

PHOTOELECTRIC PHOTOMETRY OF β LYRAE IN 1967

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Abstract

We present 45 photoelectric observations of β Lyrae made differentially with respect to γ Lyrae in 1967.

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One of us (Lovell) is presently participating in a program of systematic UBV photometry of the well-known eclipsing binary β Lyrae. It is hoped that this program will be helpful in understanding the nature of the long-term changes in the light curve, which are as large as 0^m1 in some parts. Earlier studies of these long-term changes have been hampered by the lack of standardization in the old photometry, which included visual estimates, visual measures, photographic estimates, photographic measures, and photoelectric measures at various effective wavelengths. Already five papers in the series have been published: the 1968-69 light curve (Lovell and Hall 1970), the 1970 light curve (Lovell and Hall 1971), the 1971 light curve (Landis, Lovell and Hall 1973), the 1972 light curve (Landis, Lovell, Frazier, and Hall 1973), and the 1973 light curve (Landis, Lovell, and Hall 1975).

In 1967, the year before the systematic UBV program was begun, we made 45 photoelectric observations of β Lyrae using a 1P28 photomultiplier with no filter. Although these measures cannot be transformed to any of the three wavelengths in the UB system (which uses a 1P21 photomultiplier and various filters) and hence cannot contribute directly to the systematic program, we feel the results are worth publishing to illustrate the type of photoelectric photometry which amateurs can do, to yield times of minimum, and to give some indication of what β Lyrae was doing in 1967.

The observations were obtained with the 10-inch reflector of Lovell used in the Cassegrain mode and equipped with an unrefrigerated 1P28 photomultiplier, which has its maximum sensitivity at about 3400 Å. The signal was amplified with an amplifier similar to the one described by Lovell and Hall (1970) and read on a Weston Modell 911 DC Milliammeter. All readings were made differentially with respect to γ Lyrae as a comparison star, and no corrections were made for differential atmospheric extinction since β Lyr and γ Lyr are reasonably close together in the sky and most observations were made very near the zenith.

The individual differential magnitudes, in the sense β Lyr minus γ Lyr, are listed in Table I. The phases have been computed with the ephemeris given in the 1963 Finding List for Observers of Eclipsing Variables:

$$\text{JD}(\text{hel.}) = 2,436,379.532 + 12^d93016 \text{ E.}$$

These magnitudes are plotted in Figure 1, where several qualitative features of the light curve can be noted. The maximum after the primary minimum is fainter than the maximum after the secondary, by about 0^m05 ; this seems to be generally the case in the 1968-73 light curves. The actual minimum light does not seem to fall at the time of mid-eclipse (as judged by the eclipse branches) but closer to third contact; this also seems generally to be the case in the 1968-72 light curves whereas in the 1973 light curve minimum light seems to fall closer to second contact. The suggestion of a flat secondary minimum, however, does not appear in any of the 1968-73 light curves.

Mean times of primary and secondary minimum have been derived from these data by Klimek and Kreiner (1975).

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TABLE I

Differential Photoelectric Observations of β Lyrae

JD 2439000+	Phase	Δm	JD 2439000+	Phase	Δm
609. ^d 8	0. ^p 824	+0. ^m 09	702. ^d 6	0. ^p 001	+0. ^m 75
639.7	.137	.44	704.6	.156	.28
640.7	.214	.15	707.6	.388	.18
642.7	.369	.07	708.7	.473	.38
643.7	.446	.38	709.6	.543	.37
645.8	.608	.32	710.7	.628	.28
651.7	.065	.96	711.6	.697	.21
652.7	.142	.37	714.6	.929	.14
653.7	.219	.18	716.6	.084	.99
656.6	.444	.20	716.8	.100	.85
657.7	.529	.38	717.6	.161	.32
661.6	.830	.06	724.7	.710	.14
662.6	.908	.23	726.6	.857	.11
669.7	.457	.36	731.7	.252	.18
672.7	.689	.12	734.7	.484	.37
673.7	.766	.10	735.7	.561	.39
675.7	.921	.26	736.7	.638	.18
676.6	.990	.80	737.7	.716	.18
677.6	.068	.86	744.6	.250	.12
680.6	.300	.12	890.9	0.564	+0.36
683.6	.532	.37			
693.6	.305	.14			
695.6	.460	.37			
698.7	.700	.13			
701.7	0.932	+0.31			

