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THE INTRA-MERCURIAL PLANET OR PLANETS

THE question of the existence of one or more planetary bodies revolving within the orbit of Mercury is again revived by Weber's observation of a round black spot just within the sun's eastern limb, on the afternoon of April 4 in the present year which had not been visible on the same morning, and early on the following day had disappeared. The position at $2\frac{3}{4}$ only from this limb is one, where an ordinary spot would not be expected to exhibit a circular outline; and a round black disk, in such a position more especially, must instantly attract the attention of a practised observer. On April 4 clouds unfortunately prevented lengthened observation, and in Weber's notice there is no reference to any perceptible motion during the short time the spot could be watched.

This observation resembles others already upon record, made by persons equally worthy of credit, which it is hardly possible to explain except on the hypothesis that one or more planetary bodies exist with mean distance less than Mercury, the rate of motion where motion has been detected by the most reliable observers, not being consistent with greater distance from the sun. While it is certain that comets with perihelia within the earth's orbit have transited the solar disk, and notwithstanding such transits may have been more frequent than is generally supposed, the appearance of the spots now in question seems, at least in several of the best authenticated cases, to negative any idea of their being due to the passage of comets across the sun, near their nodes. At the same time there are several instances where the form of the spots would perhaps accord better with the assumption of a cometary transit, unless we can admit that the deviation from circular contour is attributable to an optical cause.

It may be remembered that the attention of astronomers was first seriously directed to the possible existence of a planet or planets interior to the orbit of Mercury, by M. Leverrier's announcement that the motion of the perihelion of this planet was not explained by known causes of perturbation, but that an excess of 38 seconds in the century must be admitted beyond the value derived from theory, to produce an agreement between calculation and observation in the discussion of the long series of observed transits across the sun's disk. The unexplained motion of the line of apsides might, as M. Leverrier remarked, be due to the existence of a single interior planet of a mass which would depend upon its mean distance. With a distance of 0.17 (period of revolution, 25.6 days) the mass would be precisely equal to that of Mercury, and it would vary inversely with the distance. Or it might be due to a group of small planets circulating within the orbit of Mercury.

Having before us the whole of the recorded observations of the presence of suspicious spots upon the sun's disk, we shall soon discover that they hardly admit of explanation on the hypothesis of a single planet, even if we assume a small inclination of the orbit of this planet to the ecliptic, a condition which, while it would greatly extend the transit-limits, must at the same time render

the transits so frequent that it is in a high degree improbable the planet could have so long escaped certain detection. Some few of the observations, as just remarked, we may perhaps refer to comets in transit; it remains to endeavour to ascertain from observations not thus explained what period or periods will best represent them, with the view to being warned of the probable times of future transits.

This subject has engaged the attention of M. Leverrier during the last few weeks, or since he became cognisant of Weber's observation last April, the notification of which was long delayed. It appears that the observations of Stark and Steinheil, 1820, February 12, Lescarbault, 1859, March 26, and that of Weber, may refer to the same planetary body if the revolution be supposed 280077 days; this being the sidereal revolution with respect to the node, the synodical period would be 30.33 days; the corresponding mean distance from the sun is 0.18, and the maximum elongation $10\frac{1}{2}$ degrees. Such a planet would again be in conjunction with the sun on October 2nd or 3rd of the present year; and if Lescarbault's observation affords any approximation to the position of the line of nodes would pass across the sun's disk, and for this reason M. Leverrier has directed attention to the importance of a close watch upon the same, during these days, such watch, if possible, to extend to distant meridians, so as to insure pretty continuous observation through the forty-eight hours, Paris time. He has already advised American observatories through Prof. Henry, Secretary of the Smithsonian Institution, and it is to be hoped the chance of making an important discovery at this time, may be made known to observers in the East. It will be seen that the aid of the telegraph is indispensable, in order to secure complete evidence of the existence or non-existence of the hypothetical planet this autumn.

Other observations may be reconciled with a period of similar length, but the planet to which they may be supposed to refer cannot be identical with the above. Thus if Mr. Lummis's sketch of the path of the small round black spot, which he remarked upon the sun at Manchester on the morning of March 20, 1862, is reliable in the hurried and otherwise disadvantageous circumstances under which it was made, the ascending node was almost diametrically opposite to that of Lescarbault's planet, elements which have been attributed to M. Valz and Radau, and exhibiting a near agreement in the position of the line of nodes, being certainly erroneous. Again, one of the most interesting observations bearing upon the existence of an intra-mercurial planet is that made about the end of June or beginning of July 1847 in this country, which can hardly be supposed to refer to either of the objects seen by Lescarbault and Lummis respectively. The exact date of this observation is unfortunately lost beyond recovery.

