

PHOTOGRAPHIC ASTROMETRY OF BINARY AND PROPER-MOTION STARS. VI

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ABSTRACT

85 trigonometric parallaxes and 13 binary-star mass ratios are listed and annotated.

80 yr after photographic parallax programs spread, and the Sproul refractor of Swarthmore College joined the effort, their task has by no means expired but much expanded. To long-known parallax stars, for which improved and long-term results can be reached now, catalogs with numerous faint nearby stars, binaries, and suspects have been added.

From July 1989 to August 1990 the Swarthmore program processed 85 parallax stars by means of plates taken in over 5000 nights (3500 currently measured, and sometimes combined with previous measurements). The presentation follows earlier papers (Heintz 1990c). Table 1 gives the fractional masses $f = B/(A + B)$ of some binary stars as derived from the center-of-light motion $f - \beta$ and visual data on Δm from which the fractional luminosity β follows.

The parallax results are compiled in Table 2. The measured proper-motion components μ_α and μ_δ are to three decimals and for equator 2000, corrected for reference-star motions when possible; inclusion of time quadratic (q) or orbit terms (f) is indicated. The relative parallax and its standard deviation from the joint solution in α and δ are given to four decimals; a weighted mean is added for photographically resolved doubles. π is the absolute parallax, N is the number of night means used, Int = time interval, Disk = magnitude reduction of target star by a rotating disk, mf = average reference-star magnitude as estimated from image sizes and exposure times, and Me = measurer. The Grant two-coordinate machine is used except for two fields (*) processed at the Ridell machine. Auxiliary data (dates and residuals, reference star positions, etc.) are kept archived.

The Notes detail, where needed, the time distribution of observations, and which use was made of earlier, partial measurements, in order that previously published data be identified as included in, or else independent of, the present results. The description of the objects is kept brief; a few stars (α Ophiuchi for instance) will be more detailed in separate papers, and the coverage of a new nearby binary), BD +36°1638A, should soon be complete.

In 8 yr since its reorganization, the program has now produced 400 parallaxes and 75 astrometric binary-star studies from 27 000 night means or—since formerly two plates per night used to be taken—about 40 000 actual plates. As most stars with substantial material before 1975 have now been processed, an interim on the telescope performance can be given; it updates and largely confirms earlier inferences (Heintz 1976). Following correction of the misalignment in the 1940s, systematic displacements in subsequent decades were smaller, quasiperiodic for a while but aperiodic since the early 1970s. They are also not color related but more comalike or defocused distortions which affect the comparison of over- and underexposed images, and their systematic influence may also have been altered and obscured by the switch in 1970 from bisection measuring to a scanning machine. The telescope objective was taken out, cleaned, and its cell repaired in 1966 and again in 1987; no discontinuities are noted after these dates. At present no substantial parallax errors or other quasiperiodic patterns are noted, but the effort is being made to get brightness balanced and (if possible) smaller reference-star configurations even at the price of longer and fewer exposures.

Of all the persons, to whom thanks are due for their contributions to the program, most appear in Table 2 as having helped with the plate measurement: Dr. H. J. Augensen (HA) of Widener University, M. Harper (MH), P. O'Hara (PO), the students M. MacKenzie (MM), N. P. Meyerson (NM), D. A. Packer (DP), J. Weiss (JW), also M. Jackson (MJ), whose former work on some stars was not updated by the author, and in addition J. Fedock as a volunteer observer and C. Ray as a technical aid. The financial support was shared by the National Science Foundation (AST88 41534), Swarthmore College, and the Keck Foundation, and is much appreciated.

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TABLE 1. Mass ratios.

