# VISUAL OBSERVATIONS OF FOUR CLASSICAL CEPHEIDS

JERZY SPEIL
Zamek Ksiaz
58-306 Walbrzych
Poland

Abstract

Results of visual observations of SU Cas, $\delta$ Cep, $\eta$ Aql, and X Cyg are presented. The reported period-increase of $\eta$ Aql around JD 2437000 is confirmed.

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The recent observations of the classical Cepheids SU Cas, $\delta$ Cep, $\eta$ Aql, and X Cyg have been analyzed to determine the epochs of light maxima in order to verify their current photometric elements. The observations were made by means of the Nijland-Blazhko method, with the naked eye in the cases of $\delta$ Cep and $\eta$ Aql, and with 7x50 binoculars for SU Cas and X Cyg. In 1975 about 90 brightness estimates were made of $\delta$ Cep (comparison stars: $\zeta$ Cep, $\alpha$ Lac, and $\epsilon$ Cep) and SU Cas (comparison stars: HD 16769 and HD 15784); 50 estimates of $\eta$ Aql (comparison stars: $\upsilon$, $\delta$, $\beta$, and $\iota$ Aql) were made. Another 56 brightness estimates of $\eta$ Aql were made in 1976. Over 200 estimates of X Cyg were made in the interval from September 1975 to January 1978 (comparison stars: HD 195324, HD 198437, HD 197054, and HD 197176).

The light curves derived from these brightness estimates are plotted in Figure 1. Each point was obtained as a mean of 4 to 6 estimates for SU Cas, $\delta$ Cep, and $\eta$ Aql, and eight or nine estimates in the case of X Cyg. For $\eta$ Aql the recent photoelectric observations of Schmidt (1971) are shown for comparison. The phases for $\eta$ Aql were computed according to the elements:

$$JD_{(Max)} = 2437211.203 + 7.177131\ E, \tag{1}$$

given by Schmidt (1971). Phases for the remaining three stars were computed from the elements given by Kukarkin et al. (1974). These elements account for a recent (around JD 2437200) period increase of $\eta$ Aql.

The epochs of observed maxima, O, were determined graphically by means of the Pogson method. They are listed in the third column of Table I, together with their estimated mean errors. Also listed in Table I are epochs of maxima, C, computed from the above-mentioned elements, and the O-C residuals. The latter are in all cases consistent with the errors of the observed maxima. For $\eta$ Aql this can be taken as a confirmation of the recent period increase, found by Schmidt (1971).

## REFERENCES

Kukarkin, B. V. et al. 1974, Second Supplement to General Catalogue of Variable Stars, 3rd Edition, Moscow.

Schmidt, E. G. 1971, Astrophys. Journ. 165, 335.

## TABLE I

### Observed and Computed Light Maxima

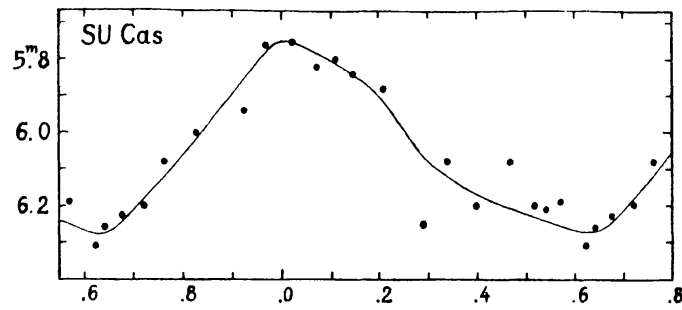| Star | Interval<br>JD 2440000+ | O<br>JD 2440000+ | C<br>JD 2440000+ | O–C |
|------|------------------|------------------|------------------|-----|
| SU Cas | 2511 – 2648$^d$ | 2593$^d$28 $\pm$ 0$^d$08 | 2593$^d$19 | +0$^d$09 |
| δ Cep | 2514 – 2666 | 2611.56 $\pm$ 0.10 | 2611.65 | –0.09 |
| X Cyg | 2657 – 3540 | 3011.28 $\pm$ 0.10 | 3011.32 | –0.04 |
| η Aql | 2553 – 3131 | 2794.93 $\pm$ 0.06 | 2795.01 | –0.08 |
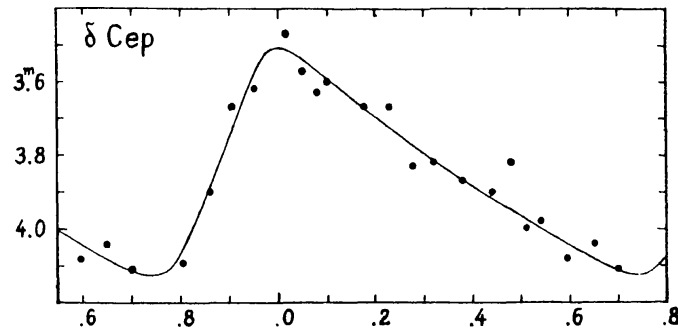




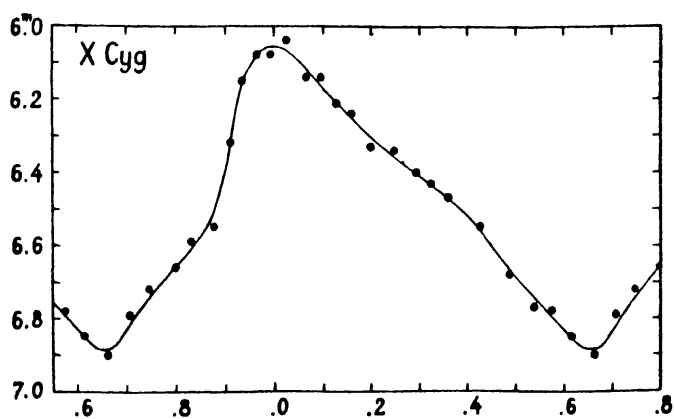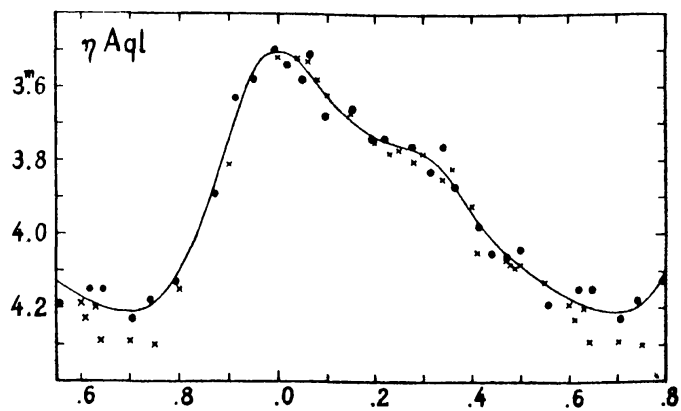Figure 1a and b.  The visual light curves of the classical Cepheids SU Cas and δ Cep.

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Figure 1c and d. The visual light curves of
the classical Cepheids η Aql and X Cyg. For
η Aql the recent photoelectric observations
of Schmidt (1971) are shown for comparison
(crosses).