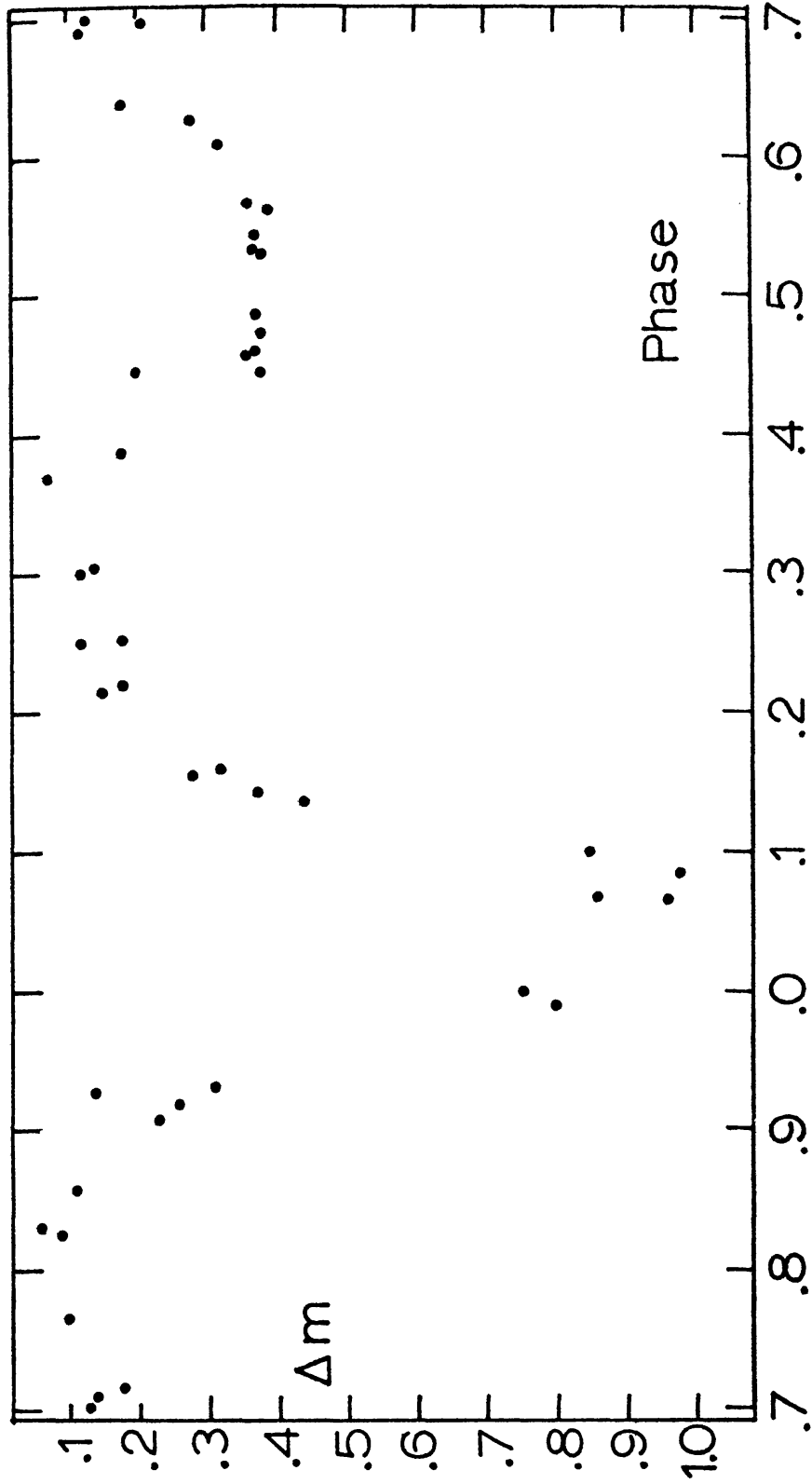


Figure 1. Photoelectric observations of β Lyrae in 1967.