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Binaries in the Hyades

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ABSTRACT: Orbital solutions are now available for 46 binaries which are members of the Hyades. The distribution of eccentricity versus period shows evidence for tidal circularization of the short-period binaries. However, the transition from circular to eccentric orbits is not clean. The first eccentric orbit has a period of 5.75 days, while the last circular orbit has a period of 8.50 days. For longer periods the distribution of eccentricity is the same as for solar-type stars in the field.

In Table 1 we list the period and eccentricity for 46 binaries which are members of the Hyades star cluster and have reliable orbits. Six of the binaries have visual orbits, two have orbits incorporating speckle and/or occultation observations, and two have orbits combining radial velocities with astrometric information (indicating that the traditional gap between astrometric and spectroscopic orbits is closing). Altogether 36 Hyades binaries have spectroscopic orbits, of which 12 are new or revised orbits using CfA radial velocities. In the CfA sample of slightly more than 200 Hyades members, we have at least 15 additional spectroscopic binaries which do not yet yield satisfactory orbital solutions, but which clearly exhibit velocity variations.

In Figure 1 we plot eccentricity versus log period for all 46 Hyades binaries that have orbital solutions. All the binaries with periods shorter than 5.75 days have circular orbits, presumably due to tidal circularization (e.g., see Mathieu *et al.* 1992). However, the transition from circular to eccentric orbits is not clean. The last circular orbit has a period of 8.50 days, substantially longer than the period of 5.75 days for the first eccentric orbit. It is interesting to note that the spectral types are classified as F8 for the primary stars in the two shortest-period binaries (5.75 and 8.55 days) with eccentric orbits. These primaries are close to the dividing line where more massive stars no longer have significant convective zones, and tidal circularization becomes much less effective (e.g., see Mathieu & Mazeh 1988).

Binaries which are members of triple systems are plotted as open circles in Figure 1. The small but significant eccentricity of the short-period members of triples is presumably the result of the pumping action of the distant third star (Mazeh 1990).

The mean eccentricity for the 30 main-sequence Hyades binaries with orbital period longer than 10 days is 0.45 ± 0.04. This is very similar to the mean eccentricity of 0.42 ± 0.03 for a sample of 44 binaries with period longer than 14 days found among 164 nearby solar-type field dwarfs (Duquennoy & Mayor 1991).

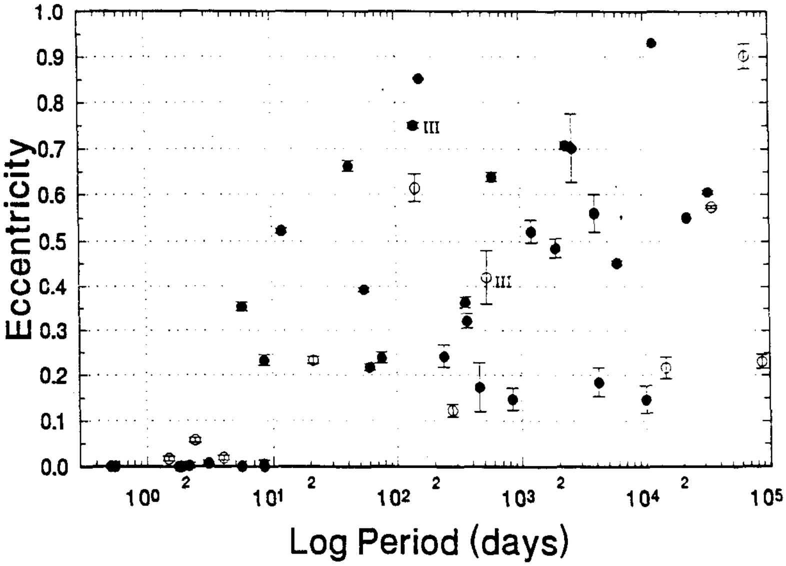

FIGURE 1. Eccentricity *versus* log period for 46 binaries in the Hyades.

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TABLE 1. Hyades binaries.

