

detached binary systems that have lost substantial amounts of angular momentum.

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08.04 Absolute Spectrophotometry of ϵ Aurigae. G. W. LOCKWOOD, B. L. LUTZ, and D. T. THOMPSON, Lowell Observatory, and J. R. SOWELL, University of Michigan. Absolute spectrophotometric observations of the eclipsing binary ϵ Aurigae, carried out at the Lowell Observatory during the first half of the primary eclipse, are presented. These observations, obtained on a regular basis beginning with the pre-eclipse night of U.T. 5 April 1982, were recorded with the 1.8-meter Perkins reflector and Cassegrain scanner used in the absolute flux calibration of 109 Virginis. The spectral range covers the region from 3300 to 8800 Å at a nominal resolution of 8 Å. Preliminary reductions indicate an essentially grey eclipse, but variations of nearly a factor of 2 in the equivalent widths of the lines of O I at 7775 Å, H α , and NaD are observed. Spectrophotometric monitoring of ϵ Aurigae is continuing throughout the remainder of the eclipse, and periodic high-resolution (~ 0.1 Å) echellograms are being obtained between 4300 and 6800 Å to complement the spectrophotometry.

08.05 The Outer Atmosphere of ζ Aur. R. D. CHAPMAN, GSFC. The ζ Aur eclipsing binary system consists of a K4 Ib primary and a B7 V secondary. During ingress to and egress from total eclipse of the B star by the K supergiant, light from the B star passes through the atmosphere of the primary in the so-called atmospheric eclipse. The radius of the B star is smaller than the scale height at all heights in the atmosphere of the K star, so that the B star is point source probe of the atmosphere of the K star. Therefore ζ Aur offers one of the best opportunities, outside of the sun, for studying the structure of the atmosphere of a star. UV spectra were obtained during the 1979-80 eclipse using the International Ultraviolet Explorer (IUE). This paper will focus on information about the atmospheric structure of the K star obtained from an analysis of these spectra. So far, we have carried out a curve of growth analysis, which offers two advantages over visible light spectra: 1) the K star is almost invisible in the UV so that there is no contamination of the atmospheric eclipse spectrum by the photospheric spectrum of the K star, simplifying the analysis; and, 2) the IUE spectra yield information on a region of the ζ Aur atmosphere above the region studied with optical wavelength spectra. Theoretical curves of growth calculated for the Schuster-Schwarzschild model by Wrubel (Ap.J., 119, 51, 1954) were used in the analysis. Excitation temperatures inferred are:

$$\begin{array}{cc} h & \theta \\ 6.8 \times 10^7 \text{ km} & 0.6 \pm 0.1 \\ 12.0 \times 10^7 & 0.35 \pm 0.15 \end{array}$$

Ahmad, Chapman and Kondo (Astron. Astrophys., in press) suggest a lower limit of $T = 14,000$ K for the wind from the K star. The temperature appears to rise through the chromosphere, reaching 14,000 K in the region where the wind is formed, then remains roughly constant.

08.06 Observations of the 1982 Eclipse of 31 Cyg. W. HAGEN, Wellesley, R. E. STENCEL, NASA HQ, J. L. HOPKINS, HPO, R. FRIED, Braeside, P. C. SCHMITDKE, KPNO, Y. KONDO, NASA-GSFC, R. D. CHAPMAN, NASA-GFSC. UV photometry and optical and UV spectroscopy of the primary eclipse of the long-period ζ Aur-like system 31 Cygni are presented. The precise timings made possible by the photometry imply that the UV spectral features could be due to an accretion shock associated with a hot star embedded in an extended chromosphere surrounding the red supergiant. The data also suggest an extended clumpy structure for the atmosphere of the late-type supergiant. The photometric and visual spectroscopic data show no radius changes from previous eclipses.

08.07 Infrared Observations of the Eclipse of Epsilon Aurigae: Direct Measurements of the 700 K Secondary at 5, 10, and 20- μ m. D. E. BACKMAN, E. E. BECKLIN, D. P. CRUIKSHANK, Inst. for Astronomy, Univ. of Hawaii, R. R. JOYCE, Kitt Peak Natl. Observatory, T. SIMON, and A. T. TOKUNAGA, Inst. for Astronomy, Univ. of Hawaii.—Broadband photometric monitoring of ϵ Aur beginning before the 1982-1984 eclipse and extending past second contact has been carried out at wavelengths from 1 to 20 μ m. The eclipse depth is independent of wavelength from 1.25 to 3.8 μ m with a depth of 0.71 ± 0.01 mag after second contact. The eclipse is less deep at 5, 10, and 20 μ m, with depths of 0.66 ± 0.04 , 0.61 ± 0.04 , and 0.32 ± 0.06 mag, respectively. The wavelength dependence of the eclipse can be modeled by an opacity that removes 48% of the primary's light independent of wavelength over the range 1-20 μ m, plus emission from a cool ($T_c \sim 700$ K) object which remains entirely in view as the primary is eclipsed. The size of the cool object derived from its infrared flux agrees with the size of the secondary necessary to produce the observed eclipse depth and timing. The cool object is thus identified as the eclipsing object. The emission from the secondary is consistent with an excess emission observed prior to the eclipse. The known dimensions of the system combined with the eclipse timing and the infrared photometry lead to the conclusion that the secondary has a projected area >4 times that of the primary and may have an aspect ratio as large as ~ 4 . The total luminosity of the secondary is $2-4 \times 10^{35}$ ergs s^{-1} , less than 10^{-3} that of the primary. No significant absorption feature is seen at 10 μ m during mid-eclipse.

08.08 Observations of CN And with an Automated Telescope. N.L. MARKWORTH, E.J. MICHAELS, AND J.B. RAFERT, STEPHEN F. AUSTIN STATE UNIVERSITY. Over 700 observations of the contact binary CN And have been obtained using the automated 46-cm. reflector at the SFASU Observatory. This star was chosen for inclusion into one of our programs aimed at increasing the number and improving the quality of contact binary solutions. CN And has also acted as a test case for the automation system, which is aimed at reducing "dead-time" while likewise reducing training time for our student observers. The system consists of two Rockwell AIM-65 microcomputers. One is dedicated to telescope