Mr. B. Scott, the City Chamberlain, observing the sun's disk near London, a short time before sunset late in June or on one of the first days in July, remarked upon it a perfectly circular black disk, and was so confident of the unusual character of the spot that he was on the point of making known his observation through one of the London daily journals on the evening of the same day, when unfortunately an astronomical friend, under the impression that an ordinary spot had been observed, dissuaded Mr. Scott

from so doing. It thus happened that the matter dropped until the announcement in 1860 of Lescarbault's observation on March 26 in the preceding year, when Mr. Scott, in a communication addressed to the *Times*, drew attention to his experience in the summer of 1847. It was then discovered that he had not been the only observer of the strange object. Mr. Wray, the well-known optician, then resident at Whitby, had remarked a small circular black spot upon the sun late one afternoon at the end of June or early in July, though he also had, in 1860, lost the exact date. Both these gentlemen have furnished the writer with every other particular of their observations. That they refer to the same object can hardly be doubted. Mr. Wray had it under observation for forty minutes, when the sun sank into a bank of cloud and was not again visible that day. In this interval the spot appeared to have moved about five minutes of arc, and when last perceived was so near the western limb of the sun that Mr. Wray believes if the cloud had not interfered, in about ten minutes he would have witnessed the egress. This circular spot, the diameter of which he judged to be about six seconds of arc, was not visible early on the following morning, though other spots of ordinary form which were present on the disk remained nearly unchanged. Mr. Scott was observing with a refractor of about $4\frac{1}{2}$ inches aperture, Mr. Wray with a fine 6-foot Newtonian reflector of equal aperture, which he was employing at the time in a study of the varying aspect of the solar spots. Notwithstanding the unfortunate loss of the date of these observations, such particulars as are available are still of value as certifying the existence of such objects in transit; there is no observation of the kind resting upon more excellent authority.

A letter from Prof. Heis, of Münster, the author of the "Atlas Cælestis Nova," received while closing these remarks, gives full details respecting Weber's observation. The spot was intensely black, perfectly round, and smaller than the planet Mercury in transit. Prof. Heis expresses the utmost confidence in this observation by his friend, who has long been accustomed to examine the solar disk.

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UNIVERSITY COLLEGE, BRISTOL

WE have been able to keep our readers informed of the various steps which have been taken to bring to fruition the movement which was commenced about three years ago to establish in Bristol an institution for University education. This movement, we are glad to say, has been so far successful that a beginning is to be made on Tuesday week, October 10; on that day commences the first term of the first session of what will be henceforth known as University College, Bristol. From the first it was sought to make the proposed institution something more than a mere "technical" college. All along it has been kept in view that the only really liberal training is one in which all the faculties of man are drawn out harmoniously and equally, in which a broad basis for future special work is laid, by education in all the great departments of human knowledge. The Bristol institution is not to be a mere special college, it is to be a University. Prof. Jowett, at the meeting held in June, 1874, struck the right note when he said: "The distinction he would draw between liberal education and merely

technical education was this—the one comprehended the other; it was the other, with something added to it, carried on in a higher spirit; it was the one pursued not merely for the sake of getting on in the profession, or making a man an engineer, or a miner, or a doctor, but for the sake of the improvement of the mind. No man will be a first-rate physician or engineer who is not something more than either." The first programme of the classes of this new college is certainly a modest one so far as extent is concerned, but it comprehends all the elements of a liberal education—literature, science, and art. In science there will be instruction in chemistry, physics, zoology, botany, geology, mathematics and applied mechanics, and political economy; in literature, classes for modern history and literature; and in art (for evening classes at least) geometrical and mechanical drawing. In all these branches professors or lecturers have already been appointed, but the programme contains other subjects—classical languages and literature, modern languages, and textile industries—to which no appointments have yet been made, but which will no doubt be filled up as soon as circumstances permit. Affiliated to the Bristol College, moreover, is the old-established Bristol Medical School, for which new buildings will be erected, and on which, we believe, the new institution will have a stimulating and liberalising effect. The principal work of the college will of course be carried on during the day by means of lectures and laboratory work, but we are also glad to see that the directors have resolved to follow from the first the excellent example of Owens College, Manchester, by establishing evening classes for those who are unable to take advantage of the day classes.

Altogether the originators of this movement and the Council of the College are to be congratulated on the fair start they have made, and if they continue as they have begun, we cannot doubt that in no long time University College, Bristol, will become as great and as firmly-established a centre of culture as the Owens College, Manchester. But in the meantime the great want of the new institution is money. Owens College, Manchester, has received many liberal donations since John Owens left his 100,000*l.* for the endowment of professorships, and by these gifts it has been enabled to develop wonderfully. But even Owens College feels itself hampered from want of sufficient funds, and now with justice advances its claims to government endowment. The originators of the movement which has just reached a successful culmination in Bristol calculated that they could not make a beginning without a capital sum of 25,000*l.*, and an annual subscription of 3,000*l.* for five years. They have received many liberal donations and subscriptions, and have obtained so nearly all that they thought was required, that they have felt authorised in making a beginning. From the first Balliol and New Colleges promised 300*l.* a year each for five years. A good many donors, individuals, firms, and companies have given 1,000*l.* each, and many subscriptions of smaller sums have poured in. The Clothworkers Company have offered a handsome subscription, on condition that means are taken to promote technical education in the West of England clothmaking districts, and as we have said, "Textile Industries" is put down as one of the lectureships to be filled up. We hope, however,