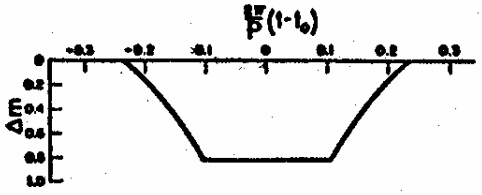
# epsilon aurigae

## 1982-84 ECLIPSE




## CAMPAIGN NEWSLETTER

No. 5

**PHOTOMETRY:**
Jeffrey L. Hopkins
Hopkins-Phoenix Obs.
7812 West Clayton Dr.
Phoenix AZ 85033

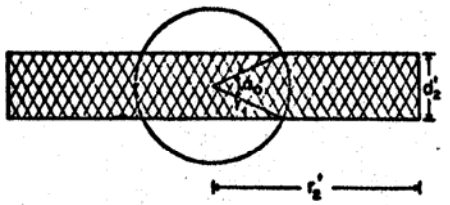


FIG. 1.—A schematic diagram of our model for ε Aurigae and its resulting light-curve during eclipse. It is assumed that we observe this system edge-on. Consequently, the rotating gaseous disk around the secondary component will appear to be a dark rectangle which obscures the primary component during eclipse. The light-curve at the top of the figure is derived by assuming a uniform stellar disk.

Huang 1965 Ap.J. 141

**SPECTROSCOPY:**
Robert E. Stencel
Code EZ-7
NASA - HQ
Washington DC 20546

December 1982

Dear Colleagues:

We are happy to report that Russell Genet (Fairborn Observatory) has received a modest grant from the American Astronomical Society to support the continued publication and distribution of this Newsletter. This grant should provide us with sufficient working capital to continue this work at least through 1983. We thank all whose individual contributions in the past helped in making previous Newsletters possible. Our present mailing list exceeds 100, with about one-quarter being external to the USA. We have thus achieved the desired ability to be a viable communication medium for this eclipse campaign. Once again we solict reports from active observers for inclusion in this Newsletter.

We plan to publish a directory of persons involved with the E Aur campaign. Suggestions concerning content or format would be welcomed by J.L. Hopkins.

This Newsletter is (partially) supported by a grant from NASA, administered by the American Astronomical Society.

## PHOTOELECTRIC PHOTOMETRY REPORT

J. L. HOPKINS

As mentioned earlier,it is very important to indicate on data submitted whether the data is correctored or uncorrected. Be sure to include any other information which will help in sorting and piecing together different reports.

R.E. Stencel has compiled an E Aur light curve (See Figure I) from the public logbook records of the IUE Observatory which indicate the on-board startracker magnitudes on each date of observation. The effective bandpass of the startracker is similar to the V band, with a small color correction. The light curve illustrates the obvious decline that every visual observer has decidedly seen--ingress is quite on schedule. The present data are shown through mid-November and will be up dated in future newsletters.

Stig Ingvarsson of the T.A.O. Observatory in Sweden reports the weather has been very bad this autumn but he has made 13 observing runs on E Aur during July - October 1982. He reports that one observation on JD2445236 agrees rather well with the HPO observation on that date.

Dr. John P. Percy of the University of Toronto reports in a letter of 2 November 1982, "I want to call your attention to the fact that E Aur is a Cepheid-like variable, with a period of 100-170 days and a range of $0^m.1$. This variability can be seen in the light curve published by van de Kamp in Sky and Telescope, Nov. 1978, page 397, and it has been discussed by Larsson-Leander in Arkiv för Astronomi, vol. 2, #25, page 283 (1958).

"For this reason, it would be helpful if observers could obtain observations every week or so, both during the eclipse and also for a year or two after the eclipse. It is rather difficult to disentangle the intrinsic variability from the eclipse variability, hence the need for observations after the eclipse."

Dr. I. Ethem Derman of the University of Ankara submits a report (see Table I) for the months of Mar. 82, Apr. 82, and Oct. 82. He plans to try to submit a report at the end of each month.

