caution given me by the builder of my boat against keeping her in the water when not in use. Brisbane is about twenty-five miles from the full influence of the Pacific, and, to the best of my recollection, the salt water is carried (on the flood) at least thirty miles up the river above the town, when there is no fresh coming down. So far does the salt water indeed extend, that at a time of severe drought (1865-66, I think) it was proposed to bring fresh water for the supply of the town from the principal affluent, the Bremmer, which joins the Brisbane about forty-two miles above the town, as it could not be obtained nearer on account of the high range of the salt flood. It was to have been brought in huge floating tanks towed by a steamer.

ARTHUR NICOLS

PROF. TYNDALL ON THE SPREAD OF DISEASE

PROF. TYNDALL occupied the chair on Saturday night at the concluding lecture of Dr. Corfield's course on the laws of health. The subject of the lecture was "Infectious Diseases." In proposing a vote of thanks, Prof. Tyndall paid a high compliment to the lecturer for the thoroughly sound instruction which he had so clearly conveyed. He had made it plain that contagion consisted, not of gas or vapour, but of definite particles sometimes floating in gas, in the air we breathed, or in the water we drank; and that, like organic seeds in the soil, they multiplied themselves indefinitely in suitable media, the great probability being that these disease-producing particles were living things. A close study of the subject, extending now over several years, enabled him to agree entirely with the lecturer in the parallelism which he had declared to exist between the phenomena of contagious disease and the phenomena of ordinary putrefaction. The case of flies, for example, to which the lecturer ascribed the power of communicating disease from one person to another, was exactly paralleled by phenomena in putrefaction. Chop up a beefsteak, steep it in water, raise the temperature a little above the temperature of the blood, pour off the water, and filter it; you get a perfectly clear liquid; but that liquid placed in a bottle and exposed to the air soon begins to get turbid, and that turbid liquid, under the microscope, is found to be swarming with living organisms. By suitably heating this perfectly clear beef tea, it can be sterilised, everything being killed which is capable of generating those little organisms which produce the turbidity; and by keeping it from coming in contact with the floating particles of the air, it might be preserved transparent for years. He had now some sterilised beef-tea of this sort, which had been preserved for eighteen months in a state of perfect transparency. But if a fly dipped its foot into an adjacent vessel containing some of the turbid fluid, and then into the transparent fluid, that contact would be sufficient to infect the sterilised infusion. In forty-eight hours the clear liquid would be swarming with these living organisms. The quantity of the turbid liquid which attaches itself to the finest needle-point suffices to infect any amount of the infusion just as the vaccine lymph taken up on the point of a surgeon's lancet spreads disease through the whole body. Here, also, as in the case of contagious disease, there was a period of incubation. In proof of what the lecturer had stated that the contagion of these communicable diseases was not gaseous or liquid, but solid particles, he would describe an experiment he had made only a few weeks since. Eighteen months ago he had a chamber prepared from which all floating particles of dust were removed, and in it he placed a number of vessels containing animal and vegetable refuse which soon fell into putrefaction, and also two or three vessels containing perfectly clear beef-tea and mutton broth, as transparent as water, in which the infective particles had been killed by heat. Although all these vessels had stood for eighteen months side by side there had been no communication of contagion from one to the other. The beef tea and mutton-broth remained as transparent as when put in, though the other vessels emitted a most noisome stench. But if a bubble were produced in one of the putrefying masses by blowing into it, and if on rising to the surface and bursting the spray of the bubble was allowed to fall into the transparent beef-tea or mutton-broth, in forty-eight hours it became as bad as its neighbours. It was not therefore sewer gas which did the mischief, but the particles which were carried and scattered by the sewer gas. Referring to another point on which the lecturer had insisted—viz., that there was no power of spontaneous generation of the germs or contagion of diseases, Prof. Tyndall said that, though at present great names were opposed to that view, he would venture to predict that ten years hence there would be very few great names opposed to the lecturer on that matter. With regard to the power of specific contagia to be generated in decomposing animal matter, he would say that for the last twenty-one years he had been in the habit of visiting the upper Alpine valleys, where, amongst the Swiss châlets, there was the most abominable decomposition going on from day to day, and exceedingly bad smells, but there these contagious diseases were entirely unknown. If, however, a person suffering from typhoid fever were transported there, the disease would spread like wildfire from this infected focus, and probably take possession of the entire population. It might be taken, therefore, that any of these special diseases required its special germ or seed for its production, just as you required a grape seed to produce a vine. He entirely agreed with all that the lecturer had stated as to these diseases "breeding true." He never found the virus of small-pox producing typhoid, or *vice versâ*. The subject was one of the most important which could engage the attention of the scientific physician—indeed, Prof. Tyndall doubted whether, in the whole range of medical art and science there was a subject of equal importance. But in dealing practically with this question of infectious disease, the scientific physician must not stand alone—he ought to be aided by the sympathy of an enlightened public. Here, in England, we did not like to be pressed into good behaviour by external influence; and if anything was to come in the way of really great sanitary improvement, it would be from the people themselves. Hence, in a people who were jealous of government interference, it was of primary importance that they should be properly instructed; and he did not exaggerate in the slightest degree in declaring that sound and healthy instruction had been imparted to them in the lecture which they had just heard.

