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A LIST OF BINARY CEPHEID CANDIDATES DESERVING RADIAL  
VELOCITY OBSERVATIONS

The Cepheid variables are continuing to play an important role in astronomy, and this statement is especially valid for the Cepheids belonging to binary systems. These stars may lead us to a more accurate determination of Cepheid masses as well as to the exact calibration of the zero-point of the period - luminosity relationship. The frequency of binaries among the classical Cepheids is considerable: every third or fourth Cepheid has a companion (Burki, 1984).

The discovery of a companion to a Cepheid is usually time consuming. Nevertheless, there are 27 cases where the presence of the companion has been established beyond doubt:

U Aql,	FF Aql,	V 496 Aql,	$\eta$ Aql,	RW Cam,	Y Car,	YZ Car,
SU Cas,	CE Cas,	DL Cas,	AZ Cen,	KN Cen,	AX Cir,	AG Cru,
SU Cyg,	V 1334 Cyg,	Z Lac,	T Mon,	S Mus,	Y Oph,	SV Per,
AW Per,	S Sge,	W Sgr,	V 636 Sco,	Y Sct,	$\alpha$ UMi.	

Generally speaking the final proof comes from radial velocity observations, where variations in the  $\gamma$ -velocity are explained in terms of orbital motion. This is demonstrated by the recent discovery of two Cepheid binaries (Z Lac and Y Sct) following a very extensive radial velocity survey of Cepheids (Moffett and Barnes, 1987; Barnes et al., 1987, 1988).

Moffett and Barnes (1987) compared the  $\gamma$ -velocities derived from their own data with those published by Caldwell and Coulson (1987), and intriguing deviations were found in a number of cases. Moffett and Barnes recommended that Cepheids with large differences in their  $\gamma$ -velocities as measured at different epochs should be examined for possible orbital motion. The aim of this note is to emphasize that most of the Cepheids with seemingly variable  $\gamma$ -velocity in Table I of Moffett and Barnes have already been suspected as binaries based on photometric and other evidence. A third-epoch radial velocity curve will probably reveal the binary nature of most of them. Table I gives some basic information on these binary Cepheid candidates. The

Table I. Cepheids with large radial velocity shifts according to  
Moffett and Barnes (1987)

Cepheid	$v_r$ km/s	P	$\langle V \rangle$	Evidence for duplicity
TT Aql	2.9	13. <sup>d</sup> 75	7. <sup>m</sup> 13	MF 80
FM Aql	3.0	6.11	8.27	M 77
RY CMa	4.6	4.68	8.11	
TW CMa	3.2	6.99	9.56	P 78
RW Cas	6.8	14.79	9.24	Sz 89
MW Cyg	2.8	5.95	9.49	MF 80
V 386 Cyg	4.9	5.26	9.63	K 66, M 77, MF 80
RZ Gem	7.4	5.53	10.01	M 77, MF 80
V Lac	5.4	4.98	8.94	
X Lac	3.9	5.44	8.41	MF 80
Y Lac	4.0	4.32	9.15	M 77, Sz 89
RR Lac	4.6	6.42	8.85	Sz 89
U Sgr	4.7	6.75	6.69	LE 68
W Sgr	2.8	7.60	4.67	J 74, B-VP 85
RV Sco	5.8	6.06	6.97	K 66
V 482 Sco	6.8	4.53	7.96	G 82
V 500 Sco	7.2	9.32	8.73	K 66, M 77, MF 80
SZ Tau	4.1	3.15	6.53	M 77, Sz 77
X Vul	3.1	6.32	8.85	J-P 76

Table II. Suspected Cepheid binaries for which radial velocity  
data are insufficient to prove duplicity

Cepheid	P	$\langle V \rangle$	Evidence for duplicity
FN Aql	9. <sup>d</sup> 48	8. <sup>m</sup> 38	D 77, P 78, Sz 88
RX Aur	11.62	7.67	M 63, J-P 76, Sz 88
YZ Aur	18.19	10.38	M 77, MF 80, Sz 81
RS Cas	6.30	9.94	MF 80
SY Cas	4.07	9.87	MF 80
VV Cas	6.21	10.74	M 77
BP Cas	6.27	10.93	LE 68
BY Cas	3.22	10.28	K 66, MF 80
AK Cep	7.23	11.18	M 77, MF 80
VX Cyg	20.13	10.07	K 66, M 77
BZ Cyg	10.14	10.22	K 66, MF 80
DX Gem	3.14	10.74	B 85
V 465 Mon	2.71	10.38	B 85

Table III. Suspected Cepheid binaries lacking radial velocity data

Cepheid	P	$\langle V \rangle$	Evidence for duplicity
CF Cas	4. <sup>d</sup> 88	11. <sup>m</sup> 14	M 77
V 532 Cyg	3.28	9.09	M 77, Sz 77
CS Mon	6.73	10.99	P 78
CV Mon	5.38	10.30	M 77, P 78, Sz 80

successive columns contain the following data: name of the Cepheid; the difference in the  $\gamma$ -velocity measured at the two epochs (the absolute value of the data given by Moffett and Barnes, 1987); the pulsation period; the mean value of the V magnitude averaged over one pulsational cycle; and references to the existence of the companion (initial of the author's first name and the last two digits of the year are given). Note that there are only two Cepheids from among the 19 stars in Table I that have never been reported as being suspected binaries. In addition, for five Cepheids there is more than one independent piece of evidence concerning their duplicity.

Unfortunately, a considerable number of Cepheids have not been subjected to a very thorough spectroscopic study. Table II contains a list of those suspected binary Cepheids that have at least a single epoch radial velocity curve, and a new series of radial velocity measurements would certainly support the binary nature of some of them.

Finally, Table III contains information on four Cepheids (also suspected binaries) that have never been observed spectroscopically as far as the radial velocity is concerned. The photometric evidence, however, suggests that these stars — as well as the binary Cepheid candidates listed in Tables I and II — are worthy of thorough spectroscopic study.

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