ADS	Name	Δm	β	$f - \beta$	f
...	He1 299	0.5 $\pm$ 0.5	0.387 $\pm$.10	0.333 $\pm$.08	0.720 $\pm$.13
7203	ϵ 1306	3.5:		A only	0.314 .04
7390	ϵ 1356	0.6 0.1	0.365 .02	0.072 .011	0.437 .02
8197	σ 235	1.3 0.2	0.230 .03	0.231 .006	0.461 .03
8311	θ 603	2.5 0.3	0.091 .02	0.305 .030	0.396 .04
8486	ϵ 1621	0.6 0.2	0.365 .04	0.170 .027	0.535 .05
8901	A 1609	0.2 0.1	0.454 .02	0.072 .020	0.526 .03
9301	A 570	0.3 0.1	0.435 .02	0.005 .019	0.440 .03
...	LPN 629	0.1 0.1	0.478 .02	0.045 .009	0.523 .02
11060	σ 341	0.7 0.1	0.344 .02	0.004 .020	0.347 .03
12145	Se 2 BC	0.2 0.1	0.454 .02	0.018 .024	0.472 .03
...	Kpr 95	0.5 0.1	0.387 .02	0.124 .005	0.511 .02
14073	β 151	0.9 0.05	0.304 .01	0.150 .011	0.454 .02

TABLE 2. Parallax data.