SUSPECTED RELATIONS BETWEEN THE SUN AND THE EARTH

I.

WHEN the telescope first enabled us to scrutinise the solar surface, the spots thereby revealed formed a stumbling-block to some of the early observers, who were unwilling to attribute the smallest taint of imperfection to our luminary. And although the spots came speedily to be recognised as true solar appendages, yet until comparatively recent times they were looked upon as mere scientific curiosities, having no perceptible reference to ourselves, or indeed to anything else.

In the eyes of the last century astronomers the sun shone upon the earth and kept us in leading-strings, and this was an end of the whole matter. But we have now advanced one step beyond the position of those men, inasmuch as we have accumulated evidence tending to show that the physical state of the solar surface affects us in a variety of ways. With regard to some of these we are nearly certain, while with regard to others we are less so; in all we are profoundly interested, but we are not yet fully awake to a true measure of our responsibility or to the necessity of keeping a continuous watch upon the sun. It may perhaps be desirable here to review the somewhat heterogeneous mass of evidence from various quarters which leads us to believe in the existence of these peculiar relations.

SOLAR SPOTS, MAGNETIC DECLINATION, AND AURORAL DISPLAYS.

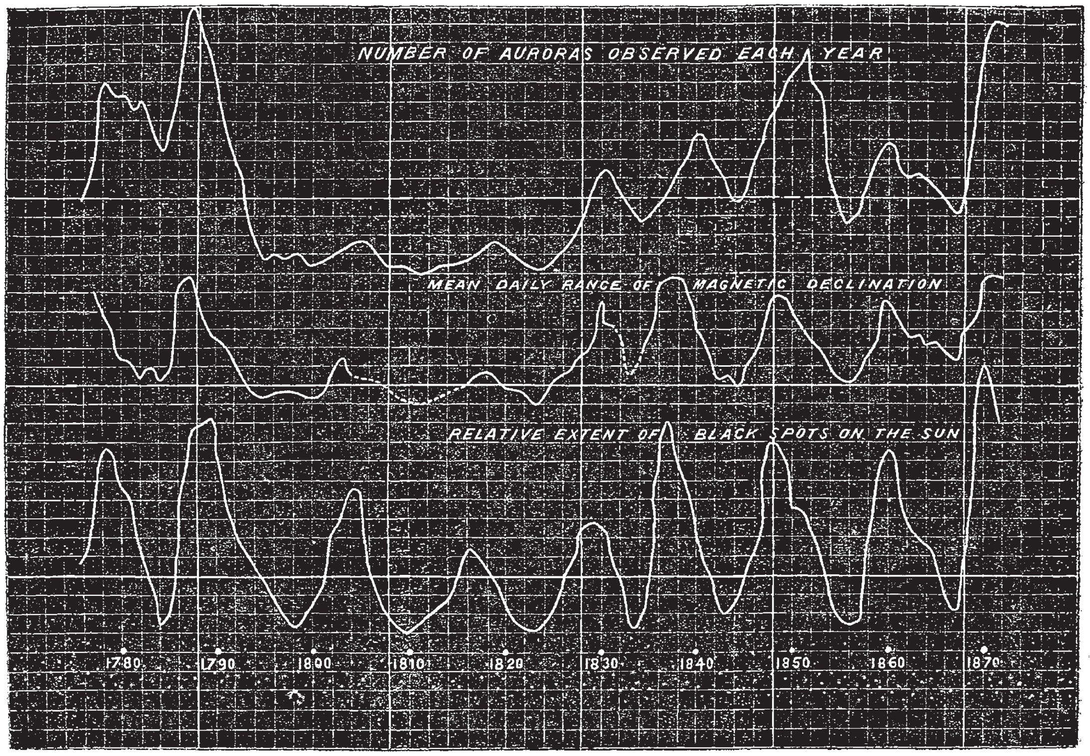


DIAGRAM A

About fifty years ago a careful observer, Hofrath Schwabe, of Dessau, with true Teutonic persistence set himself to observe the sun's surface day after day, and as the result of forty years' observations, he was rewarded by the discovery of a cycle in the frequency of spots. This will be seen from the following table :—

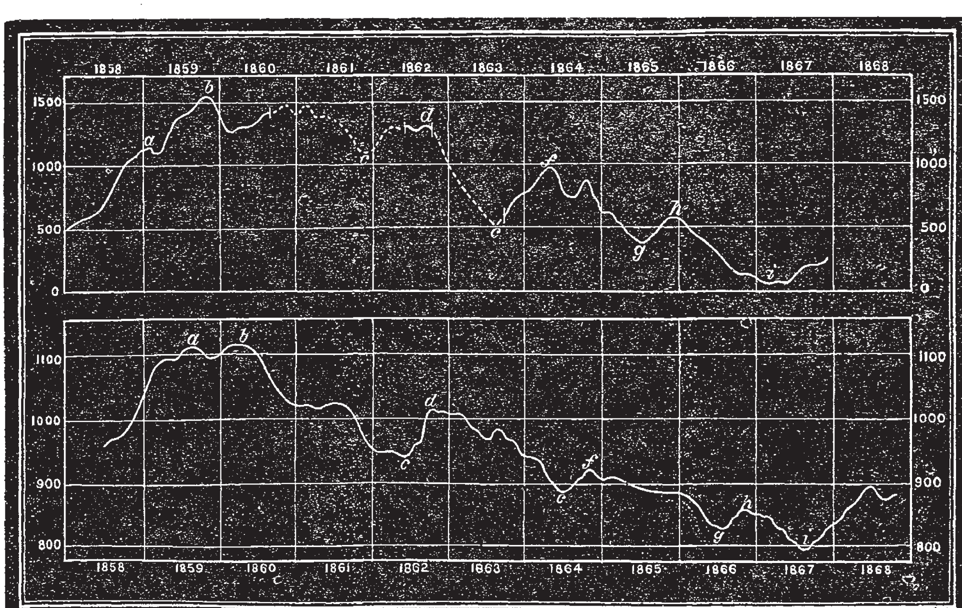


DIAGRAM B.—The upper curve denotes sun-spot fluctuations, the lower curve magnetic fluctuations.

