

AN UNIDENTIFIED OBJECT NEAR JUPITER, PROBABLY
A NEW SATELLITE

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An unidentified object of nineteenth magnitude was photographed on the night of September 28, 1951, with the 100-inch telescope on Mount Wilson. During that night Jupiter's faint satellites were being photographed to obtain accurate positions of them. Upon request, Dr. P. Musen of the Cincinnati Observatory had kindly furnished ephemeris positions of JX and JXI, and an ephemeris of JIX by Dr. Samuel Herrick of the University of California in Los Angeles was available.¹ The location of JVIII was not known. After the regions of the three faint satellites, IX, X, and XI, had all been photographed, there was still time for another pair of exposures before Jupiter was too low to observe.

Duplicate exposures were made on the field to the east of Jupiter which overlapped the field of JX that had been taken earlier in the night. Plates 8×10 inches, $54' \times 68'$, were being used. As soon as these plates were developed and while still wet, they were scanned with a low-power magnifying glass. Since the motion of JX had been set off during the exposure, the star images were all elongated about half a millimeter. It was, therefore, easy to scan the plates for small circular images. Two were found, one on the far eastern end of the plate and another of about the same magnitude $35'$ to the west, that is, nearer to Jupiter. Neither image showed any elongation, indicating that both objects were moving like Jupiter. The duplicate exposures checked the reality of the images. The two plates which had been taken about four hours earlier that night were examined at once and images of both objects were found on them. The eastern one of the two objects, which was very close to the ephemeris place of JX, was thought to be that satellite, and the western one was suspected of being a new satellite. Because each of these objects was nearly two magnitudes fainter than JVIII, neither could be identified with it, although the position of JVIII was not known.

After a few hours' sleep, while the plates were drying, I studied

the western object more carefully. It was found to be two minutes of time east of Jupiter and moving eastward relative to Jupiter at the rate of about five seconds a day. This is almost the exact mean motion of satellites VI, VII, and X when at that distance from Jupiter, definitely faster than the outer satellites VIII, IX, and XI. It therefore seemed probable that this object was a satellite of Jupiter.

Dr. L. E. Cunningham of the University of California in Berkeley, who had been observing with the 60-inch telescope that night and whose program extended for three more nights, obtained photographs of the object on each of the three nights and on the last night also photographed the regions of JIX, X, and XI. On the morning of October 4, Dr. Pettit, who was then observing with the 100-inch, let me have the telescope for an additional observation. Preliminary measures of the plates obtained that night and of those taken by Cunningham showed that the western object was slowly decreasing its rate of motion relative to Jupiter. This is an important test. A satellite moving away from Jupiter must slow down and one moving toward Jupiter must speed up. It is highly improbable that an asteroid that happens to be nearly in line with Jupiter and moving with it near opposition will also fulfill this requirement for a satellite. When these checks had been made the object was announced² as probably a new satellite of Jupiter. There was a faint asteroid about 14' from it moving westward about twice as fast as Jupiter. At opposition the average asteroids can be easily identified by their motions and are no more likely to be mistaken for a satellite than a faint star would be. The elimination of asteroids as possible satellites is more difficult when photographed a month or two from opposition.

When *Harvard Announcement Card* 1147 reached the Cincinnati Observatory, Dr. P. Musen saw that the object reported there was moving in the orbit plane of JX and notified me at once. Until then the eastern object which, because of its proximity to the ephemeris, had been assumed to be JX, had not been checked carefully. When this was done, it was at once evident that the eastern object could not be JX because it was moving across the path of JX and toward Jupiter instead of away from it. The western object reported in *H.A.C.* 1147 as probably a new satel-

lite was therefore actually JX, nearly twenty days behind schedule, and the eastern object was the unidentified one.

Added in proof.—Additional observations³ on October 24 and on November 2 indicated that the new object was almost certainly a satellite of Jupiter, and orbits by Herrick⁴ and by Cunningham confirmed the identification. The orbit, although still not accurately determined because of the short arc, shows that the new satellite, JXII, moves around Jupiter in the retrograde direction with a period greater than 600 days. This identifies it as one of the outer group of satellites, which includes JVIII, IX, and XI. These satellites are, in the mean, about 14,000,000 miles from Jupiter, twice as distant as the group which includes JVI, VII, and X.

¹ *Pub. A.S.P.*, **63**, 88, 1951.

² *Harvard Announcement Card* 1147.

³ *H.A.C.* 1154 and 1155.

⁴ *H.A.C.* 1156.