Coord.	1900/2000	Names	m_V	Sp.	μ_α	μ_δ	π rel	s.d.	π	N	Int.	Disk	mf	Me
00074 128	+5405 40	G 217-38	13		+782	+609	+0334	±0067	+0.034	34	82-89	0	13	hz
00103 155	-1640 08	L 722-22 Hei 299	11.0		+624	-598 f	+1673	0096	.171	34	83-89	0	11	hz
02458 521	+3400 23	+33 529 Wolf 1323	9.6	M0	+989	-983	+0535	0044	.057	48	37-89	0.8	10½	MH
03447 504	+1657 75	+16 516 V471 Tau	9.6	K0e	+115	-002	+0043	0039	.006	63	76-90	2.3	12	hz
04096 159	+3127 42	+31 737 ADS 3082 AB	7.3	F9V	-001	-050	+0065	0033		71	19-89	3.0		
		C	8.5	dG	-004	-050	+0094	0081		38	19-89	3.0		
		combined					+0069	0030	.010				10	MH
04444 498	+0647 58	+ 6 762 I Ori	3.2	F6V	+460	+029	+1240	0036	.127	77	38-90	6.6	10+	MH
05292 348	+1353 57	+13 925 Hei 108	9.4		+003	+009	-0116	0072	-.010	33	83-90	0	11½	hz
05292 349	+1353 58	Ross 602	11.5	K7	-049	+217	+0140	0052	+.016	33	83-90	0	11½	hz
05292 349	+1349 53	Ross 46	12	M4V	-111	-386	+0781	0057	.080	33	83-90	0	11½	hz
05548 601	+0242 42	G 99-49	11.6		+299	-023	+1837	0062	.185	36	84-90	0	11½	hz
06401 462	+2329 22	+23 1491 GC 8837	6.5	G8	-010	+018	-0094	0037	-.007	51	80-90	4.4	11	MH
07263 321	+1732 19	G 88-35	13		-229	-164	+0375	0092		30	83-90	0		
		G 88-36	11.1		-232	-169	+0355	0085		30	83-90	0		
		combined					+0364	0063	+.038				12½	hz
07357 404	-1710 25	L 745-46 A	13	DF	+1138	-540	+1100	0062	.111	57	41-89	0	13	hz
07392 453	+2816 02	+28 1463 β Gem	1.2	K0III	-630	-034	+0901	0058	.093	59	40-90	9.2	10½	MH
08538 629	+6827 04	LP 60-179 G 234-53	12		+187	+338	+0955	0070	.098	32	83-90	0	12	hz
09017 104	+6732 08	+67 577 13 UMa	4.8	F7V	+014	-063 q	+0414	0056	.044	73	38-90	7.1	12	PO/h
09231 285	+0930 03	+ 9 2188 ω Leo	5.4	F9V	+046	-052 f	+0172	0034	.021	74	16-90	5.4	11	NM
09276 324	-1045 71	-10 2857 GC 13168	7.8	K0	-238	+036	+0485	0051	.052	47	72-90	2.2	10	MH
09286 334	-1044 71	-10 2861	10		-175	-095	+0082	0055	.012	47	72-90	0	10	MH
10347 396	-0624 55	L 897-16	11.3		-690	-118	+0668	0061	.070	49	71-90	0	11½	JW
10579 633	+3598 58	+36 2147 GC 15183	7.5	M2V	-587	-4765 q	+3874	0019	.392	426	48-82	2.5	10½	MJ
11267 324	+6138 05	+61 1246 GC 15822	5.5	F7V	+035	-075 f	+0377	0043	.042	84	14-89	4.8	10½	*hz
11435 486	+1450 17	+15 2381 GC 16181	5.9	A6V	-123	+008 f	+0222	0044	.026	61	18-90	4.6	10½	NM
11455 507	+0180 46	+ 2 2489 β Vir	3.6	F8V	+751	-266	+0828	0062	.087	60	38-89	7.0	11	DP
11460 511	+3549 16	+36 2219	9.7	M1V	-271	+276	+1025	0050	.106	54	72-89	2.0	12	PO
11464 516	+3545 12	+35 2288	10	G5	-134	+017	-0073	0132	-.004	29	72-87	2.0	12	PO
12018 069	+0582 48	+ 6 2551 ADS 8426 A	9.0	K0	+291	-246	+0155	0078	+.019	23	74-89	1.4	11	hz
		B	10.5		+294	-246	...							
12109 160	+0572 38	+ 6 2573 ADS 8486	9.3	dK5	-321	-034 f	+0209	0036	.026	75	71-90	1.4	10½	MH
12290 337	+4154 21	+42 2321 β CVn	4.3	G0V	-696	+292	+1151	0036	.119	101	15-90	6.5	11+	hz
12572 622	+1090 58	+11 2529 ϵ Vir	2.8	G9III	-273	+017	+0274	0050	.031	46	40-89	8.2	11+	DP
13149 196	+3539 07	+35 2436 GC 18029 A	9.4	M1V	-400	-773	+0728	0073		57	38-90	0		
		B	12.1	M3V	+387	-800	+0618	0048		56	38-90	0		
		combined					+0651	0040	.069				11	hz
13215 258	+4461 30	+45 2108 ADS 8901	8.3	G8V	+039	+010 f	+0190	0057	.023	57	25-90	2.7	11	NM
13407 457	+1486 53	+15 2620 GC 18602	8.5	M2V	+1775	-1428	+1780	0023	.186	181	38-83	2.2	10+	MJ
13413 461	+1533 03	+15 2623	10.5	G5	+066	-016	+0151	0061	.020	45	67-83	0	10½	MH/h
13560 611	-0211 39	- 1 2892	9.7	M0V	-811	+611	+1000	0047	.104	54	72-89	1.6	11+	MH
