

A. J. 62, 276, 1957

22 ^h 20 ^m 0	BD +21°4747	$\mu_\alpha = -$	"214	-	"212
23 56.1	BD +13°5195A	$\mu_\alpha = +$.015	+	.009
		$\pi = +$.027	+	.032
	BD +13°5195B	$\mu_\alpha = +$.009	+	.015
		$\pi = +$.032	+	.027
	BD +13°5195A-B	$\rho =$	23°		204°

A. J. 62, 276-279, 1957 (cont.)

13 33.0	BD +36°2393	Mag. =	9.6		9.0
13 39.9	BD -3°3527	$\mu_\alpha =$	"150		- "150
17 38.0	BD +71°850	$\mu_\alpha = +$.108		+ .094
23 03.0	AC +3°2781-116	μ tot. =	0.43		0.54

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11 ^h 38 ^m 6	AC +33°238-107	Mag. =	9.1		9.9
12 18.4	Ci 20, 701	$\pi = +$	"060		+ "056
13 13.5	AC +37°30242	$\mu_\alpha =$.072		- .072
13 29.4	Wolf 1487	Mag. =	10.4		9.7
13 29.6	BD -7°3646	Mag. =	10.1		9.3

Additional Stars in Pub. McCormick Obs. Vol. 14, part 1.

20 ^h 36 ^m 2	GC 28814	Not published in any of the lists and therefore not included in the General Catalogue of Trigonometric Stellar Parallaxes (1952).			
23 25.4	AC +18°1085-42				

TRIGONOMETRIC PARALLAXES DERIVED FROM PHOTOGRAPHS TAKEN WITH THE TWENTY-INCH REFRACTOR OF THE VAN VLECK OBSERVATORY

(EIGHTH LIST)

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Abstract. Relative trigonometric parallaxes and proper motions for twenty stars were determined photographically by essentially the same methods as were used for previously published parallaxes from the Van Vleck Observatory.

These parallaxes were determined from photographs taken with the 20-inch refractor of the Van Vleck Observatory of Wesleyan University, using a Wratten number 12 "minus blue" filter

and Eastman IG or Super Panchro-Press plates. This list is a continuation of those published in earlier volumes of the *Astronomical Journal* (Stearns 1951, 1956).

No.	Name	R.A. (1900)	Dec. (1900)	Mag.	Proper motion			Relative parallax and P.E.	No. of plates	Comp. stars
					Catalogue Total	in X	Obs. in X			
240	Ross 597	4 ^h 11 ^m 4	+23° 13'	11.3	0".58	+0".49	+0".469	+0".017 ± 0".008	43	4
241	μ Geminorum	6 16.9	+22 34	3.19	0.128*	+0.059	+0.062	+0.012	6	41
242	Anonymous	6 38.1	+58 44	9.7	0.56*	+0.05	-0.003	+0.013	9	35
243	Ross 390	7 30.1	-10 10	11.6	0.63	+0.32	+0.433	+0.011	7	46
244	LPM 269	7 35.6	-17 10	13	1.29*	+1.15	+1.136	+0.102	17	45
245	BD +67°552	8 27.4	+67 38	9.2	1.09	-1.09	-1.056	+0.052	7	42
246	BD +10°1857	8 37.3	+ 9 56	9.3	0.66	+0.19	+0.209	+0.081	8	46
247	Anonymous	8 37.4	+ 9 56	10	0.68	+0.31	+0.220	+0.061	6	46
248	ω Leonis	9 23.1	+ 9 30	5.52	0.054*	+0.053	+0.071	+0.027	10	33
249	R Leonis	9 42.2	+11 54	var.	0.047*	+0.001	+0.013	+0.019	13	41
250	Ross 445	10 10.2	- 9 10	11	0.52	-0.52	-0.497	+0.014	8	35
251	Ross 626	10 42.0	+28 56	10.4	0.83	+0.21	+0.187	+0.026	7	46
252	Ross 911	11 36.4	+ 5 42	9.5	0.52*	+0.21	+0.216	+0.042	8	43
253	Ross 119	11 49.0	+10 23	11	0.73	+0.10	+0.100	+0.091	13	63
254	Wolf 1438	12 8.3	+17 16	13.3	0.65	-0.44	-0.477	+0.040	10	26
255	Wolf 427	12 30.0	+10 23	11.1	0.45	-0.38	-0.440	+0.061	7	46
256	BD +24°2735	14 23.3	+24 18	10.2	0.49	-0.48	-0.503	+0.050	12	45
257	Ross 651	19 9.9	+ 1 59	9.4	0.56	+0.39	+0.352	+0.046	7	34
258	Comp. to Ross 651	19 9.9	+ 1 59	10			+0.362	+0.038	9	34
259	Wolf 896	20 51.4	-10 48	11.3	1.14	-0.20	-0.033	+0.026	15	38

