PHOTOGRAPHIC MONITORING

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ABSTRACT. The usefulness of photography in long term studies of variable stars is demonstrated by recent results on pulsation periods. Photography has been in use long enough for evolutionary changes to be detected, at least during stages that are relatively rapid, such as after core He exhaustion.

For many purposes photography is being supplanted by newer techniques, but there is an important role that it still plays. Photography has been in use for many decades. Continued monitoring with small telescopes can provide the long time base needed for detecting small changes in periods. Our Observatory uses a telescope of 18-cm aperture, scale 4 arcmin/mm, to follow variable stars. The limiting magnitude is 15 to 17 with exposures of 30 to 60 minutes.

There are useful plates taken with this telescope 60 years ago and more. The data set, sometimes supplemented by published magnitudes and by plates at the Harvard College Observatory, has become valuable for studies of small changes in the periods of pulsating variable stars. Table I summarizes results for cases where a reasonable fit to an O-C diagram is obtained by a curve no more complicated than a parabola (constant rate of change of period).

For 13 of the 25 stars, indicated by an asterisk, the change is no larger than about twice its mean error, indicating that a straight line fit to the O-C diagram (constant period) is still a reasonable hypothesis in these cases. Upper limits to the rates are given by the listed values and their mean errors.

For V759 Cyg and UZ Com the parabolas are purely formal fits, since there is evidence of somewhat more complex period behavior. The average rates of change, however, are significantly different from zero. Least-squares parabolas give a reasonable approximation.

The time scale of change for the BL Her stars is consistent with post-horizontal-branch evolution, after exhaustion of He in the core. UZ Com, an RR Lyr star whose amplitude is high for its long period, may be related.

The assistants who did the bulk of the work, most of them college students on summer vacation, are named in the last column. More

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details on individual stars are or will be available in brief papers in the Journal of the AAVSO. Table I supplants a table which appeared on p. 41 of vol. 8 of that Journal. Work on the less well-behaved periods will be published separately. This project has received support from Earthwatch and from National Science Foundation grants AST 78-07405 A01, AST 80-05162 and AST 83-20491.

Table I. The rates of change of periods of pulsating variable stars monitored at the Maria Mitchell Observatory. Rates are given in fractions of the period per million years and are accompanied by mean errors obtained from least squares fits to the data. BL and CW identify population II Cepheid of types BL Her and W Vir, respectively. Cep I identifies the classical Cepheids.

STAR	TYPE	PERIOD	(1/P)(dP/dt)	OBSERVER
V759 Cyg	RRab	$0^{d}.360$	+1.67 ±.12	J.F.Waugh
TT Sct	RRab	0.453	-0.03 ±.05*	S.Cederbloom
IM Aql	RRab	0.457	-0.66 ±.05	E.Lada
FV Com	RRab	0.472	+1.29 ±.44	M.A.Reynolds
V801 Cyg	RRab	0.516	+0.53 ±.13	M.Yarlott
V943 Aql	RRab	0.519	-0.17 ±.13*	B.Meyer
EE Com	RRab	0.540	-0.80 ±.90*	A.Reeves
RR CVn	RRab	0.559	-0.02 ±.08*	W.Larson
V894 Cyg	RRab	0.571	+0.13 ±.04	J.Fahn
MY Sct	RRab	0.574	+0.07 ±.06*	S.Davis
V1510 Cyg	RRab	0.581	-0.03 ±.04*	L.Hoecker
CD Com	RRab	0.590	-1.32 ±.67*	D.Gilmore
V957 Aql	RRab	0.605	+0.24 ±.06	E.Street
V783 Cyg	RRab	0.621	-0.14 ±.04	A.Loser
EO Com	RRab	0.632	+0.67 ±.60*	M.A.Reynolds
DV Com	RRab	0.654	-0.33 ±.16*	D.Gilmore
UZ Com	RRab	0.737	+0.69 ±.06	D.Svetlov
V2022 Sgr	BL	1.533	+1.22 ±.17	J.Provencal
VZ Aql	BL	1.668	+0.70 ±.08	J.Christianson
V741 Sgr	CW	15.168	+7.0 ±4.6 *	M.Mitchell
XY Cas	Cep I	4.502	-0.35 ±.14	J.Fahn
V1954 Sgr	Cep I	6.179	-0.79 ±.34	M.Wooldridge
BX Sct	Cep I	6.411	-0.17 ±.33*	J.Sigismondi
V336 Aql	Cep I	7.304	+0.83 ±.65*	L.Bissonnette
TY Sct	Cep I	11.053	+3.0 ±1.5 *	C.Bailey