

from the averaged march for 1917 to 1920, showing that there is a close correspondence between the averaged march for the two consecutive sets of four years—1913 to 1916 and 1917 to 1920. It is well known that a marked eight-yearly periodicity exists between the heliocentric longitudes of the Earth and Venus, and a close four-yearly periodicity between the longitudes of the Earth and of Venus or anti-Venus. This almost proves that the magnetic changes on the Earth are chiefly due to some tidal effect upon the Sun, or matter connected therewith, due to the gravitational effect of the Earth and Venus.

Dr. L. A. Bauer states that in the course of time (say, seventy years) the mean annual variation of terrestrial magnetism (from 140 years' observation in the Northern Hemisphere) changes its phase-angle at the commencement of the year by 180°. This seems to me to point to the planetary forces upon the Sun being able to completely reverse on the Sun either some static condition (such as shape) or the phase at January 0d. of some persistent natural oscillation in the Sun, which oscillation is the means by which the solar effect is sent out into the system. The solar corona seems to indicate the possibility of the Sun being surrounded by an electric field of force. Any change of shape would result in electrical surgings (in any changed condenser), and in the radiation of characteristic electromagnetic waves more or less plane polarized into surrounding space. It is conceivable that these might have a characteristic effect upon any magnetized "receiver" in their path. Any theory involving the passage of electrons from Sun to Earth involves the certainty of slowly increasing the mass of the Earth, which is admittedly slowly increasing by the addition of meteoric masses. In the case of the Sun the effects might balance, but the Earth must grow from both causes. There is no doubt that the amount of energy which runs down into heat in the Earth in the course of such a magnetic storm as that of May, 1921, is very large, and it seems to me rather doubtful if it could be conveyed to the Earth by electronic streams from the Sun unless the streams were either non-divergent or specially directed by the gravitational field between Earth and Sun. Any way, the recognition of a distinct "Earth and Venus relative to Sun" effect in terrestrial magnetism is of great importance, and I think that the Venus effect should be calculable, and so amenable to further investigation.

A regular beat in the solar system, such as that produced by the action of the Earth and Venus, must be in effect balanced by an inverse beat elsewhere in the system—that is, in the perturbations of the other planets and the Sun; also, the action of these two inverse beats must be accompanied by simultaneous beats in the ether or the medium conveying the gravitational force. If changes could be actually observed in the Sun or its radiation corresponding to these beats, then mankind would not be so tempted to suspect or to seek for a direct connection between gravitational energy and magnetic energy in the great laboratory of Nature. Such changes will certainly have to be looked for, and their existence proved or disproved, before we are satisfied, because we are unable in our laboratories to reproduce the conditions existing in the neighbourhood of the Sun—a region traversed radially by intense light radiation, a gravitational field varying with immense rapidity radially, and the ether of which is continuously gaining or losing immense motions in the process of the conversion of potential to kinetic energy or *vice versa*. Lord Kelvin has shown the well-nigh impossibility of our visible Sun being a strong-enough magnet to affect the Earth directly, but it is by no means certain that this applies to the conditions of the ether in the space surrounding the Sun. We have no experience of possible invisible non-material magnets, like we have of transparent matter. It would perhaps be easy to show that the local magnetic effects here are just now correlated with the occurrence of tides on the Sun itself, but correlation does not show necessarily a direct cause and effect, because two effects of the same cause are perfectly correlated with each other, and this applies to Sun-spottedness and terrestrial magnetism; but the establishment of a correlation is always a step in the right direction, and sooner or later leads to the truth of the cause and effect.

NOTE ON RANGE OF DIURNAL INEQUALITY OF HORIZONTAL FORCE.

In the annual report for 1920-21 it was pointed out that the range of the mean monthly diurnal inequality of magnetic horizontal force in the months of April, July, and October was the same for these same months in 1910 and 1920, being 27, 19, 30 γ, very nearly. It was of interest to examine the positions of the planets relative to the Sun in these months.

The approximate heliocentric longitudes on the 15th of these months given in the Nautical Almanac were to the nearest degree :—

		1910.			1920.			Approximate Longitude of Perihelion of Planet.
		April 15.	July 15.	October 15.	April 15.	July 15.	October 15.	
		°	°	°	°	°	°	°
Mercury		72	91	115	260	269	280	75° ±
Venus		243	27	176	334	120	269	129
Earth		205	292	21	205	293	22	100
Mars		110	151	192	208	254	309	333
Jupiter		191	198	205	139	146	153	12
Saturn		26	29	33	160	163	166	90
Uranus		292	293	294	332	333	334	171
Neptune		..	109	..	..	131	..	46 ±