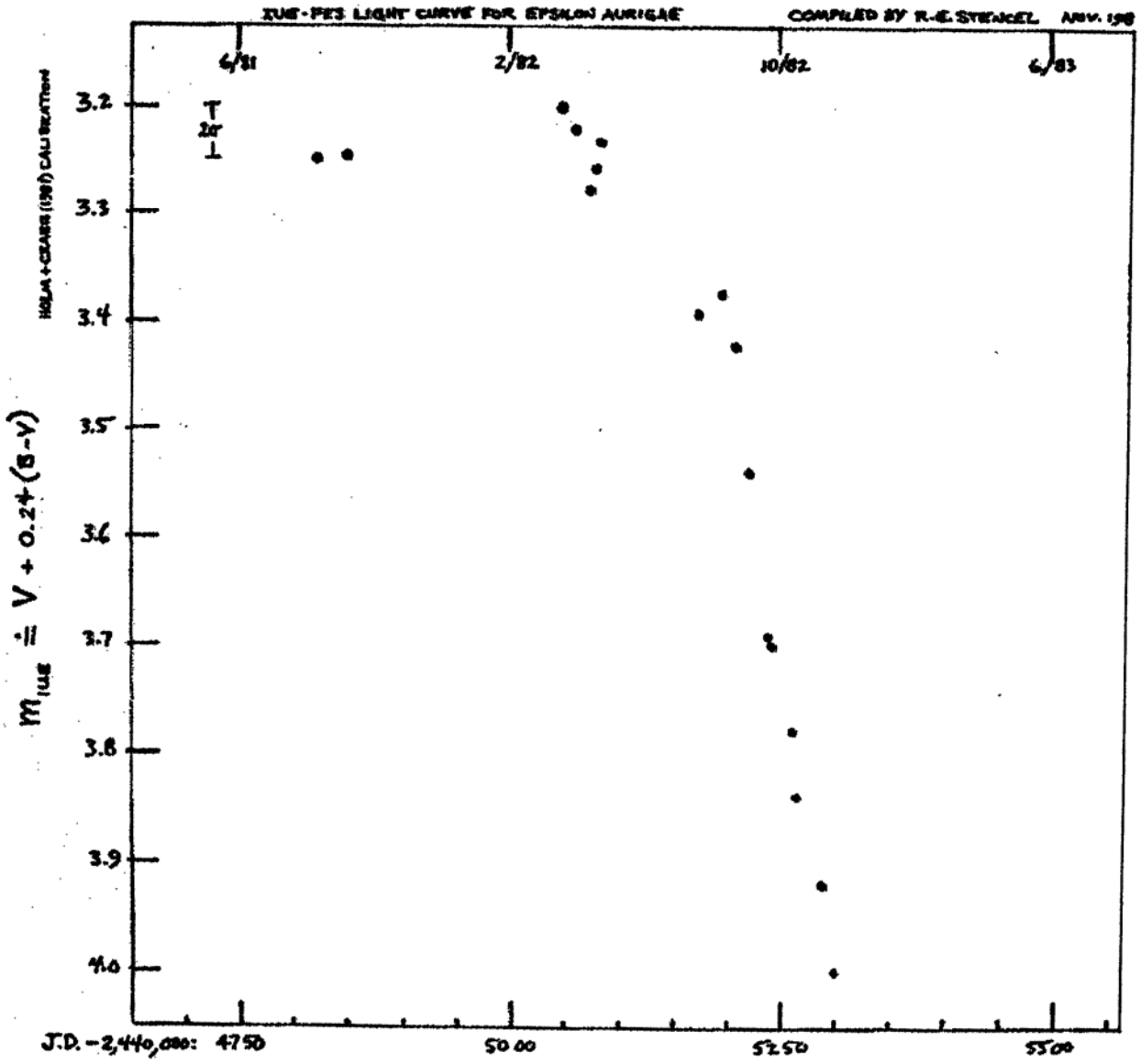



Figure I. Epsilon Aurigae Light Curve from IUE Star Tracker Observations. JD2,444,750 - JD2,445,500 (June 1981 - June 1983) (Compiled by R.E. Stencel, Nov. 1983).

EPSILON AURIGAE/LAMBDA AURIGAE
DATA REPORT

NAME: I ETHEM DERMAN
OBSERVATORY: ANKARA UNIVERSITY OBS.
YEAR: 1982

REPORT DATE: NOVEMBER 5, 1982
SOLID STATE/PMT: PMT
PMT HV: VARIOUS

| DATE | UT | JD (Hel) | Δu | Δb | Δv |
|---|---|---|---|---|---|
| 28/29 MAR 82 | 17:37 | 5057.232 | -1.654 | -1.838 | -1.754 |
| " | 17:46 | 5057.238 | -1.650 | -1.826 | -1.759 |
| 8/9 APR 82 | 19:04 | 5068.292 | -1.727 | -1.811 | -1.710 |
| 22/23 OCT 82 | 02:10 | 5265.593 | -0.996 | -1.263 | -1.382 |
| " | 02:23 | 5365.602 | -1.000 | -1.262 | -1.396 |
| 24/25 OCT 82 | 21:37 | 5267.404 | -1.001 | -1.234 | -1.159 |
| " | 21:50 | 5267.413 | -0.997 | -1.231 | -1.154 |
| 25/26 OCT 82 | 23:37 | 5268.488 | -0.984 | -1.248 | -1.160 |
| " | 23:50 | 5268.497 | -0.993 | -1.241 | -1.157 |

s = 0.034
t = 0.929
w = 1.080

ANKARA UNIVERSITY OBSERVATORY
EPSILON AURIGAE/LAMBDA AURIGAE DATA REPORT
TABLE I

## SPECTROSCOPY REPORT

R. E. STENCEL

The IUE startracker light curve previously described should indicate to the reader that a significant amount of ultraviolet spectroscopy has occurred during the ingress portion of the eclipse. Analyses are underway by several groups and reports are expected to appear soon, particularly at the Boston meeting of the American Astronomical Society in January [1983]. Authors are encouraged to submit preprints to this editor for inclusion of results in future newsletters.

