TWO NEW SATELLITES OF JUPITER

By Seth B. Nicholson

A photographic survey of the region around Jupiter made with the 100-inch reflector resulted in the discovery of two new satellites. The survey covered about ten square degrees and consisted of sixteen partially overlapping fields which extended three degrees east and west and a degree and a quarter to the north and south of Jupiter. The exposures were one hour each on 8×10-inch plates (54′ × 68′) and reached magnitude 20 over most of that area. The survey was completed from July 27 to August 1 except for two fields, which were photographed on August 25, and six additional fields, three on each side of Jupiter, which were photographed on July 5 and 6 to record any satellites that would have been hidden in the glare near Jupiter when the principal survey was made three weeks later. Jupiter's motion was allowed for in the guiding so that the images of its satellites were nearly circular while those of the stars were elongated.

On these plates images of about forty moving objects were found, most of which could easily be distinguished from satellites because their motions were so different from that of Jupiter. The images of J VI and J VII were identified by their ephemerides in the *American Ephemeris and Nautical Almanac*. J VI and J VII were about two days and fourteen days, respectively, ahead of their ephemeris positions. The image of J VIII was identified with the aid of the ephemeris by Hans G. Hertz in *Harvard College Announcement Card*, No. 451, the corrections to which were found to be one minute larger in right ascension and eight minutes larger in declination than those anticipated by Hertz. No ephemeris of J IX was computed until after the survey had been completed so that the rediscovery of that satellite, which had not been observed for ten years, served as a check on the completeness of the survey.

In addition to the satellites for which positions were available six other objects were found, moving with approximately the same rate and direction as Jupiter. These were followed

until their accelerations identified three of them as satellites and three as asteroids.

One of the three satellites was readily identified as J IX by an ephemeris computed from the elements of its mean orbit.[1] The satellite was fifteen days ahead of its ephemeris position. J VIII was about forty days ahead of its position computed from similar mean elements.[2] Attention should be called to an error in the mean elements of J VIII as given in the reference cited, where the value of ω should read 166° instead of 136°.

One of the new satellites, J X, was first photographed on July 6; the other, J XI, on July 30, first in the same field with J VII and again an hour later in the same field with J IX, the identity of which was at that time unknown. One of the slowly moving objects was near J VIII on July 27 and was reported in *Announcement Card* No. 453 as "probably an asteroid." Later observations proved that this provisional identification was correct. Another of the three asteroids moving with approximately the same motion as Jupiter was 27′ north of J X; the third was $7^m.2$ east and 44′ south of Jupiter.

The new satellites are both about nineteenth magnitude, approximately the same brightness as J IX. Perhaps the most surprising result of the survey was that no fainter satellites were found, since satellites a magnitude fainter should have been recorded in the central region of the plates. The period of J X is apparently about 270 days, like the periods of J VI and J VII. The period of J XI is not obvious from an inspection of the observations, and no orbit is yet available. Its position and motion indicate a period longer than that of J X, but unless its orbit is very eccentric and the satellite is near peri-jove the period must be shorter than the periods of J VIII and J IX, which are about two years. The approximate positions of J IX, J X, and J XI relative to Jupiter were:

	J IX		J X		J XI	
1938	α	δ	α	δ	α	δ
July 6	.....	.....	$-0^m.5$	+30′	.....	.....
July 30	$+4^m.7$	+53′	−2.8	+21	$+6^m.4$	+24′
Aug. 25	+3.1	+52	−4.5	+ 6	+6.1	+11

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[1] *Publ. A.S.P.*, **39**, 242, 1927. [2] *Ibid.*