Name	V	$B-V$	Spectrum	Period	Eccentricity	Reference
HD 28319	3.40	0.18	A7III	140.728	0.750 ± 0.006	Eb59
HD 27176	5.65	0.28	A8V+G0	4,177.31	0.185 ± 0.031	CfA
HZ 9	14.02	0.29	DA+dM4.5	0.564	0.0	L&P81
HD 27749	5.64	0.30	A1m	8.418	0.005 ± 0.008	CfA
HD 27628	5.72	0.32	A3m	2.144	0.001 ± 0.006	CfA
HD 28485	5.58	0.32	A8V+G2V	64,977.98	0.901 ± 0.027	P&S88
HD 27483	6.17	0.46	F6V	3.059	0.007 ± 0.005	CfA
HD 30869 AB	6.25	0.49	F5V	34,786.41	0.573 ± 0.003	P&S88
HD 30869 A	6.25	0.49	F5V	143.53	0.614 ± 0.030	GGZG85
HD 27991	6.46	0.49	F7V	2,294.14	0.707 ± 0.009	M88
HD 30738	7.29	0.50	F8	5.751	0.354 ± 0.010	G&G78
HD 28394	7.05	0.50	F7V	238.87	0.242 ± 0.025	GGZG85
HD 28363 AB	6.59	0.53	F7V+G0V	14,584.43	0.216 ± 0.024	P&S88
HD 28363 A	6.59	0.53	F7V+G0V	21.254	0.233 ± 0.008	CfA
HD 28033	7.38	0.54	F8V	8.551	0.233 ± 0.012	G&G78
HD 30810	6.76	0.54	F8V	5,946.75	0.453 ± 0.005	P&S88
HD 27691 A	6.99	0.56	G1	4.000	0.018 ± 0.005	CfA
HD 27691 AB	6.99	0.56	F8IV+G1	87,331.28	0.230 ± 0.016	P&S88
HD 27383	6.88	0.56	F7V+G3V	32,594.91	0.605 ± 0.004	P&S88
HD 28068	8.08	0.64	G1V	2,595.3	0.701 ± 0.075	CfA
HD 26090	8.33	0.64	G1V+G8V	21,915.	0.55	M78
HD 33204 B	8.54	0.67	dG7	11,724.5	0.93	H76
HD 27989	7.53	0.68	G3V+G6V	10,077.25	0.147 ± 0.030	P&S88
HD 27149	7.54	0.68	G5V	75.657	0.239 ± 0.012	P&S88
HD 26874	7.84	0.71	G4V	55.130	0.393 ± 0.005	G&G81
HD 28291	8.64	0.75	G8V	41.663	0.662 ± 0.012	GGZG85
HD 27935	8.94	0.76	G8V	156.387	0.852 ± 0.001	GGZG85
HD 27130	8.34	0.77	G8V	5.609	0.0	P&S88
HD 28545	8.93	0.85	G8V	358.41	0.364 ± 0.012	G&G81
+16°516	9.51	0.85	DA+K2V	0.521	0.0	BLM88
HD 284414	9.40	0.91	K2V	590.6	0.638 ± 0.010	GGZG85
HD 27697	3.76	0.98	K0III	529.8	0.42 ± 0.06	G&G77
HD 284303	9.52	0.98	K0	1.887	0.0	GMG82
HD 28634	9.53	0.98	K2	844.6	0.148 ± 0.024	GGZG85
HD 29896	9.87	0.99	K0	3,942.	0.56 ± 0.04	GGZG85
HD 283882	9.54	1.05	K3V	11.924	0.523 ± 0.005	CfA
HD 285766	10.16	1.06	K2	1,907.	0.485 ± 0.021	GGZG85
HD 16909	8.17	1.07	dK4	1,214.	0.521 ± 0.024	GGZG85
HD 284163	9.38	1.09	K0	2.394	0.057 ± 0.005	G&G81
HD 285828	10.39	1.09	K2	459.197	0.174 ± 0.054	CfA
HD 29608	9.47	1.10	K3V	276.76	0.123 ± 0.014	GGZG85
HD 283750	8.25	1.12	dK	1.788	0.0	GGZG85
HD 285947	10.17	1.15	K5	60.821	0.218 ± 0.008	GGZG85
HD 286839	11.03	1.22	K0	1.485	0.016 ± 0.005	CfA
J 331	11.16	1.41	K9V	8.495	0.0	GGZG85
J 316	11.23	1.45		367.674	0.322 ± 0.016	CfA

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