14279 323	+2667 41	+27 2388 GC 19608	6.0	A7	-036	-016 f	+0113	0053	.015	57	14-90	5.5	11½	JW
14302 335	+5280 54	+53 1719 GC 19646	7.2	K2V	-208	+238	+0763	0045	.079	58	72-88	4.6	11½	HA
14363 406	+3156 27	Ross 51	11.4	K5	+118	-857	+0160	0028	.020	70	38-89	0	11+	PO
14498 545	+1631 06	+16 2708 CE Boo	10.2	M2V	+291	-097	+0986	0038	.102	71	72-89	1.2	11+	HA
14519 558	+3963 39	+40 2829 ADS 9441	8.0	F0	-017	000	+0069	0047	.011	48	32-89	2.8	11	JW
14574 609	+4549 26	+45 2247	9.0	M0V	+249	+294	+0683	0033	.072	58	71-89	2.0	11	MH
15207 245	+3744 23	+37 2636 μ Boo A	4.3	F0V	-120	+091	+0182	0058		41	13-90	5.4		
		B,C	6.5	G0V	-116	+096	+0282	0063		49	13-90	4.1		
		combined					+0229	0043	.028	54			10+	*hz
15390 440	+0250 31	+ 2 2989 ψ Ser A	5.9	G5V	-037	-126 q	+0496	0042	.053	86	33-89	5.2	11+	NM
15493 531	+3464 45	Ross 806	11		+253	-480	+0551	0073		35	83-90	0		
		L 1489-3	13		+255	-495	+0230	0098		32	83-90	0		
		combined					+0445	0062	.047				12+	hz
16149 171	+5531 16	+55 1823 CR Dra	10.1	M0V	+093	-476	+0427	0045	.046	58	80-90	0.6	10½	NM
16231 254	+5432 18	AC +55 41703	10.2	dM	+464	-165	+1450	0030	.148	73	71-89	1.3	11½	PO
16598 650	-0454 64	- 4 4225 GC 23043	7.7	K5V	-912	-1133	+1109	0051		62	70-90	2.5		
17000 052	-0456 66	- 4 4226 Wolf 636	10.2	M3V	-913	-1126	+1056	0048		64	70-90	0		
		combined					+1081	0036	.110				11+	PO
		1979 result					+0922	0050	.095	47	38-78			
17002 053	+0051 42	+ 0 3629 GC 23050	6.0	F8	-016	-329	+0214	0065	.024	31	80-89	4.8	11	PO
17067 119	-0144 51	LPM 629	11.3		-456	-273 f	+0744	0038	.077	50	71-90	0	11+	hz
17297 321	+5030 25	G 203-71	12.8		+010	-515	+0449	0081	.046	31	83-89	0	13	hz
17303 349	+1238 34	+12 3252 α Oph	2.1	A5	+119	-223 f	+0663	0052	.069	75	46-90	8.0	10½	HA
17420 461	+2440 39	L 1350-84	12.4	dM	-370	+566	+0680	0088	.069	33	83-90	0	12½	hz
17518 522	+6448 46	AC +64 5618	11		000	-346	+0245	0059	.027	34	83-89	0.6	12	HA
18016 058	+2126 27	+21 3302 GC 24664	7.1	G1V	-024	-028 f	+0261	0045	.029	76	26-89	3.0	10½	PO
18506 555	+0817 24	V1285 Aql Vys 188	10.1	dM2	+092	-062	+0860	0023	.089	78	71-90	0	10+	hz
19011 002	+7030 40	AC +70 8247	13.2	DA	+079	+511	+0813	0061	.082	70	37-89	0	13+	PO
19077 111	+3837 47	+38 3466 GC 26442 A	8.4	G5	-254	-107	+0054	0039		91	14-90	2.0		
		BC	8.2	dK0	-262	-095	+0139	0045		91	14-90	2.0		
		combined					+0091	0030	.013				9	hz
19417 457	+2655 67	Ross 165 Kpr 95	12.2	M4V	-022	-1219 f	+0912	0037	.092	186	37-90	0	12	hz
19524 573	+0457 73	+ 4 4286 ADS 13156	8.5	F8	-020	-005	-0084	0043	-.005	61	35-90	2.0	10½	JW
20292 305	+6506 27	AC +65 6955	10.5	M3V	+441	+292	+1166	0024	+.120	124	67-89	0	10½	PO
		combined with 1973 result					+1178	0019	.121	225	38-89			
20272 311	+3312 33	+33 3930 Cou 1962	8.5	K0	+070	+081	+0179	0057	.020	30	82-89	2.0	10½	PO
20329 375	+1415 36	+14 4369 β Del	3.6	F5IV	+104	-015 f	+0266	0042	.030	90	14-89	6.5	10+	JW
20351 396	+2122 43	+21 4307 GC 28781 A	8.6	K3III	+014	+016	+0049	0043	.008	55	33-89	1.6	10½	hz
		B	10.5		-001	+006	+0082	0082	.011	44	37-89	1.6	10½	hz
20512 532	+6148 69	+61 2068	8.5	dM1	-016	-771	+1299	0024	.134	149	37-89	1.4	9½	PO
21116 165	+0859 84	+ 8 4638 Vys 833	8.0	dK8	+153	-102	+0556	0034	.059	67	72-89	2.2	10+	MH
21158 189	+5347 73	G 231-40	12.3	DA	-087	+199	+0489	0062	.050	41	80-89	0	12+	PO
21194 223	+5707 32	+56 2562	8.4	K0	+081	+032	+0241	0053	.027	64	31-90	1.8	10+	NM