NOTES

240 The proper motion and parallax are weighted means of two sets of measurements of the same plates. For the second measures different comparison stars were used: two plates were rejected on account of the faintness of one of the new comparison stars. There is no obvious reason for rejecting the first set of measurements. Proper motions in X were +0".485 and +0".453; parallaxes were +0".004 ± 0".009 and +0".027 ± 0".008 for the first and second sets, respectively.

241, 248, 249 Boss' *General Catalogue*.

242 *A. J.* 47, 113.

244 *Pub. Astron. Obs. Minnesota*, III, No. 1.

252 *A. J.* 46, 158.

The magnitudes in the fifth column are in general taken from the same sources as the catalogue proper motions, but for stars whose magnitudes are given to two decimal places the source is the *Henry Draper Catalogue*. Magnitudes in italics are photographic. The catalogue proper motions in the sixth and seventh columns are taken from *Publications of the Cincinnati Observatory*, No. 20, except for the stars indicated by an asterisk in the sixth column, for which the sources are given as notes to the table.

The plates were taken by F. Slocum, B. W. Sitterly, R. T. Matthews, N. W. Storer, V. A. Goedicke, and the author. The measuring for twelve fields was done by Helen Dondero, for four fields by Elizabeth Maier, and for one field each by Patricia Flosdorf, Janice Grover, Caryl McLear, Michael Ryan, and Norman Thomas.

REFERENCES

- Stearns, Carl L. 1951, *A. J.* 56, 86.
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FORMULAE FOR PREDICTING THE POSITION OF AN ARTIFICIAL SATELLITE

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The appended formulae give the solution of the problem of motion in vacuum of an artificial satellite of the earth. Since the theory of the motion will appear in another paper, only a brief description of the work appears here. Under the assumption of the axial and the equatorial symmetry, the gravitational potential is represented by

$$V = -1/r + \frac{2}{3} J P_2(\sin \theta)/r^3 - \frac{8}{35} D P_4(\sin \theta)/r^5,$$

with r denoting the ratio of the radius vector to the equatorial radius of the earth, θ the declination, P_2 and P_4 the Legendre polynomials; the geophysical constants J and D , introduced by Jeffreys, are treated as small quantities of the first and second orders, respectively. The unperturbed orbit is defined by a V_0 that incorporates the major portion of the second spherical harmonic and leads to a closed solution in terms

of elliptic functions, without any secular variations of the first order (Garfinkel 1958). The perturbations of this non-Keplerian intermediary orbit have been derived by the von Zeipel modification (1916) of the method of Delaunay. The periodic and the secular variations have been carried up to the first and the second orders, respectively. The solution is valid for $e < 1$, provided the time of prediction does not exceed a bound beyond which the omission of the secular variations of the third order can no longer be justified. The presence of a singularity at the critical inclination $i_* = \tan^{-1} 2 = 63.4^\circ$ imposes the further restriction

$$|i - i_*| \geq e/20(1 + e),$$

with the right-hand member attaining a maximum of 1.4° when $e = 1$.

REFERENCES

- Garfinkel, B. 1958, *A. J.* 63, 88.
 Jeffreys, H. 1952, *The Earth* (Cambridge University Press).
 von Zeipel, H. 1916, *Ark. Mat. Astr. Fys.* 11, 1.

APPENDIX. COMPUTATIONAL SUMMARY

A. The data:

1) the geophysical constants:

$$R = 6378.4 \text{ km}$$

$$J = 1.624 \times 10^{-3}$$

$$n_0 = 1.23943 \times 10^{-3} \text{ rad./sec.}$$

$$D = 6 \times 10^{-6}$$

2) the elements $a, e, i, \sigma, \omega, \Omega$