A VISUAL LIGHT CURVE OF EG CEPHEI

BILL KEEL
Nashville, Tennessee

ROBERT E. MONTLE
DOUGLAS S. HALL
Dyer Observatory
Vanderbilt University
Nashville, Tennessee

INTRODUCTION

EG Cephei = BD+76°790 = HD 194089 is a 9th magnitude eclipsing binary with a very short period but a β Lyrae-type (not W Ursae Majoris-type) light curve. In this paper we present a series of visual estimates and photoelectric observations sufficient to define the approximate ranges of the light curve and to yield one time of primary minimum and one time of secondary minimum. We selected EG Cep for observation because of its northerly ($\delta = +76°$) declination, its conveniently short ($P = 0^d.5$) period, and its reasonably deep ($\Delta V = 0^m.9$) primary eclipse. At the time we were unaware of the photoelectric observations of Cochran, discussed recently by Wood (1971).

OBSERVATIONS

The visual estimates were made by Keel with his 6-inch f/8 Newtonian reflector at 45x, except on two occasions when exceptionally bright moonlight forced the use of a 70x eyepiece. The V magnitudes of 17 comparison stars were determined by Montle with the photoelectric photometer of the 24-inch Seyfert reflector at Dyer Observatory. He made approximate allowance for extinction and transformation to the UBV system and consequently feels that the V magnitudes in Table I should be accurate to about $\pm 0^m.02$ or $\pm 0^m.03$. In the selection of sequence stars an attempt was made to have the fainter stars redder so that the variable would be compared with stars of similar color even though it becomes redder as it goes into eclipse. Then, with the help of the comparison star magnitudes in Table I, the visual estimates of Keel were converted to magnitudes which should, apart from accidental errors, correspond to V magnitudes of the UBV system. In addition, Montle used the photoelectric equipment to make six photoelectric measurements of the variable by observing differentially with respect to one of the brightest of the sequence stars.

The individual observations of the variable are listed in Table II. The first column gives the heliocentric Julian date. The second column gives the phase, calculated with the ephemeris

$$JD(hel.) = 2{,}426{,}929.4584 + 0^d.54462012E$$

of Geyer (1961). The third column gives the observed V magnitude. And the last column contains a number to indicate the type of observation and, in some cases, a letter to represent conditions which might have affected the observation. The number 1 refers to the photoelectric observations; 2 sig-

nifies visual estimates where the variable was numerically ranked in brightness between two comparison stars; 3 means the variable and one sequence star were considered approximately equal in brightness; and 4 means the variable was estimated to be a given number of steps (approximately $0^m.1$ per step) brighter or fainter than a sequence star. The numbers are so assigned that to some extent they can be regarded as weights, with 1 the most reliable. The letter L means light sky; T means twilight; M means moonlight; X means the 70x eyepiece was used; H means haze; D means little dark adaption; and G means one comparison star was affected by glare from a neighboring star.

THE LIGHT CURVE

According to our observations, which are plotted in Figure 1, the maximum brightness of EG Cep outside eclipse is about V = $9^m.35$. Judging by our faintest observations in primary minimum, the depth of primary eclipse is about $\Delta V = 0^m.85$. Similarly, the depth of the secondary eclipse is about $\Delta V = 0^m.30$. These ranges are in essential accord with those of Cochran, as estimated from Figure 10 of Wood (1971).

TIMES OF MINIMUM

One time of primary minimum was well observed and found to occur at JD(hel.) = 2,441,560.685. This was based on consideration of magnitudes on the two eclipse branches as well as the faintest magnitude. With the ephemeris of Geyer (1961) this time corresponds to an O-C of $+ 0^d.007$. In a similar manner, one time of secondary minimum was observed and found to occur at JD(hel.) = 2,441,557.683, corresponding to an O-C of $+ 0^d.001$.

REFERENCES

Geyer, E. 1961, Zeitschrift für Astrophysik 51, 79.

Wood, D. B. 1971, Astronomical Journal 76, 701.