TABLE 2. (continued)

Coord.	1900/2000	Names	m_v	Sp.	μ_α	μ_δ	π rel	s.d.	π	N	Int.	Disk	mf	Me
21194 223	+5708 34	+56 2564 ADS 14926	8.0	G5	+075	+025	+0132	± 0038	+016	64	31-90	1.8	10+	NM
21361 402	+3637 63	G 213-9	11.5	M3V	-390	-288	+0347	0057	.037	34	82-89	0	11½	PO
21441 478	+4946 75	Wolf 945	13		+679	+437	+0453	0065	.046	52	37-90	0	13	hz
21537 589	-0451 22	- 5 5674 GC 30755	6.2	K2	-008	-251	+0228	0041	.027	77	70-89	4.2	11	MH
22024 070	+2451 81	+24 4533 ι Peg	3.7	F5V	+296	+036	+0987	0075	.102	60	15-81	6.9	10½	PO
22076 121	+3105 34	+30 4633	10.2	dM0	-348	-413	+0212	0037	.024	53	78-89	0	10+	PO
22460 506	+3540 72	LP 289-12	12		-206	-047	+0451	0072	.047	36	83-89	0	11+	PO
22463 509	+3532 64	G 189-39	11		-382	-116	+0242	0077	.026	36	83-89	0	11+	PO
23370 419	+4340 71	Ross 248	12.3	dM6	+112	-1591	+3176	0028	.319	348	37-89	0	12+	PO
23430 481	+4828 61	Ross 249	11.7	M1V	+624	+088	+0550	0044	.056	68	38-89	0	12	PO

Notes to TABLE 2

L 722-22: Preliminary result (Heintz 1990b); the period is 4.9 yr and one component is undermassive.

BD +16°516: Update of preliminary measures of 29 plates by E.Borgman in 1981. The complex binary shows total eclipses of a degenerate companion. Contrary to earlier assumption, it is certainly not a Hyades member, the tangential velocity being much too large and also 20° off in direction. This eliminates the time constraint on the evolution of the white dwarf. The primary star (classified KOV) is at least a subgiant and thus semi-detached, though its spectrum is not characteristic for mass transfer. The system may well be a quiescent Nova.

BD +31°737: The period of AB is near 190 yr; the present series covers the apastron section and shows no significant photocentric displacement over 70 yr. Component C is 56" distant with cpm; its images are mostly weak under the disk.

BD +6°762 = GC 5875 was observed in 1938-70 and in 1985-90. The series was measured from the start, not using the earlier, manual measurements to 1963 (about half of the present material). The 1969-70 plates have been taken with a defective disk and are included with half weight and with a correction of 4 μ m. Apart from that, no systematic trend shows, and the other results on the parallax are confirmed.

Ross 46 has the substantial parallax expected from the color. Two other stars (Ross 602 and Hei 108) have less interest.

G 99-49: This is apparently the first measure of the large parallax.

BD +23°1491: Misclassified as a main-sequence star.

G 88-35/36: The proper-motion pair is separated by 11" (not 8" as Ciclas estimated); the precision of measuring is limited by the magnitude difference.

L745-46A: Includes the 1980 measures by E.Borgman of plates taken mostly in the 1970's; the 24 added plates have substantially increased the parallax. This white dwarf is recorded with $m_v = 13.0$ but seems to be somewhat brighter.

BD +28°1463 = GC 10438 (Pollux): The earlier plates (1940-65) have overexposed (reduced by only 8.4 mags) and partly diffracted images; only 40 of them were retained. Observations in 1985-90 used a stronger neutral filter. Previously derived parallaxes are confirmed.

LP 60-179: Color class m; a large parallax is found.

BD +67°577 = GC 12619 = ADS 7203 is the primary of a visual pair with a period of about 1200 yr. The mass ratio is deduced from quadratic terms (mostly in δ) in the measured motion of star A, as compared with those from micrometer positions. The parallax agrees with other results and with main-sequence masses, but for a type F3V rather than F7V. Since the color does not support F3, the primary must be considered a subgiant.

BD +9°2188 = GC 13062 = ADS 7390: The measured π (compatible with $\pi_{\text{dyn}} = 0''.026$) together with f make the components more luminous than type dF9. The plates are from 1916-28 and 1970-90, covering two opposite segments of the orbit; the proper motion (corrected for reference-star motions) disagrees with SAOC.

BD -10°2857: IUE has found UV flares. The Cape parallax is very weak and much too large. BD -10°2861 has the color class k (Luyten) and was included in the measurements.

L 897-16: $m_v = 11.3$ is estimated from the plates, much fainter than Luyten's 10.4.

