original and startling; but it involves a deliberate renunciation of the exercise of reason.

The translation of Prof. Semper's highly entertaining and really valuable and suggestive book has been remarkably well executed. Throughout great care has been taken to give the correct English equivalents for the German names of many obscure animals, and to preserve the sense of the original. At the same time there is not from beginning to end any trace of that awkward diction which sometimes infects a translation from the German. It is not too much to say that it is the best executed translation of a foreign work on science which has appeared for twenty years. E. RAY LANKESTER

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Movements of Plants

FRITZ MÜLLER, in a letter from St. Catharina, Brazil, dated January 9, has given me some remarkable facts about the movements of plants. He has observed striking instances of allied plants, which place their leaves vertically at night, by widely different movements; and this is of interest as supporting the conclusion at which my son Francis and I arrived, namely, that leaves go to sleep in order to escape the full effect of radiation. In the great family of the Gramineæ the species in one genus alone, namely Strephium, are known to sleep, and this they do by the leaves moving vertically upwards; but Fritz Müller finds in a species of Olyra, a genus which in Enlicher's "Genera Plantarum" immediately precedes Strephium, that the leaves bend vertically down at night.

Two species of Phyllanthus (Euphorbiaceæ) grow as weeds near Fritz Müller's house; in one of them with erect branches the leaves bend so as to stand vertically up at night. In the other species with horizontal branches, the leaves move vertically down at night, rotating on their axes, in the same manner as do those of the Leguminous genus Cassia. Owing to this rotation, combined with the sinking movement, the upper surfaces of the opposite leaflets are brought into contact in a dependent position beneath the main petiole; and they are thus excellently protected from radiation, in the manner described by us. On the following morning the leaflets rotate in an opposite direction, whilst rising so as to resume the diurnal horizontal position with their upper surface exposed to the light. Now in some rare cases Fritz Müller has observed the extraordinary fact that three or four, or even almost all the leaflets on one side of a leaf of this Phyllanthus rise in the morning from their nocturnal vertically dependent position into a horizontal one, without rotating, and on the wrong side of the main petiole. These leaflets thus project horizontally with their upper surfaces directed towards the sky, but partly shaded by the leaflets proper to this side. I have never before heard of a plant appearing to make a mistake in its movements; and the mistake in this instance is a great one, for the leaflets move 90° in a direction opposite to the proper one. Fritz Müller adds that the tips of the horizontal branches of this Phyllanthus curl downwards at night, and thus the youngest leaves are still better protected from radiation.

The leaves of some plants, when brightly illuminated, direct their edges towards the light; and this remarkable movement I have called paraheliotropism. Fritz Müller informs me that the leaflets of the Phyllanthus just referred to, as well as those of some Brazilian Cassiæ, "take an almost perfectly vertical position, when at noon, on a summer day, the sun is nearly in the zenith. To-day the leaflets, though continuing to be fully exposed to the sun, now at 3 p.m. have already returned to a nearly horizontal position." F. Müller doubts whether so strongly marked a case of paraheliotropism would ever be observed under the duller skies of England; and this doubt is probably correct, for the leaflets of *Cassia neglecta*, on plants raised from seed formerly sent me by him, moved in this manner, but so slightly that I thought it prudent not to give the case. With several species of Hedychium, a widely-different paraheliotropic movement occurs, which may be compared with that of the leaflets of Oxalis and Averrhoa; for "the lateral halves of the leaves, when exposed to bright sunshine, bend downwards, so that they meet beneath the leaf." CHARLES DARWIN

Down, Beckenham, February 22

Barometric and Solar Cycles

REGARDING one of the conclusions drawn by Mr. F. Chambers in his paper on "Abnormal Variations of the Barometer in the Tropics," and Dr. Balfour Stewart's remarks concerning the same in the first article of NATURE (vol. xxiii. p. 237), I and other meteorologists would like very much to know which side of the earth is to be considered the east, and which the west.

In other words, if waves of high barometer travel slowly from west to east, on what meridian do they commence, and is there any reason why they should commence on one meridian more than on another? The only reason that I can think of is that some meridians embrace more land than others; but in this respect the meridians passing through the centres of America, Europe-Africa, and East Asia-Australia are very much alike. Again, if barometric changes originate, say at St. Helena, and travel slowly eastwards, as Mr. Chambers supposes, they ought after several months to reappear on the meridian from which they started, but Mr. Chambers's paper gives no evidence of this whatever.

Dr. Balfour Stewart says it is unmistakably indicated by all the elements that the connection between the state of the sun's surface and terrestrial meteorology is of such a nature as to imply that the sun is most powerful when there are most spots on his surface. The barometric evidence, however, is all the other way.

Mr. Blanford, following up a suggestion originally made by the present writer, has shown clearly enough that the decennial variation of the height of the barometer has nearly opposite phases in the Indo-Malayan region and in Western Siberia, especially if the winter season, when the pressure is higher over Siberia than in South-Eastern Asia, be considered alone (NATURE, vol. xxi. p. 480). From Mr. Blanford's paper it is clear that the barometrical differences, on which the strength of the winds depends, are greater when the sun-spot area is small than when it is large.

The true relation between the variations of sun-spot area, solar radiation, and barometric pressure will, I feel confident, be soon discovered through the agency of the United States Weather Maps in the manner pointed out by you at page 567, vol. xxi., in discussing the United States Weather Map for July, 1878. It is there shown that in the middle of summer in the last year of minimum sun-spot, the pressure of the air was below the average over all the great continents, and above it over the neighbouring oceans. In India, it is true, the pressure was above the average; but then India is not Asia, but merely a narrow triangular peninsula surrounded on two sides by the ocean, and on the third by a broad zone of snow-covered mountains which may be likened to an oceanic area as far as constancy of temperature is concerned.

Meteorologists will all agree with Dr. Balfour Stewart that "unexceptionable observations of the sun's intrinsic heat-giving power, if these could be obtained, would furnish a more trustworthy instrument of prevision than the sun-spot record." We may soon hope for a nearly continuous series of such observations, for, according to the last published Administration Report of the Indian Meteorological Department, a trustworthy form of actinometer is being sent to Leh, 11,500 feet above the sea, in the dry region of Tibet, where observations will be taken with it under the superintendence of Mr. Ney Elias.

Meantime we may perhaps adopt what is considered by Mr. Blanford the best criterion of the sun's heating power which can be obtained from ordinary meteorological observations, viz. the highest excess of the vacuum black-bulb thermometer above the maximum in shade for each month. At ten stations in India where comparable thermometers have been used since 1875, the mean maximum solar excess has been:—

1875		1876		1877		1878
67°·0	...	67°·2	...	68°·8	...	68°·1