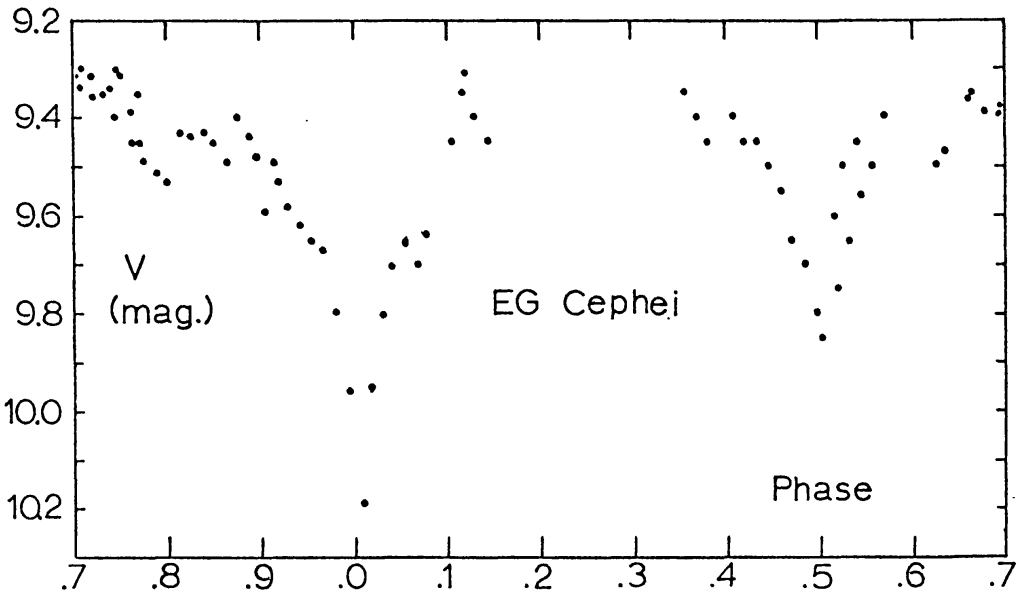

Figure 1. Light Curve of EG Cephei.

TABLE I

Photoelectric Magnitudes of the Comparison Sequence

BD Number	V	BD Number	V
+75°735	8.82	+76°783	9.76
+76°799	9.02	+75°725	9.90
+76°802	9.05	+76°782	10.02
+75°737	9.15	+75°734	10.09
+76°781	9.55	+76°778	10.14
+76°789	9.68	+75°729	10.23
+76°793	9.70	+75°728	10.27
+75°736	9.72	+76°787	10.48
+76°768	9.75		

TABLE II

Visual Magnitudes of EG Cephei

JD(hel.) 2441000+	Phase	V	Notes	JD(hel.) 2441000+	Phase	V	Notes
548.763	.122	9.31	1	560.576	.813	9.53	2 G
551.699	.513	9.60	4 MH	560.583	.826	9.43	2
551.706	.526	9.50	4 MH	560.591	.840	9.44	2
551.713	.539	9.45	4 MH	560.597	.851	9.43	2
555.723	.902	9.48	1	560.606	.868	9.45	2
555.734	.922	9.53	1	560.613	.881	9.49	2 G
556.662	.626	9.50	1	560.618	.890	9.40	2
556.667	.635	9.47	1	560.625	.903	9.44	2
556.684	.667	9.35	1	560.632	.916	9.59	2
556.726	.744	9.40	4	560.639	.928	9.49	2
556.740	.769	9.45	4	560.646	.941	9.58	2
557.606	.360	9.35	4	560.653	.954	9.62	2
557.612	.370	9.40	4	560.660	.967	9.65	2
557.618	.382	9.45	4 D	560.667	.980	9.67	2
557.632	.407	9.40	3	560.675	.995	9.80	2
557.639	.420	9.45	4	560.681	.006	9.96	2
557.646	.433	9.45	2	560.683	.009	10.19	2
557.653	.446	9.50	3	560.688	.018	9.95	2
557.660	.459	9.55	3	560.694	.030	9.80	2
557.667	.471	9.65	2	560.701	.042	9.70	3
557.675	.486	9.70	3	560.708	.055	9.66	2
557.681	.497	9.80	2	560.717	.072	9.70	3
557.684	.503	9.85	2	560.723	.083	9.64	2
557.688	.510	9.75	2	567.598	.706	9.39	2
557.694	.521	9.65	3	567.606	.721	9.34	2
557.701	.534	9.56	2	567.614	.735	9.31	2
557.708	.547	9.50	3	567.618	.743	9.35	2
557.717	.563	9.40	4	567.627	.759	9.30	2
559.646	.105	9.45	2	573.568	.668	9.36	2 T
559.653	.118	9.35	2	573.574	.679	9.39	2 T
559.660	.131	9.40	2	573.584	.697	9.38	2 L
559.667	.143	9.45	2	573.592	.712	9.30	2 L
560.553	.771	9.45	2 X	573.598	.723	9.36	2 L
560.564	.791	9.49	2 X	573.607	.740	9.34	2
560.570	.802	9.51	2	573.614	.752	9.31	2
				573.619	.762	9.39	2
				573.627	.776	9.35	2