NOTES FROM PACIFIC COAST OBSERVATORIES.

DISCOVERY OF THE NINTH SATELLITE OF JUPITER.

On July 21, 1914, while volunteer assistant for the summer at Lick Observatory, I photographed the eighth satellite of *Jupiter* with the Crossley reflector. On the following night a second plate was secured, and in comparing the two negatives a new image was found, about one minute of time east and six minutes of arc south of the eighth satellite. The two exposures had been made by setting off the motion of the eighth satellite, and the new object showed almost no trail. It was estimated about one magnitude fainter than the eighth, and, judging from the distinctness of the images on the plates, which were of two hours exposure, it must be nearly nineteenth magnitude. On the 23rd and 24th of July it was again photographed, and as soon as the positions were obtained from the plates of July 21st and 22d telegraphic announcement of the discovery of the unidentified object was made by Acting Director TUCKER of the Lick Observatory. The object was followed until the end of July, when the Moon became too bright to permit of further observations.

I then returned to Berkeley to investigate the nature of the orbit. A general solution was undertaken by LEUSCHNER's *Method of Direct Solution of Orbits of Disturbed Bodies*, on the basis of the attractions of the Sun and *Jupiter,* using the observations of July 22d, 27th and 31st. Three distinct orbits resulted from the preliminary solution, all of which satisfied the three observations. Two of these orbits belong to *Jupiter* and the other to the Sun. The latter, and one of the *Jupiter* orbits, were hyperbolic, the other elliptic. Since all three orbits satisfied the available observations, it was necessary to secure

additional photographs before the true one could be selected, for altho the two hyperbolic orbits were recognized as exceedingly improbable, the problem in hand demanded not only the proof that the elliptic orbit would satisfy future observations, but also that the other two orbits were impossible. Positions were computed from the ellipse for August 21st and 23d, and at that time I went to Mount Hamilton to secure further observations. The object was found very near the predicted place on the three nights of August 21st, 22d and 23d.

Of the three orbits the ellipse around *Jupiter* was the only one that represented these observations satisfactorily, thus proving the ellipse to be the real orbit, and establishing the identity of the object as a newly discovered satellite of *Jupiter*. The fact that this identity could be established without previous assumptions by LEUSCHNER's method, particularly from observations so close together—the entire interval for the original solution being only nine days—shows the remarkable efficiency of the method. The elements of the orbit are of course only approximate, but they serve to establish the identity of the object and to describe the nature of the orbit, which is very similar to that of the eighth satellite. The motion is retrograde, and the period about three years. A detailed account of the discovery and the orbit computation will be published in the Lick Observatory Bulletin.   SETH B. NICHOLSON.

UNIVERSITY OF CALIFORNIA, September 17, 1914.

AN A-TYPE STAR OF VERY LOW LUMINOSITY.

It has been suggested by HERTZSPRUNG that there is no such range in absolute brightness among the A-type stars as among those of types F to M, and, in fact, it is doubtful whether hitherto any certain case of a very faint A-type star has been found. A recent observation of the ninth-magnitude companion of o *Eridani* shows, however, that this star must be considered as such. The companion is at a distance of $83''$ from the principal star and shares in its immense proper-motion of $4''.08$ annually. Its parallax, therefore, may be assumed to be that of the bright star which is $0''.17$. This would make the absolute magnitude of the companion 10.3, the Sun being taken as 5.5. The spectrum of the star is Ao.

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