TABLE I.

Number of New Groups of Sun-spots observed each Year. The Observations from 1826 to 1863 were made by Hofrath Schwabe, the others were made at the Kew Observatory.

Year.	No. of new groups.	Year.	No. of new groups.	Year.	No. of new groups.
1826	118	1842	68	1858	188
1827	161	1843	34	1859	205
1828	225	1844	52	1860	210
1829	199	1845	114	1861	204
1830	190	1846	157	1862	160
1831	149	1847	257	1863	124
1832	84	1848	330	1864	113
1833	33	1849	238	1865	93
1834	51	1850	186	1866	45
1835	173	1851	151	1867	17
1836	272	1852	125	1868	115
1837	333	1153	91	1869	224
1838	282	1854	67	1870	403
1839	162	1855	38	1871	271
1840	152	1856	34	1872	186
1841	102	1857	98		

From which it appears that 1828, 1837, 1848, 1860, and 1870 were years of maximum, while 1833, 1843, 1856, and 1867 were years of minimum sun-spot frequency.

While Schwabe was observing the sun with praiseworthy regularity, Sir E. Sabine was likewise observing the magnetism of the earth. A freely suspended magnetic needle is usually thought to be very constant as to the direction in which it points, and this is no doubt quite true as far as large fluctuations are concerned. Nevertheless, between certain small limits it is always in motion—it has, for instance, a well understood oscillation depending upon the hour of the day, besides which it is also liable to irregular fluctuations that occur abruptly. Now Sabine perceived that these abrupt and spasmodical affections of the needle were most frequent in years when sun-spots were most frequent; and, furthermore, inasmuch as these fluctuations of the magnet are almost invariably accompanied with displays of the aurora borealis, he came to the conclusion that auroral displays occur most frequently in years of maximum sun spots. Our readers will no doubt remember the brilliant auroræ of 1870, which was likewise (see Table 1) a year of maximum sun-spot frequency.