BD +36°2147: The series has been discussed by Hershey and Lippincott (1982), but a discrepancy in the time-quadratic term and the question of a periodic effect remained. The numerous but short-exposed plates give only a poor and very large reference frame; the far-out star +36°2152 in particular contributes to the measuring error. The present evaluation is again based on the 1979 measures, with some later plates added by the author, a group of plates (measured by MJ but inadvertently omitted in the 1982 paper) included, and all plates prior to 1948 (145 nights) excluded because of uneven exposures and of the too-large distance of +36°2152. After correcting for reference-star motions, the centennial change $d\mu/dT$ results as $-0''.3$ (α) and $-3''.2$ (δ) $\pm 0''.2$ cy^{-2} , exactly as expected from the radial velocity -86 km/s, and the annual proper motion given here for 1950 is $0''.02$ larger than at the GC epoch 1896. Inclusion of the old plates raises π abs to $0''.395$ or $0''.397$, depending on the assigned weight. The residuals of the 34-yr coverage were searched for periodicities: Only a flat noise under $0''.01$ is found, and no signal at the formerly suspected 8 yr, 22 yr, or other period.

BD +61°1246 = ADS 8197: Includes the earlier measures (Heintz 1972); the series now extends over a full revolution and the periastron passage. A revised orbit (Heintz 1990a) was used in the mass-ratio reduction.

BD +15°2381 = ADS 8311: The measured plates are from 1918-21, 1971-82, and 1989-90; they bracket the periastron passage in 1941. The photocentric motion is distinct, the mass ratio as expected, and the measured π is within range of $\pi_{\text{dyn}} = 0''.019$ computed from a revised orbit ($a = 0''.707$, $P = 134.0$ yr, $e = 0.69$).

BD +2°2489 = GC 16215: These measures give a smaller parallax than three older series.

BD +36 2219: Agrees with the Van Vleck parallax (Uppgren and Weis 1975). BD +35°2288 was measured on a part of the plates; its image quality and position are unfavorable but the result suffices to not confirm a parallax of $+0''.04$.

BD +6°2551 has a fairly high velocity. The images of star B are too weak to be included in the parallax but show that the relative motion indicated by older micrometer observations is absent.

BD +6°2573: Coverage of the periastron in 1974 permits to derive the masses of the long-period pair ($P \approx 875$ yr, $e = 0.88$). The measured π suggests that the period is not much shorter. Spectral classifications range from dK0 to dK6.

BD +42°2321 = GC 17127: Includes and updates the 1976 measurements by M.Shanley (Lippincott and Worth 1979); the solution is combined from two reference frames. No systematic trend is seen after 75 yr.

BD +11°2529 = GC 17687: The series was made in 1940-66 and a few recent plates were added. The four-star reference frame has a substantial overall motion of $0''.08$; allowing for that the p.m. of ϵ Vir matches that in the FK4.

BD +35°2436 = ADS 8861: Δm is underrated in catalogs; in order to reach the companion, star A was overexposed and is difficult to measure. The separation is $17''.6$ and increases, but the substantial relative motion is still below the parabolic limit. The weak 1915-19 plates, from which a (much too large) parallax of star A was obtained in 1920, were not used now.

BD +45°2108: This series (1925-36, 1971-75, 1978-90) includes material near the periastron passages of 1937 and 1981. An unpublished orbit ($a = 0''.321$, $P = 44.24$ yr) was used. The parallax found confirms $\pi_{\text{dyn}} = 0''.021$ and the late-dG spectrum.

BD +15°2620: This completes a series over 45 yr, most of which had been measured earlier by MJ (cf. Lippincott and Hershey 1982). While adding the latest plates, two of the four reference stars were found to move, and were measured separately on selected plates. BD +15°2623 is included in Table II; +15°2624 has $\mu = 0''.10$ but no discernible parallax. Applying the data to +15°2620 with the respective dependences, 0.25 and 0.23, the discordant proper motion becomes corrected, π is slightly increased, the apparent quadratic term reduced, and the star still shows no periodic effect.

BD -1°2892: A larger parallax is found than from two low-weight earlier measures.

Notes to TABLE 2 (continued)

BD +27°2388 = ADS 9301: The series covers the time 1949-90 (1½ revolutions), and four old plates are included. A revised orbit with $a = 0''.200$ and $P = 29.93$ yr has been used. The photocentric motion is much smaller than expected, and the parallax does not permit to distinguish between subgiant and main-sequence stars.

