

all magnetism to electrical currents which lie in a plane at right angles to the axes of the magnet, advanced the ingenious hypothesis that terrestrial magnetism (the magnetic charge of the Earth) was generated by electrical currents, circulating round the planet from east to west; and that the horary variations of the magnetic declination are on this account consequences of the fluctuations of heat, varying with the position of the Sun, by whose action these currents are excited. These views of Ampère have been confirmed by Seebeck's thermo-magnetic experiments, in which differences of temperature of the points of contact of a circle composed of bismuth and copper, or other heterogeneous metals, affect the magnetic needle.

Another recent and brilliant discovery of Faraday's, the notice of which has been of almost simultaneous occurrence with the printing of these pages, throws an unexpected light on the same important subject. While the earlier researches of this great physicist showed that all gases are diamagnetic, *i. e.*, assume a direction from east to west, as bismuth and phosphorus, but that this property is most feebly exhibited in oxygen, it has been shown by his latest researches, which were begun in 1847, that oxygen alone, of all gases, like iron, assumes a position from north to south, and that oxygen gas loses a portion of its paramagnetic force by expansion and by elevation of the temperature. Since the diamagnetic activity of the other constituents of the atmosphere, such as the nitrogen and carbonic acid, are not modified by expansion or by an elevation of temperature, it only remains for us to consider the oxygen, "which surrounds the whole Earth, as it were, like a large sphere of sheet tin, and receives magnetism from it." The half of this sphere which is turned toward the Sun is less paramagnetic than the opposite half; and as the boundaries of these halves are constantly altered by their rotation and revolution round the Sun, Faraday is inclined to refer a portion of the variations of terrestrial magnetism on the Earth's surface to these thermic relations. The assimilation thus shown by experiment to exist between a single gas (oxygen) and iron, is an important discovery of our own age,\* which derives additional value from the fact that oxygen probably constitutes the half of all the ponderable matters

\* Faraday upon atmospheric magnetism, in the *Exper. Researches on Electricity*, series xxv. and xxvi. (*Philos. Transact.* for 1851, part i.) § 2774, 2780, 2881, 2892, 2968, and for the history of the investigation, § 2847.