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Konkoly Observatory
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BD $-3^{\circ}5357$ AN UNUSUAL ECLIPSING BINARY

We have found that the star BD $-3^{\circ}5357$ ($\alpha_{1950}=21^{h}58^{m}01^{s}$; $\delta_{1950}=-2^{\circ}59'$; $m_V=9.4$; type KO in the SAO catalogue) is a unique eclipsing binary containing a red giant (~G8 III) and what is probably a hot subdwarf. This remarkable system was initially noted as an ultraviolet source during analysis of data from the S2/68 sky survey experiment on the TD-1 satellite. Subsequent photometric and spectroscopic observations made at Mount Wilson, Palomar, and Mount Laguna observatories in 1975 and 1976 have since revealed a clearer picture of the system.

The hot secondary is extremely blue; the satellite ultraviolet continuum is consistent with a 38000 K black body. The eclipses in U are $1\overset{m}{.}2$ deep, yet they are barely visible in V. The UV continuum is clearly visible on our spectrograms. The spectrum has strong Ca II H and K in emission and a very strong H_α emission. We note the presence of a very strong "reflection effect" in the system.

Ingress and egress take only 24 minutes although the period is 9.2 days. The U light curve is shown in Figure 1. The heliocentric times of mid-eclipse have been found to be

$$JD_{\odot} = 2442752.9577 + 9\overset{d}{.}207755 \cdot E$$
$$\pm.0005 \quad \pm.000010.$$

The 17 radial velocities obtained in 1975 and 1976 give a preliminary value of $K_1=27\pm3$ km s^{-1} for the G8 star, but we have not yet been able to detect lines of secondary. Therefore, we can only state that the data are consistent with $M_{sd} \sim 0.5\ M_{\odot}$, $R_{sd} \sim 0.1\ R_{\odot}$, $M_{G8} \sim 2M_{\odot}$, $R_{G8} \sim 6R_{\odot}$. A wider range of masses and radii are possible but all plausible models conform to the hot subdwarf-G

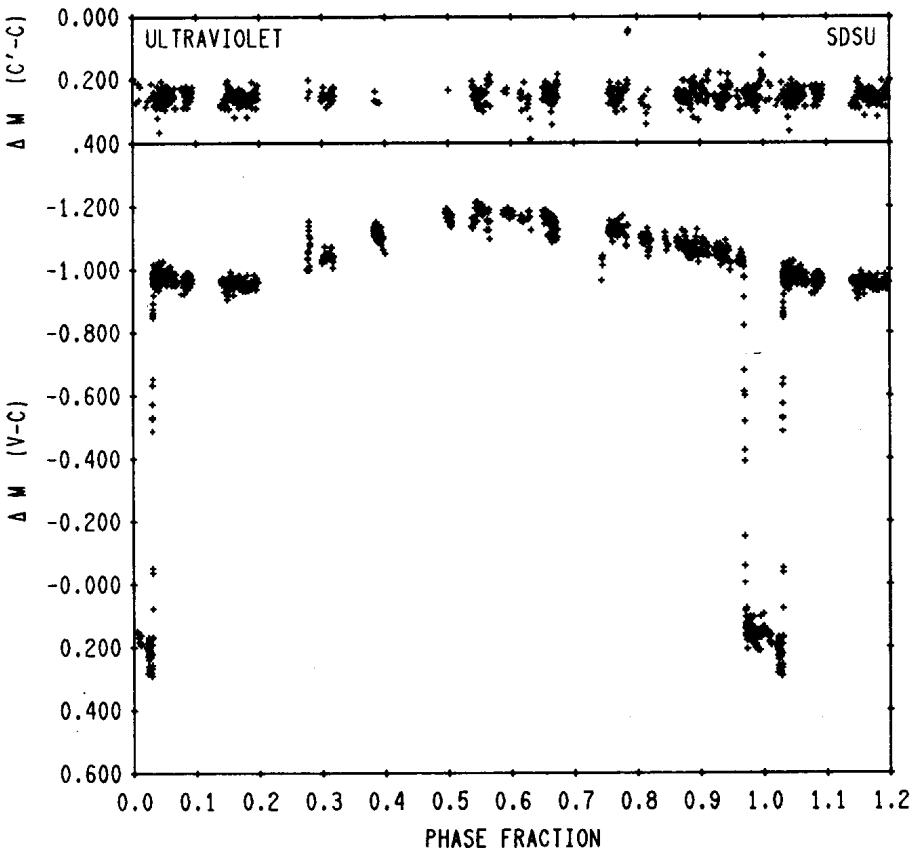

Figure 1. The U light curve.

subgiant model. The radius of the G star is about one-half the Roche radius.

A brief description of the eclipses is given in Tables 1 and 2.

Table 1

Light Curve Description

Filter	Eclipse Depth	Outside Variation	Phase of Maximum
U	$1^{m}.2$	$0^{m}.22$	$0^{p}.53$
B	0.4	0.33	0.55
V	0.15	0.35	0.66

Table 2

Eclipse Description

Eclipse Portion	Phase Fraction	Hours:Minutes
Ingress/ Egress	$0^{p}.00175$	00:24
Eclipse Duration	0.0625	13:48
Totality	0.0590	13:02

Table 3 is a summary of UBV photometry of nearby field stars obtained in 1976 at Palomar Observatory with the 20-inch (50-cm) telescope on moderately good photometric nights. BD $-3^{\circ}5358$, the comparison star, has a close (~20 arc-sec) companion which was excluded from the photometer diaphragm. BD $-3^{\circ}5362$ was the check star.

Table 3

Nearby Field Stars

Star	V	B-V	U-B	n
$-3^{\circ}5353$	9.07	+0.42	-0.03	3
$-3^{\circ}5355$	10.91	+0.62	+0.08	3
$-3^{\circ}5358$	10.39	+0.64	+0.12	1
$-3^{\circ}5359$	10.38	+0.50	+0.01	3
$-3^{\circ}5361$	9.39	+1.29	+1.27	3
$-3^{\circ}5362$	9.58	+1.12	+0.79	2

A more detailed analysis of the light curve and spectroscopic orbit will be published elsewhere.

M.M. DWORETSKY

Department of Physics and Astronomy
University College London
London WC1E 6BT

H.H. LANNING

Hale Observatories
Pasadena
California
U.S.A.

P.E. ETZEL and D.J. PATENAUDE

Mt. Laguna Observatory-Astronomy Department
San Diego State University
San Diego
California, U.S.A.