

gations I have been describing belong to the mechanical side of the subject: but when philosophers have to consider the causes of the secular changes which are found to occur in this mechanical condition, they cannot fail to be driven to electrical, that is, chemical agencies and laws.

I can only allude to Gauss's investigations respecting the *Absolute Measure* of the Earth's Magnetic Force. To determine the ratio of the magnetic force of the earth to that of a known magnet, Poisson proposed to observe the time of vibration of a second magnet. The method of Gauss, now universally adopted, consists in observing the position of equilibrium of the second magnet when deflected by the first.

The manner in which the business of magnetic observation has been taken up by the governments of our time makes this by far the greatest scientific undertaking which the world has ever seen. The result will be that we shall obtain in a few years a knowledge of the magnetic constitution of the earth which otherwise it might have required centuries to accumulate. The secular magnetic changes must still require a long time to reduce to their laws of phenomena, except observation be anticipated or assisted by some happy discovery as to the cause of these changes. But besides the special gain to magnetic science by this great plan of joint action among the nations of the earth, there is thereby a beginning made in the recognition and execution of the duty of forwarding science in general by national exertions. For at most of the magnetic observatories, meteorological observations are also carried on; and such observations, being far more extensive, systematic, and permanent than those which have usually been made, can hardly fail to produce important additions to science. But at any rate they do for science that which nations can do, and individuals cannot; and they seek for scientific truths in a manner suitable to the respect now professed for science and to the progress which its methods have made. Nor are we to overlook the effect of such observations as means of training men in the pursuit of science. "There is amongst us," says one of the magnetic observers, "a growing recognition of the importance, both for science and for practical life, of forming exact observers of nature. Hitherto astronomy alone has afforded a very partial opportunity for the formation of fine observers, of which few could avail themselves. Experience has shown that magnetic observations may serve as excellent training schools in this respect."¹⁸]

¹⁸ *Letter of W. Weber. Brit. Assoc. Rep. 1845, p. 17.*