BD +53°1719: The photometric distance estimate is confirmed.

Ross 51 is evidently a subdwarf. All plates except two are from 1970-89.

BD +16°2708 is a low-activity flare star and a suspected binary. The 17-yr monitoring here does not show orbital effects.

BD +40°2829: Completes an old series; the photocentric amplitude of the binary is too small to appear in the measurements.

BD +45°2247: The photometric parallax $0''.10$ and the SAOC motion in δ are too large.

BD +37°2636/7 = GC 20724/5 = ADS 9626: The pair BC is separated on 37 plates taken in 1969-90, and 17 selected plates from 1913-15 with blended images are included (not using the measures from 1916). BC has a period near 250 yr and - now in apastron - too slow a motion to find orbit curvature, but the parallax confirms the main-sequence classification.

BD +2°2989 = GC 21155 = ADS 9763: The solution includes t^2 terms of $+0''.68$ (α) and $+0''.64$ (δ) $\pm 0''.16$ cy^{-2} which are probably due to orbital motion, giving a mass ratio of approximately 4:1. The plates do not include the very faint companion at $4''$ of separation, and visual observations are infrequent. The comparison of the presently derived proper motion at mean epoch 1974.3 with the GC in 1906 makes the terms du/dt smaller. The assertion that the bright star is a spectroscopic binary is copied from one catalog into the next, but no evidence supports it.

Ross 806 is doubtlessly a physical pair; the discordant parallax seems to be due to the weak secondary images. Δm amounts to about 2 mag, much more than LHS states; the separation is $26''.4$ in position angle 172° and increasing.

BD +55°1823 is a UV flare star and a possible binary; the large photometric parallax is not confirmed.

AC +55°41703: Catalogued as K2 or M2 but probably of still later type. A McCormick measure gives $\pi = 0''.16$.

BD -4°4225/6: The cpm pair has a separation of $185''$ in position angle 122° ; $\Delta m_v = 2.5$. The present result is from the observations in 1970-90, measured against a faint but symmetric reference frame. Apparent trends in the δ coordinate are similar in both stars and thus probably due to their occasional overexposure. Also given in Table II is a solution from 1979 (unpublished) which included some plates from 1938-41 and was composed of three different reference frames. It yields substantially smaller parallaxes ($\pi_{\text{rel}} = 0''.0925 \pm 0''.0076$ for the brighter, $0''.0919 \pm 0''.0066$ for the fainter star). As plates from 42 nights are common to the two results (the measures are entirely separate), the difference is rather large. One of the old reference stars is BD -4°4224 with a proper motion of $0''.10$, but its measurement on 20 plates showed zero parallax. Seasonal exposure imbalances are also an improbable cause at that amount.

BD +0°3629: This disagrees with the larger Yale parallax and with the dwarf classification.

LFM 629: The series covers most of the orbit and the periastron ($a = 0''.69 \pm 0''.04$, $P = 33.5$ yr). The components are almost indistinguishable; the + sign of f-8 holds if the slightly fainter star is in the first quadrant at periastron. The masses then are 0.30 and 0.34 solar masses, determined to $\pm 25\%$.

G203-71: The photometric distance is confirmed; the passage within $5''$ of a 15 mag field star impaired the images somewhat.

BD +12°3252 = GC 23837: The revised orbit is discussed separately (Augensen and Heintz 1990) and is derived from Allegheny and Sproul material combined whereas the listed parallax is only from the S plates (1946-67 and 1985-90).

AC +64°5618: The color had suggested a larger parallax than is found here.

BD +21°3302 = ADS 11060: This updates an earlier parallax result (Heintz 1982) and uses the orbit given there: $a = 0''.253$, $P = 20.08$ yr. The visual and spectroscopic data combined lead to $\pi = 0''.025 \pm 0''.001$ and $f = 0.36 \pm 0.01$, in close agreement with the astrometry. Star A is a single-lined short-period subsystem ($P = 0.88$ d), and the third mass makes fractional luminosity and mass in the visual pair nearly equal so that no photocentric motion occurs. The orbit catalog by Batten et al (1989) lists an orbit by Batten et al which is disallowed by visual observations near periastron, already those from 1898.

