Intra-Mercurial Planets

THE places sent you of the objects which I designated by (*a*) and (*b*) in my observations during the total eclipse on July 29 were derived from the hurried readings of the circles made immediately upon my return from the Eclipse Expedition, in order to be able to answer numerous inquiries addressed to me for information in regard to these observations. Subsequently I made a careful determination, and the readings of the circles and all the data for a definitive reduction of the observations were communicated to astronomers in this country and in Europe. These have probably already come to your knowledge and need not be repeated here.

The only outstanding question in regard to the place of the star which I designated by (*b*), is whether any disturbance of the telescope by the wind is to be feared. The position was marked on the hour circle first, and but a moment was occupied in passing from the eye-piece to the place where this was done. The wind was blowing fresh from a direction south of west, but our telescopes were, as you know, well sheltered by the semi-circular ledge behind which we observed. My own instrument was near the ledge on the west, and was more completely protected than any of the others, and hence it became desirable to know whether any such disturbance of their instruments was noticed by Prof. Newcomb, Commander Sampson, and Lieut. Bowman, who observed near me. Accordingly, I addressed letters to these gentlemen for information upon this point. Prof. Newcomb read the circles of his instrument for a pointing made at about the same instant, which proved to be on a fixed star, and there was no disturbance whatever of the position of his telescope. Lieut. Bowman says that there was no disturbance of his instrument by the wind during the totality, and Commander Sampson says that his assistant, Dr. Dewitt, who pointed for him while using the spectroscope, did not notice any disturbance.

These reports might be regarded as conclusive upon the question which I raised, when I came to reduce the observations, since otherwise the star (*b*) could not be ζ Cancri. If the totality had only lasted a few seconds longer I might have moved out to ζ Cancri, and by observing it also there would have been no uncertainty whatever. But I hardly realised at the time the possibility of there being two planets near the sun, and being sure of one, I gave more attention to it. The record of (*b*) was made just before the sun reappeared. In fact, the sun came out just as I turned to go to the eye-piece again, and anxious to have Prof. Newcomb's telescope also directed on (*a*), I ran across to where he was observing, but his telescope being then directed toward a suspicious object, for which he was reading the circles, it could not be disturbed. Returning to my own instrument it was too late to re-observe (*b*) or to find ζ Cancri, and I could not then determine whether the object observed was a stranger or not. It was very much brighter than I expected to see ζ Cancri, judging from the appearance of δ Cancri, which I had seen in a preceding sweep.

In order to obtain further evidence as to the stability of the instrument, I have made careful experiments with it, clamped as it was then, and I find that the danger feared has no significance whatever. During the present week, also, there have been days when the wind was blowing very strong from the same direction as on the day of the eclipse, and I have placed the telescope in the position as to direction in which it then was, but fully exposed to the wind, and it has remained hours at a time thus exposed without the pointing being sensibly changed. I conclude, therefore, that the object which I designated by (*b*) is also a new star.

I have lately examined, on two mornings, the stars in that part of Cancer, and my recollection of the appearance of the stars (*a*) and (*b*) being still vivid, I have compared, with the same telescope and magnifying power, the stars which I then observed in the vicinity of the sun. The moon shining brightly in the west, and the bright twilight in the east, gave a sky-illumination in some respects similar to that at the totality of the eclipse. By observing when the approaching daylight had extinguished the light of two small stars which I saw on July 29 east of the sun, so that they were just visible in the telescope as they were on that day, I proceeded to compare the light of θ and ζ Cancri. As a result of this examination, I am convinced that I under-estimated the magnitudes at the time. I think that (*a*) must be classed as good fourth magnitude, and (*b*) as third magnitude, if not brighter. JAMES C. WATSON

P.S.—I have begun some calculations, but being pressed just now in the preparation of elements, perturbations, and ephemerides of ten or twelve of the minor planets for the *Berliner Astr. Jahrbuch*, I have not yet progressed very far. It is probable that M. Gaillot will have worked up all the material available for this. J. C. W.

Ann Arbor, September 21

Sun-spots and Weather

IN the last number of NATURE (p. 567) there is a very interesting communication from Mr. Fred. Chambers of Bombay. He shows that the barometric pressure at Bombay when graphically exhibited for a series of years, gives a curve which is very similar to the sun-spot curve, and he remarks that the barometric curve lags behind the sun-spot curve particularly in the years of maximum sun-spots. He argues that the sun is probably hottest at times of maximum sun-spots. I have grounds for thinking that I found traces of a somewhat similar relation in discussing the daily range of the thermometer at Kew Observatory, although the results obtained were not so definite as those of Mr. Fred. Chambers.

When, however, we go from the meteorological to the magnetical influences of the sun we find a very marked and well-known relation between the sun-spot areas and the magnitude of the diurnal range of declination—this diurnal range being unmistakably greater when there are most spots. Here also the lagging behind comes prominently out whatever may be its cause.

Mr. Frederick Chambers quotes the following remark made by me (NATURE, vol. xvii. p. 326):—

"It is nearly, if not absolutely, impossible from observations already made, to tell whether the sun be hotter or colder as a whole when there are most spots on his surface. The sooner we get to know this the better for our problem."

I ought here to mention that in these words I referred more particularly to *direct* observations of the heating effect of our luminary. I ought also to state that the fundamental importance of such observations was impressed upon me by the remarks of a very distinguished physicist, who considers that a persistent and well-organised attempt should be made to determine by means of actinometric observations whether our luminary is in reality of variable heating power.

We know a good deal about sun-spots, although not nearly so much as we ought, but we know next to nothing about the variations (if any) in the direct heating effect of the sun. I can only here repeat what I said before, that "the sooner we get to know this the better for our problem." BALFOUR STEWART

Manchester, September 27

Cyclones and the Winter Gales of Europe

THE following figures may interest some of your readers as a contribution to the theory put forward in NATURE, vol. xvi. p. 505, regarding the meteorological effects of variations in the intensity of solar radiation, and of the consequent changes in terrestrial temperature.

According to this theory, the high temperature which generally coincides with sun-spot minima should have the effect of increasing the steadiness and velocity of the prevailing winds of the globe, whilst, at the opposite epoch of the solar cycle, the weakness and unsteadiness of these currents ought to give rise to heavy rain on the coasts and islands of the tropics, and to facilitate the generation of cyclones, which (as has been shown by Messrs. Blanford and Eliot in the case of the Bay of Bengal), are most probably caused by the condensation of aqueous vapour over the place of its production. If this view of the action of variations in temperature upon the convection currents of the atmosphere be the true one, it follows that the south-westerly gales of Europe should be most frequent and powerful at times when the cyclones of the West Indies are least frequent. This is borne out by the accompanying table, which shows the number of hours in each year during which the wind-velocity in the British Isles exceeded thirty miles, as compared with the number of cyclones in the West Indies, according to Poëy. The figures in the second line are taken from the *Quarterly Weather Reports*, and represent the averages of the annual totals for Valencia, Armagh, Glasgow, Aberdeen, Sandwick, Falmouth, Stonyhurst, and Kew. These are the only stations which give a continuous register for the six years in the table.