

### THE GREAT SUN-SPOT AS SEEN FROM MCGILL COLLEGE.

On Wednesday, November 15th, 1882, I was informed by Prof. McLeod, who had been testing the performance of his telescope preparatory to the observation of the Transit of Venus, that a very large spot was visible on the sun's surface. On Thursday morning I exhibited this to my Astronomy class with a telescope of 2½ inch aperture. Mr. Murray, a member of the class, looking at it in the afternoon, observed that it had undergone a great change in the interval. Learning this, and news arriving from all quarters on Friday, the 17th November, of the extraordinary disturbance of telegraphic communications caused by a violent "magnetic storm," I sent a brief notification to the city papers (which appeared in their Saturday issue, November 18th) of the presence of this spot of unusual size and of the rapid changes it was undergoing, suggesting its possible connection with the "magnetic storm." A subsequent announcement from the Toronto magnetic observatory stated that indications of the "storm" had begun as early as 7 p.m. on Thursday evening. Figures 5 and 6, page 61 showing the spot as seen through the same telescope, with an inverting eye-piece, were sketched on November 18th and 20th respectively.

ALEXANDER JOHNSON

### THE GREAT SUN-SPOT. (Knowledge.)

WE have endeavoured in Fig. 1, page 61, to give a telescopic view of the aspect of the sun with the great spot on it, which has been visible to the naked eye during the last week, whenever the sun's disc has been somewhat dimmed by fog or mist. The actual area of disturbance is almost as large as any single area ever recorded; though no actual umbra of any very extraordinary size is now visible on the sun's face. As will be seen from our picture, the spot—regarding as one the whole penumbral region—has four large umbrae and many smaller ones. We show the spot as it appeared on Monday, seen under very unfavourable atmospheric conditions, our rough sketch being only just finished before the sky clouded over, and the opportunity for further observation was lost. The evidence of disturbance around the spot region was marked. But the faculae around the triple spot which has recently come into view near the eastern edge are even more conspicuous than those around the great region of disturbance, though, within the large penumbral region of disturbance, facular streaks of great splendour can be seen.

We are inclined to believe that the great spot is a phenomenon by no means so independent of the great comet as some of the daily papers have confidently asserted it to be. Professor Kirkwood's theory of the association of a great solar disturbance with meteoric matter following in the train of the great comet of 1843 will here occur to many readers. We shall touch on this later.

Mr. Sydney Hodges has kindly forwarded to us a picture (Fig. 2) of the sun spot, as drawn by him on Nov. 19, at 8 a.m. We have inverted his picture to show the spot as it would have been seen with an erecting eye-piece, so that it may be more readily compared with our own drawing. We give both for comparison. It is singular that Mr. Hodges should have made his drawing, in our hands before last number appeared, to almost exactly the same scale as ours.

The spot at this time was decidedly of a cyclonic appearance, a huge forked tongue lying spirally over the umbra, and all round the larger spot there were shelving "tongues" distinctly seen projected into the blacker umbra.

**SOLAR ENERGY.**—By M. Rey de Morande. (*Comptes rendus*.) The conservation of solar energy seems sufficiently explained by Laplace's theory of the gradual contraction of the sun; the recent investigations which have been made in fossil botany have strengthened this hypothesis still more.

At the time of the first geological explorations in the polar regions, the explorers discovered to their surprise that the coal of these regions was sensibly the same as that of other terrestrial parts; the quantity of heat and light given out by the sun near the poles must therefore have been very nearly equal to that given out near the equator. At that time, Dr. Blandet published in the Bulletin de la Société Géologique de France, his theory, which up to the present has alone accounted for the facts observed, and which is also a necessary consequence of Laplace's theory.

So long as the sun's diameter was sufficiently great to enable it to illuminate and heat at the same time the two terrestrial

poles, there was great uniformity in the investigation of our planet; but this condition of things ceased pretty suddenly at the Cenomanian epoch. At that time first appeared vegetables with decaying leaves, natives of the most northern countries; very slowly, but very surely, the southern regions, and confined the tree-ferns and other primitive plants within a more and more contracted equatorial zone.

The great uniformity of the terrestrial vegetation up to the Cenomanian epoch, and, afterwards, the gradual differentiation of this vegetation, according to the latitude, the gradual encroachment of the meridional regions by trees with caducous leaves and the disappearance of all vegetation in the polar regions are phenomena which may be explained by the gradual cooling of the earth.

The solar energy sustains over the tropical zone the principal vegetable types which were formerly spread over the whole of the terrestrial surface; so that the sun, in consequence of its gradual contraction, still gives out to this zone a quantity of heat which has apparently undergone but little variation since the primary existence of terrestrial vegetables, but which, nevertheless, must subsequently diminish with extreme slowness.

**TOTAL ECLIPSE OF THE SUN IN 1843.**—M. Janssen in a report to the Bureau des longitudes respecting the eclipse which is to take place on the 6th of May, 1853, says that this total eclipse of the sun will have an altogether extraordinary duration due to the respective positions of the sun and moon, positions which are rarely assumed. We ought to take advantage of it in order to clear up certain pending questions, especially the constitution of the sun and of the unexplored spaces which border upon it, as well as the existence of those hypothetical planets which Le Verrier's analysis places on this side of Mercury.

M. Janssen reminds us that during the great Asiatic eclipse of 1868 was discovered the long sought secret of the character of those roseate protuberances which surround in such a singular manner the limb of the eclipsed sun. It was then discovered that those protuberances are only jets, expansions of a layer of gases and vapours from 8" to 12" thick, in which hydrogen predominates and which is at a very high temperature in consequence of its close contact with the sun's surface.

The American eclipse of 1869 enabled us to make the important observation, confirmed on every subsequent occasion, of the inversion of the solar spectrum at the outside edge of the disc.

The eclipses of 1875, 1878 and 1882, have enabled us to unravel pretty rapidly the sun's constitution. But it remains to be determined whether the immense appendices which the corona has presented during some eclipses have an objective reality and are a dependant of that vast coronal atmosphere, or whether they are not rather streams of meteorites revolving round the sun. The relation of the zodiacal light to these appendices of the sun has also to be determined. It is necessary to know whether the regions which we inhabit enclose one or more planets which the illumination of our atmosphere, so vivid in the neighbourhood of the sun, has always concealed from us. Le Verrier had been led by his analytical investigations to suppose their existence, and other observers have seen round and dark bodies in front of the sun; but these observations are by no means to be relied upon.

There are two methods only by which these problems may be solved, viz., by a careful investigation of the solar surface or by an examination of the circum-solar regions, when an eclipse enables us to explore them; the last is the most effective method if the occultation is sufficiently long to allow of a minute examination of all the regions in which the small star may be observed. Now the total eclipse on the 6th of May next, will last for 5'. 59" at the point where the phase is a maximum, this is three times the duration of ordinary eclipses. The central line of the eclipse is wholly comprised within the South Pacific Ocean.

The most suitable islands for the observation of this eclipse are Fiji and the Caroline islands. The duration of the eclipse will be 5'. 33" in the former, and 5'. 20" in the latter.

Among the numerous observations made by M. P. Tacchini during the total eclipse of the sun on the 17th of May, 1882, one of the most remarkable was that on the western side of the corona where was seen a plume which was attributed to a comet whose supposed nucleus at the middle of the total eclipse, i.e., at 20h 31m 37s, was defined by the following coordinates: R A = 3h 35m 16s. and D = +18°. 30'. 17".—Tr. from *Comptes Rendus*