

rally found to be connected,<sup>6</sup> and have illustrated this law in the case of electrical, magnetical, and chemical polarities. If we regard motion backwards and forwards, to the right and the left, and the like, as *polar* relations, we see that magneto-electric induction gives us a new manifestation of connected polarities.

### *Diamagnetic Polarity.*

But the manifestation of co-existent polarities which are brought into view in this most curious department of nature is not yet exhausted by those which we have described. I have already spoken (chap. iv.) of Dr. Faraday's discovery that there are diamagnetic as well as magnetic bodies; bodies which are repelled by the pole of a magnet, as well as bodies which are attracted. Here is a new opposition of properties. What is the exact definition of this opposition in connexion with other polarities? To this, at present, different philosophers give different answers. Some say that diamagnetism is completely the opposite of ordinary magnetism, or, as Dr. Faraday has termed it for the sake of distinction, of *paramagnetism*. They say that as a north pole of a magnet gives to the neighboring extremity of a piece of soft iron a south pole, so it gives to the neighboring extremity of a piece of bismuth a north pole, and that the bismuth becomes for the time an inverted magnet; and hence, arranges itself across the line of magnetised force, instead of along it. Dr. Faraday himself at first adopted this view;<sup>6</sup> but he now conceives that the bismuth is not made polar, but is simply repelled by the magnet; and that the transverse position which it assumes, arises merely from its elongated form, each end trying to recede as far as possible from the repulsive pole of the magnet.

Several philosophers of great eminence, however, who have examined the subject with great care, adhere to Dr. Faraday's first view of the nature of Diamagnetism—as W. Weber,<sup>7</sup> Plücker, and Mr. Tyndall among ourselves. If we translate this view into the language of Ampère's theory, it comes to this:—that as currents are induced in iron and magnetics parallel to those existing in the inducing magnet or battery wire; so in bismuth, heavy glass, and other diamagnetic bodies, the currents induced are in the contrary directions:—

<sup>6</sup> *Phil. Ind. Sc. B.* v. c. ii.

<sup>6</sup> Faraday's *Researches*, Art. 2429, 2430.

<sup>7</sup> Poggendorf's *Ann. Jou.* 1848.