

Popular Science Monthly/Volume 13/October 1878/The Planet Vulcan

From Wikisource

< Popular Science Monthly | Volume 13 | October 1878

THE PLANET VULCAN.

BY PROFESSOR DANIEL KIRKWOOD.

THE discovery of an intra-Mercurial planet during the total eclipse of July 29, 1878, has given new importance to any previous speculations on the question of its existence. A brief historical review of the subject will not be without interest.

In an article by the writer, "On the Probable Existence of Undiscovered Planets," written immediately after the discovery of Neptune, and published in the *Literary Record and Journal of the Linnæan Association of Pennsylvania College*,^[1] the question was thus considered:

"The distance from the centre of Jupiter to the nearest satellite is about three times the equatorial diameter of the primary. If, therefore, we suppose the distance of the nearest primary planet to have the same ratio to the diameter of the sun, the orbit of such planet will be somewhat less than 3,000,000 miles from the sun's centre. Consequently, in the interval of 37,000,000 miles there may be four planets, the orbit of the nearest having the dimensions above stated, and their respective distances increasing in the ratio of Mercury's distance to that of Venus. Such bodies, however, in consequence of their nearness to the sun, could hardly be detected except in transiting the solar disk."

It is well known that the disturbing influence of the other planets causes an advance in the position of Mercury's perihelion. In a century this change amounts to 10' 43," which, according to Leverrier, is 38" more than can be accounted for by the influence of the known planets. This great astronomer inferred, therefore, that a planet, or possibly a zone of extremely small asteroids, must exist within the orbit of Mercury.

The conclusions of Leverrier were communicated to the French Academy in the autumn of 1859. Soon after their publication Dr. Lescarbault, an amateur astronomer as well as a medical practitioner of Orgères, some forty miles southwest of Paris, announced that, on March 26, 1859, he had observed the passage of a dark circular spot across the sun's disk, which he thought might have been the transit of an intra-Mercurial planet. He stated further that he had delayed the publication of the fact in the hope of obtaining confirmatory observations. On the appearance of this statement Leverrier at once determined to seek an interview with the observer, in order to test the truth of his discovery. With the details of this interview the public is familiar. After a thorough examination of Lescarbault's original memoranda, as well as of his instruments and methods of observation, Leverrier was satisfied that the amateur astronomer of Orgères had really observed the transit of an intra-Mercurial planet. From the notes furnished by Lescarbault, the director of the Paris Observatory estimated the period of the planet at nineteen days seventeen hours; its mean distance

from the sun, 13,000,000 miles; the inclination of its orbit, $12^{\circ} 10'$; and the greatest elongation of the body from the sun, 8° . The apparent magnitude of the solar disk, as seen from Vulcan's estimated distance, is fifty times greater than as seen from the earth.

The sun was again watched during the last days of March in 1860 and 1861, in the hope of reobserving the new member of the system. The search, however, was unsuccessful until March 20, 1862, when Mr. Lummis, of Manchester, England, between eight and nine o'clock A. M., observed a perfectly round spot moving across the sun. Having satisfied himself of the spot's rapid motion, he called a friend, who also noticed its planetary appearance. From these imperfect observations two French astronomers, MM. Valz and Radau, computed elements of the planet: the former assigning it a period of seventeen days thirteen hours; the latter, one of nineteen days twenty-two hours. From 1862 to 1878 the planet was not seen, or at least no observation was well authenticated. The transit of Mercury, however, on May 6, 1878, afforded new evidence of the truth of Leverrier's theory that Mercury's motion is disturbed either by a planet or a zone of planetary matter within his orbit.

We must now refer to a very unpleasant incident in the history of this interesting discovery. This is nothing less than the charge, by an eminent astronomer, that the observations and measurements claimed by Dr. Lescarbault were a pure fabrication. M. Liais, a French astronomer employed at Rio Janeiro by the Brazilian Government, claimed to have been engaged in an examination of the sun's surface with a telescope of twice the power of Dr. Lescarbault's, at the very time of the latter's alleged discovery of the planet. M. Liais says, therefore, that "he is in a condition to deny, in the most positive manner, the passage of a planet over the sun at the time indicated." The weight of this negative testimony has, perhaps, been over-estimated; and Lescarbault, who for eighteen years has quietly submitted to the charge of falsehood and dishonesty, may perhaps yet retort that, if M. Liais was examining the sun at the time referred to, his merit as an observer cannot be highly rated.