The first significant finding concerning the nature of the invisible companion has been reported to us by Dr. Parthasarathy of the University of Texas at Austin. Using the McDonald Observatory facilities, he has discovered a significant increase in the strength of the neutral potassium resonance line as ingress proceeded, indicating that the invisible object is surrounded by a cool shell. Continued observations into totality may determine whether a 'hard core' exists as well. This data indicates that IR photometry and spectroscopy may be very useful.

Dr. Wallerstein of the University of Washington--Seattle has written with mention that he has obtained very high dispersion image tube spectra with the Hale 5-meter and DAO 1.2 meter telescopes, covering the sodium D to neutral potassium line region during early Sept. 1982. He notes that the spectra are available through Dr. Batten at the Dominion Astrophysical Observatory, Victoria, Canada.

Dr. Gimens and Dr. Lopez-Arroyo, Astrophysicists at the Universidad Complutense, Madrid, Spain have written that they have been obtaining spectra of E Aur with the 1.5 meter Calar Alto Observatory facilities in the 3400 - 8000A spectral region, and will continue to do so in support of the international campaign. This is excellent news, particularly for European collaborators, because a significant amount of observing time has been so dedicated.

We again encourage spectrocscopists to advise us of their activities for the E Aur eclipse so that we may advise campaign members of potential collaborations in data collecting and analysis. We note that ingress coverage appears to have been satisfactory, but that coverage of totality is equally important.

## 31 CYGNI

For those interested in the recent 31 Cygni eclipse the following report is provided.

R.C. Reisenweber of the Rolling Ridge Observatory submitted visual magnitude PEP data on 31 Cyg for the night of 27/28 Oct. 82.

R.E. Stencel reports ultraviolet spectra were obtained with the IUE satellite of 31 Cyg near times of ingress and egress: 4 and 22 Sept and 12 and 19 Nov. The 12 Nov data showed eclipse still in progress while the 19 Nov data indicated that the eclipse had ended. This data agrees with the preliminary analysis of the HPO observations which indicated egress commenced on 12/13 Nov 82 and leveled off by 14/15 Nov 82. It was regrettable tha the night of 13/14 Nov was clouded over in Phoenix. The Hopkins Phoenix Observatory reports a total of 60 nights of UBV PEP observations on 31 Cyg from 26 Aug 82 to early Dec 82. A complete light curve will be presented in a future Newsletter.

Dr. D.S. Hall of Vanderbilt University reports some comments on 31 and 32 Cyg: "Most photometrists seem to have used 26 Cygni as the comparison star, although one (working on 32 Cyg) used 30 Cyg as the comparison and 26 Cyg as the check star. HR7756 was also used by one group as the check star. The best ephemeris for the primary eclipse seems to be JD 2,441,256.9 + $1147^{d}.3$ n for 32 Cyg and JD 2, 437,685.65 + $3784^{d}$ n for 31 Cyg." Dr. Hall also suggests, "Don't hesitate to get observations well before first contact and well after fourth contact. This is because the eclipse durations are a function of wavelength. Moreover, there are humps and dips in the light curve outside the eclipse."

In Table II Dr. Hall has supplied partial bibliographies for 31 and 32 Cyg.

Both Zeta Aur (p = 972 d, last eclipse Summer '82) and 32 Cyg (p = 1148 d, last eclipse April '81) will be passing through secondary minimum during the spring of 1983. Photometric data between the present and mid-summer on either or both systems would be valued by spectroscopists who will study evidence for an extended shock front surrounding the secondary stars. Please contact J.L. Hopkins for further information.

**TABLE II**

**PARTIAL BIBLIOGRAPHIES OF 31 AND 32 CYGNI**

**31 Cygni**


Astronomy & Astrophysics Suppl. 1, 129.

" " " 21, 189.

Astronomical Journal 83, 636.

Astrophysics and Space Science 45, 63.

I.A.U. Symposium No. 88, 555.

P.A.S.P. 85, 131.

" 85, 348.

Publ. of the Dominion Astrophys. Obsv. 15, No. 10.


**32 Cygni**


Astronomy & Astrophysics Suppl. 1, 129.

" " " 21, 189.

Astrophysical Journal 233, 621.

I.A.U. Symposium No. 88, 555.

P.A.S.P. 86, 947.

" 91, 343.

P.A.S. Japan 29, 739.

Publ. of the Dominion Astrophys. Obsv. 15, No. 10.