Vys 188: The update includes the 1980 measurements by R. Kennedy for a preliminary result. Very slight trends in δ are not periodic but are related to seasonal overexposures of two northern reference stars.

AC +70°8247: An update of a 1981 result with 23 plates added; the parallax measures of the peculiar degenerate agree well.

BD +38°3466 = ADS 12145 A, BC was observed mostly in 1914-16 and in 1968-90. The northern component is a close pair BC with a 65 yr period. The plate series extends over the revolution but does not cover the periastron in 1956, and Δm is small; thus no orbital term is detected in the photographic positions. The 223" distant pair DE (a.k.a. ADS 12149) does not share the proper motion of A and BC.

Ross 165: The series was begun soon after Kuiper reported the binary nature of the red dwarf. It has now been completely measured, but manual measurements of the first 90 plates in 1937-68 with only three reference stars, used for a preliminary parallax (Lippincott 1973), have been rereduced and included with half weight. By visual inspection and from two exposures in 1963 at excellent seeing, which show the pair almost separated, $\Delta m = 0.5$ is estimated. The orbit (Heintz 1990a) has the elements $a = 1''.10 \pm 0''.06$ and $P = 81$ yr. The component masses are equal, 0.13 solar masses each, and determined to $\pm 20\%$.

BD +33°3930: Visual observations suggest a period less than 25 yr.

BD +14°4369 = GC 28709 = ADS 14073: The long series yields a good mass determination of this subgiant binary (Heintz and Weiss, in preparation).

AC +65°6955: The present result is from the material of the last 22 years, and is independent of the measures by Hershey (1973); it shows no systematic trend. Table II also lists a weighted mean of the solutions. It was this well-covered field which, when measured in 1970, established a convincing pattern of telescopic variations, and triggered the reinvestigation of the then suspected, small proper-motion wobbles.

BD +21°4307 = ADS 14123: Completes an old and intermittent series; the companion is probably optical.

BD +61°2068: Two earlier results from parts of the present material (mostly measured by M. Worth) are now updated. All of the plates are short-exposed and give no balanced reference frame. The formerly suspected 17-year period is not confirmed; the slight systematic trend is aperiodic (the added data would hint at a period, if any, over 30 yr), and its amount, less than $\pm 0''.03$, is within range of optical effects on the distant reference stars.

BD +8°4638: The parallax results as expected from the spectral type. The semiregular variable T Eql had to be used as one of the reference stars; it showed no major fluctuations.

G 231-40 is an unusually bright white dwarf.

BD +56°2564: Large discordances between present and earlier micrometer data preclude a useful evaluation as to the orbital elements at this time; the period seems to be around 230 yr. The astrometric series contains 9 nights in 1931-37, the rest is from 1971-90. The proper motion of BD +56°2562 is notably different, and its association with the binary thus doubtful.

Wolf 945: All nights except two are in 1971-90; M. Worth's measurement of the first 19 plates is included. Small trends in the residuals do not fit a period.

BD -5°5674 is misclassified as K2V.

BD +24°4533 = GC 30932: The series suffers from sector diffraction and from a weak reference frame; it was discontinued in 1981. 60 plates were selected, mostly from 1914-14 and 1969-78; the 1916 measurements of the old series were not used. The parallax of the double-lined binary has also been measured as $0''.07$ (Allegheny) and $0''.095$ (McCormick).

BD +30°4633: The spectral parallax estimate $0''.05$ is not confirmed.

LP 289-12: The fainter of two unrelated proper-motion stars shows a substantial parallax.

Ross 248: This updates earlier results (Lippincott and Worth 1976); the plates to 1980 had been measured by MJ. Reference star motions are now included. The star had been heavily covered till 1977, presumably in order to clarify a formerly suspected small trend, but the precision attained did not match the effort as larger parts of the series were too weakly exposed. No systematic effect is seen now, at least not over the last 30 yr.

Ross 249: The catalogued parallax of $0''.075$ seems to be much too large.

Correction to Paper V: The printing of some Notes in unrevised form was missed in proofreading. LDS 1201 and G251-29 have previous parallaxes, and the attempt to find masses for Stein 2051 (Strand loc. cit.) is not supported by the author's data.