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NOVA T AURIGAE 1891 : A NEW SHORT-PERIOD ECLIPSING BINARY

The discovery by the writer in 1954 of the eclipsing nature ov Nova DQ Her 1934 opened the possibility that the nova phenomenon might result from the binary nature of the objects. Accordingly, since that time observations have, from time to time, been obtained of other old novae in order to determine whether they too might be eclipsing systems. Nova T Aur was placed on the observing program since the light-curve of its nova explosion was almost identical to that of DQ Her, suggesting, that the nature of the systems and/or their orientation in space were the same, so that T Aur might be a favourable case for the detection of eclipses.

The system was observed photoelectrically with the Crossley reflector for an interval of six hours in December, 1958. At first glance, the light-curve appeared to show only the random variations in light characteristic of old novae. However, during a recent re-examination of this material the writer conculded that one of the fluctuations in brightness could represent a very shallow eclipse and, further, found that the shape of this variation, agreed with that of one observed at Mount Wilson in 1954. Accordingly, the system was observed intensively during the fall and winter of 1961 with the Crossley reflector. All of the observations were made through a Schott GG 13 filter to improve the accuracy of the observations, since the system is of about m_{pg} 15.2.

The observations confirm the eclipsing nature of the system. The system is of the Algol type. Primary eclipse is partial and lasts about 40 minutes, although asymmetry of the rising branch sometimes extends the duration to nearly 80 minutes. The depth of eclipse is variable; depths from 0.10 mag. to 0.28 mag. have been observed. The eclipse is often preceeded by a bright shoulder 0.05 mag. to 0.10 mag. high. The eclipse-curve is thus similar to those of UX UMa, DQ Her, and RW Tri. The light-curves have notyet been reduced in final form. However, preliminary times of minimum light have been determined, and are listed in the following table:

OBSERVED MINIMA OF T AURIGAE

(colon indicates half weight)

JD hel.	O - C day	Cycle No.	JD hel.	O - C day	Cycle No.
2434797.676:	-0.001	-8574	2437638.944	+0.001	5329
6549.890	E	0	7644.871	+0.001	5358
7614.011	0.000	5207	7666.735	-0.002	5465
7619.943:	+0.005	5236	7666.945:	+0.004	5466
7620.959	0.000	5241			

These minima are represented by the following preliminary elements:

$$\text{Min.} = \text{JD hel. } 2436549.890 + 0^{d}.2043635 \text{ E.}$$

The residuals between the observed minima and those calculated from these elements are given in the table. Since the eclipses are so shallow, it is possible that we are dealing with a system having equal primary and secondary eclipses and a period twice that given above. However, none of the other similar systems show secondary eclipses and the fact that the spectrum gives no indication of a late-type component would indicate that both components are similar in type and luminosty. Thus, it appears probable that the above period is the correct one.

The derivation of meaningful photometric elements for this system will probably be impossible both because of the shallowness of the eclipse and its lack of symmetry and since the analysys of UX UMa, DQ Her, and RW Tri show that even when the light-curve yields a determinate solution, what is being eclipsed is probably not a star in the usual sense. The significant point here is the fact that the system is eclipsing. This result, together with Kraft's recent discovery of the binary nature of WZ Sge, lend support to the theory that all novas are binaries. Further observations, both spectroscopic and photoelectric, of old novae are clearly of the utmost importance.

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