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ECLIPSING Ap STARS

In the Catalogue des périodes observées pour des étoiles Ap, Catalano and Renson (1984) notice that three Ap stars are eclipsing binaries. Although the eclipses of HD 68826 were already studied long ago (see below), HD 34364 is referred to by most authors as the only Ap eclipsing binary (e.g. Hack, 1981, p.90), the results allowing to confirm the nature of the variations of CpD-60^o981 and to establish definitely its period have been published only after the achievement of Catalano and Renson's catalogue. Here we call attention to these rare and little known objects, as the study of the changes undergone by their spectra during the eclipses may provide valuable information about the inhomogeneous distribution of the chemical elements over their surface (which would be responsible for the spectroscopic variations observed in most Ap stars, according to the oblique rotator model).

The data relevant to these eclipsing binaries are summarized hereafter in Table I.

Table I									
A	B	C	D	E	F	G	H	I	J
34364	17 Aur = HR1728	AR Aur	5 ^h 15 ^m .0	+33 ^o 43'	6.1	B9 MnHg	4.1347	0.69	0.52
-	NGC2516-38= CpD-60 ^o 981	-	7 ^h 57 ^m .4	-60 ^o 44'	9.5	A2SrCrEu	3.175	0.17	0.15
68826	CoD-48 ^o 3586	AO Vel	8 ^h 10 ^m .4	-48 ^o 36'	9.3	B9 Si	1.5846	0.4:	0.2:

Column headings: A = HD number, B = other identifications, C = variable star name, D = α (1950.0), E = δ (1950.0), F = m_v , G = spectral type, H = period (days), I = depth of the primary minimum (mag.), J = depth of the secondary minimum (mag.)

The first one, 17 Aur = AR Aur (= HD 34364), has been known for almost a decade as a Mn-Hg star (Wolff and Wolff, 1975). Its eclipses have been studied for more than half a century (see the references quoted by Zverko et al., 1981, and by Catalano and Renson, 1984), while its orbital elements, as a spectroscopic binary, have already been computed by Wyse (1936) and by Harper

(1937). Due to the advantageously large inclination of its orbital plane, 88.4° (Johansen, 1970, table 9), a very large fraction of the surface of each component (B8V and B9.5V) is eclipsed in turn. Furthermore, as it is much brighter than the other two stars reported here, spectra may be obtained during its eclipses with a higher signal-to-noise ratio and a better time resolution. Its belonging to the Mn-Hg subgroup of Ap stars may a priori appear as less favourable, since the spectral variations of these stars, if any, are usually very small (as those of the Am stars, among which more than a dozen eclipsing binaries are known), and the distribution of the various elements over their surface is thus presumably rather homogeneous. However, results of observations obtained in October 1977 during the eclipses by Takeda et al. (1979), partly confirmed by other observations in November 1979 (Takada, 1982), raised several unanswered questions.

The second star of Table I, Cox 38 in NGC 2516, is mildly Ap, but belongs to the Sr-Cr-Eu type (Hartoog, 1976). Its eclipsing nature has been known only for a short time (North et al., 1982, North, 1984). The star is rather faint, so that a fast detector is required to get a good insight into the changes of the spectra during the eclipses, which are unfortunately very partial and last for less than four hours.

Finally, HD 68826 = AO Vel is a Si star (Bidelman and MacConnell, 1973), i.e. of a type generally displaying rather large variations, so that one can infer that there are significant surface inhomogeneities. While preparing the general catalogue of Ap and Am stars, one of the authors of this note (P.R.) noticed that this star has a variable star name, having long been known to undergo eclipses. Unfortunately, it is almost as faint as the former. That is probably the reason why it has hardly been studied (Hertzsprung, 1937, star II; Oosterhoff and van Houten, 1949) and data on its orbital motion are lacking.

During the recent meeting of the European Working Group on Ap Stars (Zurich, March 1984), five members of the group (R. Faraggiana, R. Kroll, G. Mathys, P. North and P. Renson) planned to observe the evolution of the spectra of each of these stars during eclipses.

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