What we have said refers to the spasmodical affections of the needle, but its diurnal oscillations are not less dependent on the state of the sun's surface.

Here also we have a maximum amount of fluctuation in years of maximum sun-spot frequency.

This near relation between sun-spots on the one hand, and magnetic oscillations and auroral displays on the other, is exhibited in Diagram A, which has been compiled by Prof. Loomis, the well-known American meteorologist.

Close and striking as is the relation between these three associated phenomena exhibited in the above diagram, the intimacy of this connection may be rendered even more obvious if we confine ourselves to such observations of the solar surface and of magnetic fluctuations as have been made with the greatest possible accuracy.

For this purpose Schwabe's eye-observations are not precise enough, and we must, as far as sun-spots are concerned, make use of some very accurate measurements of the solar spotted area made at Redhill by the late R. C. Carrington, along with the results deduced from the solar photographs taken at the Kew Observatory, under the superintendence of Mr. Warren De La Rue.

Again, as far as magnetic observations are concerned, let us employ the results derived from the self-recording magnetographs at the Kew Observatory.

Furthermore, in order to equalise oscillations of short period, let us plot a solar curve, each point of which represents the mean of nine months' sun-spot observations, and alongside of it a magnetic curve, each point of which similarly represents the mean of nine months' magnetic observations.

A comparison of this kind has been made by the writer of these remarks, the results of which were recently communicated by him to the Royal Society. These results are embodied in Diagram B, in which accurate sun-spot observations are compared with Kew declination ranges, that is to say, with the diurnal oscillations of a magnetic needle, freely suspended at the Kew Observatory.

A comparison of the two curves given above will show us that almost every prominent fluctuation of the sun-spot curve is represented in the magnetic curve, similar letters being employed to denote what appears to be corresponding fluctuations.

There is, however, a greater want of similarity for that part of the solar curve which is dotted, but this represents the results of eye-observations taken by Hofrath Schwabe, while the more accurate Kew photoheliograph was unfortunately out of action.

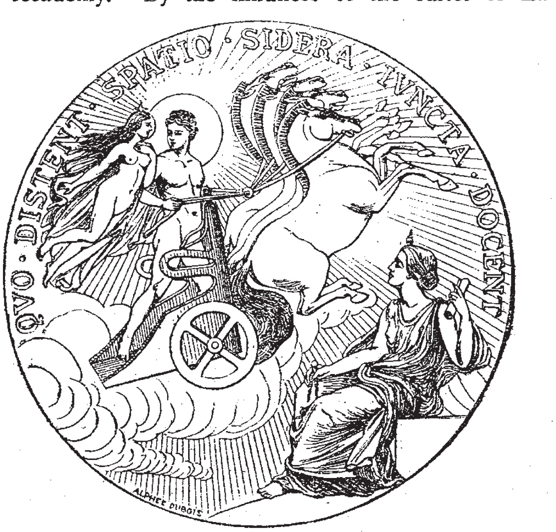
It will be perceived that the magnetic fluctuations invariably follow after or lag behind the corresponding solar fluctuations in point of time, the mean amount of this lagging being probably six months. We may therefore conclude from these comparisons that there is a very close and intimate relation between the physical condition of the sun's surface and the diurnal oscillations of the magnetic needle freely suspended at the Kew Observatory, and also that the former is probably the cause of which the latter is the effect, or at least that the magnetic change lags behind the corresponding solar phenomenon in point of time.

BALFOUR STEWART

(*To be continued.*)

THE FRENCH TRANSIT MEDAL

WE recently announced that the Paris Academy of Sciences had presented an appropriate medal to those Frenchmen who were engaged in observing the recent transit of Venus, as well as to all the members of the Academy. By the kindness of the editor of *La*



Nature we are able to give an illustration of the principal face of this medal, the design being that of the artist M. Alphée Dubois. It will be seen that the artist has had recourse to mythology to represent under a graceful form the important astronomical phenomenon. Venus, in the