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UPDATE ON THE RR LYRAE STAR NSV 134

In a previous bulletin (Rössiger 1987) the announcement was made that the star $BD+40^{\circ}0060 = NSV 134$ was probably an RR Lyrae variable of type "ab". Mention was made of a companion star to NSV 134 that is as almost equally bright as the variable and located about 6 arc-seconds away. Since it is not known whether or not the variable and its bright companion are indeed a physical pair, we decided to obtain spectra of them in order to help resolve this issue. On August 3, 1987 (UT) we obtained echelle spectra of both the variable and its companion using the coudé Hamilton Spectrograph at the Shane 3-meter telescope at Lick Observatory. Since it was unknown how stable the period of the variable's light curve was, CCD images of the variable's field were taken at approximately 5 minute intervals on August 25, 1987 (UT) using the Nickel 1-meter telescope at Lick Observatory. The CCD images were reduced to derive the relative magnitudes of the variable and surrounding stars and to construct the variable's light curve.

The CCD was a Texas Instruments 500×500 pixel device used at an imaging scale of 0.18 arc-seconds per pixel. A red filter was employed which generally restricted the light transmission to the range 6100\AA to 7300\AA . From the CCD images it was discovered that in fact there are two other fainter stars located near the variable and the bright companion. Figure 1 shows the field of the variable (north at top, east at left) with the designations A: NSV 134, the variable, B: the previously recognized bright companion, C: a fainter companion located almost midway between A and B, D: a very faint star just to the west of B, and E: a field star. All of these stars appear blended together on the red and blue copies of the Palomar Observatory Sky Survey. The apparent separation between the variable and its brightest companion is about 7.5 arc-seconds. The fainter companion is located about 4.5 arc-seconds from the variable and 3.5 arc-seconds from B.

Field of NSV 134

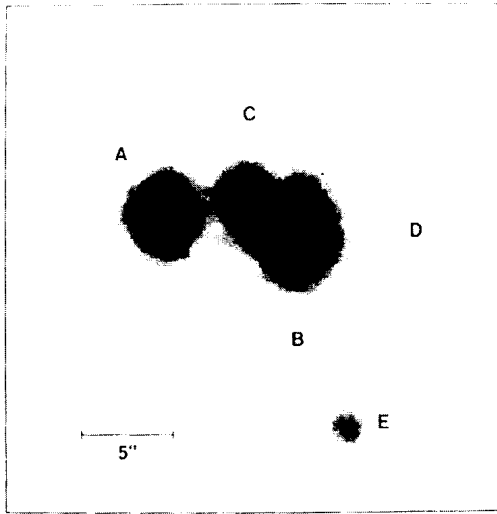


Figure 1.

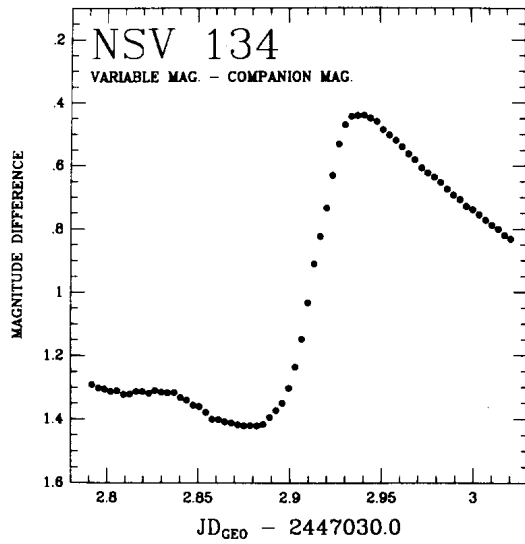


Figure 2.

The variable's light curve from the images is given in Figure 2, plotted in terms of the magnitude difference from the brighter companion (B) in the sense 'variable magnitude minus companion magnitude'. The observations indicate that the variable did go through an amplitude of $0.^m980$ ($\sigma = 0.^m004$) in its light variation on August 25 (UT). This amplitude is essentially twice that stated by Rössiger and could mean that the comparison star he used, BD+40°0056, may have some variation in brightness as well. No variability was detected in the companion B or any of the other stars, except the star E whose relative magnitude was not calculated due to its faint signal on the short exposure CCD images. The observed time of maximum for NSV 134 coincides nicely with that calculated from the elements given by Rössiger to within the time interval between exposures. The elements given by Rössiger were therefore used to compute the variable's phase at the time its spectrum was taken on August 3 (UT).

The midpoint of the 20 minute exposure for the variable occurred at $11.^h71444$ Aug. 3, 1987 universal time ($JD_{geo} = 2447009.988$). From Rössiger's elements this corresponds to the variable having a phase of approximately .24. The high dispersion spectra indicate that the variable had a radial velocity at that time of -194 km/sec while the companion's (B) radial velocity was -62 km/sec. This radial velocity for the variable can be regarded as near its mean radial velocity due to its phase at the time of observation. The large difference in radial velocities indicates that NSV 134 and its brightest companion B, do not form a physical pair. The spectra show that the variable did indeed have an early-type spectrum while that of B was late-type — very probably late-G which would agree with the classification given in the New Catalogue of Suspected Variable Stars (1982). Further study of the fainter companion, C, is needed in order to determine what its relation is to either of the two brighter stars.

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