was, that the floating Needle rested under the respective Poles of the other Needle mark'd

with the small Letters *s*, *n*, *s*. So that by one Touch with the Loadstone, which gave the Needle a North-pole at *N*, where it was touch'd, it acquir'd three other Poles, *s*, *n*, *s*, which we may not therefore improperly call its consequential Poles. Having discover'd these consequential Poles, I made some other Experiments



to discover more of the Nature of them, as they are describ'd in the Scheme annexed. The Needles were all of them two Inches long, made of the same fine Steel-wire, and the Letters *N*, or *n*, and *S*, or *s*, denote the Character of North or South belonging to the points mark'd; the great Letters signifying the points the Loadstone was applied to, and the small Letters shewing the consequential Poles.

There are two other Experiments described in the same Letter, relating to the Attraction of Fluids, one of which (*viz.* that of the *Hyperbola*, made by the Surface of the Water between two Glass-planes) being already described in these *Transactions* (No. 336.) we shall only transcribe the Account given of the other.

I took several very thin pieces of Fir-board, and having hung them successively in a convenient manner to a nice pair of Scales, I tried what Weight was

was necessary, (over and above their own, after they had been well soak'd in Water) to separate them at once from the Surface of stagnating Water. I found 50 Grains to separate a Surface of one Inch square; and the Weight in every trial being exactly proportional to the Surface, I was encourag'd to think the Experiment well made. The distance of the under Surface of the Board from the Surface of the stagnating Water, at the time they separated, I found to be  $\frac{1}{100}$  of an Inch; though I believe it would be found greater, if it could be measured at a greater distance from the Edge of the Board, than I could do it, the Water rising a little before it came quite under the Edge of the Board.

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**F I N I S.**

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**L O N D O N:**

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