But the astronomer of Brazil did not stop with denying the truth of Lescarbault's observations. He boldly called in question the conclusion derived by Leverrier himself from a laborious discussion of the observed transits of Mercury. It now appears, however, that in this case also his position was most unfortunately taken.

It has been frequently said that if an intra-Mercurial planet exist, of any considerable magnitude, it ought to be visible during total eclipses of the sun. But who has not remarked the difficulty of finding a small or faint object when we know not where to look for it, and how easily it may be found when its position has been once pointed out? Mitchel's detection of the companion of Antares and Clark's discovery of that of Sirius are cases in point. Fortunately, however, neither argument nor explanation is any longer necessary. The new planet was undoubtedly seen during the total eclipse of July 29, 1878, by two astronomers, Prof. James C. Watson, director of the Ann Arbor Observatory, and Mr. Lewis Swift, of Rochester, New York. The former is the discoverer of more than twenty asteroids; the latter is an amateur, who has detected several new comets. Prof. Watson was stationed at Separation, Wyoming Territory.

The planet was not found by him till half the time of totality was past. It was about $2\frac{1}{2}^{\circ}$

southwest of the sun, and appeared about as bright as a $4\frac{1}{2}$ magnitude star. Mr. Swift,

who selected a position near Denver, Colorado, took with him his excellent comet-seeker for the special purpose of searching for intra-Mercurial planets. Two stars were seen by him at the estimated distance of 3° southwest of the sun. They were of the

same magnitude—about the fifth—and at a distance apart of six or seven minutes. A straight line drawn through them pointed very nearly to the sun's centre. Mr. Swift supposed one of the stars to be Theta Caneri. The other was doubtless the planet observed by Prof. Watson, although the estimated distance from the sun was somewhat greater. Both observers describe it as a *red* star. According to Prof. Watson, "it shone with an intensely ruddy light, and it certainly had a disk larger than the spurious disk of a star." Its appearance in the telescope indicated that it was approaching its superior conjunction, or, in other words, was situated beyond the sun.

The distance of Vulcan from the centre of the system, though still uncertain, is supposed to be about one-seventh that of the earth. If this estimate be nearly correct, the solar light and heat at its surface must be about fifty times greater than at the surface of the earth. The corresponding period is nearly twenty days. In other words, Vulcan's year is believed to be less than three weeks in length. The sun is twenty-five days in completing its axial rotation; so that in the new planet we have probably another instance in which, as in the case of the inner satellite of Mars, a planetary body performs its orbital revolution in less time than is occupied by the central orb in completing its rotation. Again, as seen from the sun's surface, all the old planets rise in the east and set in the west. But this is reversed in the case of Vulcan. It rises in the west, and, after having been fifty-seven days above the horizon of any point in which the plane of its orbit intersects the sun's surface, must set in the east.

But it is useless to speculate in regard to the elements of this planet's orbit, its magnitude, physical constitution, etc. It ought certainly to be found near its greatest elongation by some of the powerful telescopes now in use. When so detected a few observations will furnish data for the complete determination of its period and distance, together with the form and inclination of its orbit.

The interesting observations of Prof. Watson and Mr. Swift will not only stimulate astronomers to renewed search for the planet so fortunately detected, but must lead also to a more thorough examination of the space within Mercury's orbit. It is not improbable that the detection of Vulcan may be merely the first in a series of similar discoveries.^[2] The solar disk will doubtless be closely watched about February 11th-17th, March 19th-27th, and October 1st-14th, as it has been claimed that at these epochs small round spots have been seen passing across the sun. In short, the prospect of planetary discoveries in this part of the system is at present more hopeful than in the space beyond the orbit of Neptune.



1. Vol. iii., April, 1847, p. 131.
2. It has frequently been noticed that astronomical discoveries occur in clusters, separated by intervals comparatively fruitless in great results or important observations. Thus, from the epoch of Cassini's discoveries to that of Sir William Herschel's—nearly a century—no new planets, primary or secondary, were added to our system.

Retrieved from "https://en.wikisource.org/w/index.php?"

title=Popular_Science_Monthly/Volume_13/October_1878/The_Planet_Vulcan&oldid=5635905"

Categories: Popular Science Monthly Volume 13 | Planetary astronomy articles in Popular Science Monthly

- This page was last edited on 23 August 2015, at 23:47.
- Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy.