LICK OBSERVATORY BULLETIN

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PRELIMINARY RADIAL VELOCITIES OF 212 BRIGHTER CLASS A STARS¹

The provisional radial velocities of 212 brighter Class A stars are published in the following table. They depend in large measure upon observations² made with the D. O. Mills spectrograph attached to the 36-inch equatorial and by the D. O. Mills Expedition to the Southern Hemisphere. The radial velocities for a few of the stars have been taken from the published results of other observatories, credit being given in each case in the appended notes. The abbreviation "A. O." refers to the Allegheny Observatory, and similar abbreviations to the other observatories whose results are included. Such of the velocities as depend upon only two observations are specified in the notes. Likewise, those stars whose observed velocities have varied, indicating that they are spectroscopic binary systems, and for which we can estimate the approximate velocities of the centers of mass of the systems, are indicated in the notes. The symbols : and :: as usual indicate some degree of uncertainty. The first column of the table contains the number of the star in the *Revised Harvard Photometry*. The visual magnitudes and the spectral classifications in the fifth and sixth columns have been taken from the same authority. d in column 8 is the angular distance of the star from the assumed apex at $\alpha = 270^\circ$, $\delta = +30^\circ$. The angle ψ in column 12 is the position angle of the vector which represents the proper motion μ measured on the arc of a great circle, as deduced from Boss's *Preliminary General Catalogue*, and quoted in column 13. The angle χ in column 11 is the position angle of the great circle drawn from

the star to the assumed apex. The quantity τ in column 14 is the component of the proper motion μ at right angles to the great circle drawn through the star and the apex; and the quantity v is the corresponding component of the proper motion μ along this great circle; v being given a negative sign when the proper motion of the star carries it away from the apex.

The proper-motion data have been used as published in Boss's catalogue; that is, without the application of the tentative or provisional corrections referred to on pp. xxviii-xxx of the catalogue.

The 212 individual stars were divided into thirty-two groups of neighboring stars, as uniformly distributed over the celestial sphere as possible. The mean right ascensions, declinations and radial velocities of the thirty-two groups, respectively, formed the basis of thirty-two equations of condition in a solution for the elements of the solar motion. These equations were of the form

$$\cos d \cdot V_0 + K - V = 0,$$

in which V_0 is the velocity of the solar system with reference to the system of 212 Class A stars; V is the mean of the observed radial velocities of the stars in each group; d is the mean angular distance of the group from the assumed apex; and K is a constant assumed to represent any systematic error to which the individual radial velocities are liable.

Assuming the apex of solar motion to be situated at $\alpha = 270^\circ$, $\delta = +30^\circ$, the most probable values of the velocity of solar motion and of the constant error of the radial velocity observations were deduced, as follows:

$$V_0 = -15.3 \text{ km. per second}$$

$$K = -0.6 \text{ km.}$$

These values differ somewhat from those obtained in 1911³ on the basis of 177 Class A radial velocities,

¹ Read before the meeting of the National Academy of Sciences, Washington, D. C., April 16, 1912.

² Funds are not available to publish (in volume form) the results for individual spectrograms obtained at Mount Hamilton and at Santiago, and it seems desirable that the mean provisional velocities be published without further delay.

³ *L. O. Bulletin*, 6, 127, 1911.

R.H.P. 1	Name 2	α (1900) 3	δ (1900) 4	Vis. Mag. 5	Spec. 6	Obs. V 7 km.	d 8	V_1 9 km.	V_2 10 km.	χ 11
15	α Andromedae	0h 3m2	+28° 32'	2.2	A	-13.0	76° 49'	- 8.9	- 8.6	297° 12'
63	θ Andromedae	11.9	+38 8	4.4	A	+ 6.2	74 8	+11.0	+11.5	295 57
127	β_2 Tucanae	27.0	-63 31	4.5	A2	+12.	119 31	+ 5.1	+ 2.4	278 43
136	A.G.C. 467	28.1	-63 35	5.2	A2	+14.	119 39	+ 7.0	+ 4.3	278 26
139	θ Tucanae	29.2	-71 49	6.1	A5	+ 4.	120 37	- 3.2	- 5.9	273 26
191	η Phoenixis	38.8	-58 1	4.5	A	-10.:	120 5	-17.1	-19.8	279 23
269	μ Andromedae	51.2	+37 57	3.9	A2	+ 8.	81 1	+11.0	+11.0	301 15
331	ν Phoenixis	1 3.2	-42 1	5.2	A3	- 6.:	120 40	-13.2	-15.9	284 23
343	θ Cassiopeiae	5.0	+54 37	4.5	A5	+14.	74 29	+18.7	+19.5	300 22
383	ν Piscium	14.0	+26 44	4.7	A2	+10.:	91 10	+10.3	+ 9.6	304 46
403	δ Cassiopeiae	19.3	+59 43	2.8	A5	+ 7.	73 31	+11.9	+12.5	301 50
546	γ Arietis	48.0	+18 49	4.8	Ap	- 1.2	102 10	- 3.8	- 5.3	307 52
553	β Arietis	49.1	+20 19	2.7	A5	- 1.	101 27	- 3.4	- 4.9	308 15
569	λ Arietis	52.4	+23 7	4.8	A5	+ 1.1	100 19	- 1.0	- 2.4	309 4
575	48 Cassiopeiae	53.8	+70 25	4.6	A2	- 3.	70 34	+ 2.7	+ 3.5	306 9
596	α Piscium	56.9	+ 2 17	4.3	A2p	+10.:	113 44	+ 4.4	+ 2.2	304 21
612	ν Fornacis	2 0.0	-29 47	4.7	Ap	+20.	128 38	+11.1	+ 7.8	286 17
622	β Trianguli	3.6	+34 31	3.1	A5	- 2.:	94 46	- 2.6	- 3.6	311 46
707	ι Cassiopeiae	20.8	+66 57	4.6	A5	+ 2.:	74 39	+ 6.7	+ 7.2	312 47
718	ξ_2 Ceti	22.8	+ 8 1	4.3	A	+ 8.	115 30	+ 2.1	- 0.4	308 48
813	μ Ceti	39.5	+ 9 42	4.4	A5	+26.0	117 34	+19.5	+17.0	311 25
837	ζ Hydri	44.0	-68 3	4.9	A2	+10.	132 32	+ 0.3	- 3.2	242 31
898	θ_2 Eridani	54.5	-40 42	4.4	A2	+20.	141 11	+ 8.7	+ 4.8	269 2
909	β Horologii	56.9	-64 28	5.1	A5	+28.	135 21	+17.8	+14.1	242 2
1070	ν Eridani	3 25.6	- 5 25	4.8	A	+ 9.:	136 9	- 1.4	- 5.1	308 46
1181	τ_7 Eridani	43.4	-24 11	5.0	A2	+21.	149 10	+ 8.5	+ 4.2	288 29
1251	ν Tauri	57.8	+ 5 43	3.9	A	- 6.6	133 49	-16.6	-20.1	322 24
1324	b Persei	4 10.7	+50 3	4.6	A2	+23.1	96 22	+22.0	+20.9	336 25
1329	ω Tauri	11.4	+20 20	4.8	A5	+16.8	123 17	+ 9.0	+ 6.1	331 47
1367	A.G.C. 4858	16.3	-20 52	5.3	A	- 9.	154 56	-22.2	-26.7	296 37
1387	κ Tauri	19.4	+22 4	4.4	A3	+40.	122 35	+32.4	+29.5	334 6
1389	68 Tauri	19.7	+17 42	4.2	A	+36.4	126 32	+27.9	+24.8	332 49
1465	α Doradus	31.8	-55 15	3.5	Ap	+26.	150 16	+13.4	+ 9.1	220 58
1530	κ Doradus	42.9	-59 55	5.4	A5	-18.:	147 24	-30.3	-34.4	212 3
1568	7 Camelopard.	49.3	+53 35	4.4	A2	- 8.9	95 1	- 9.6	-10.6	344 42
1620	ι Tauri	57.1	+21 27	4.7	A5	+42.	126 23	+33.6	+30.4	343 3
1638	11 Orionis	58.9	+15 16	4.6	A	+14.	132 24	+ 4.3	+ 0.9	342 0
1666	β Eridani	5 2.9	- 5 13	2.9	A2	- 8.:	151 48	-20.8	-25.2	333 8
1702	μ Leporis	8.4	-16 19	3.3	Ap	+28.0	161 56	+14.1	+ 9.5	321 27
1762	A.G.C. 6141	16.2	-21 20	4.7	A	+31.5	166 53	+17.2	+12.5	313 32
1896	θ_1 Orionis, D	30.4	- 5 27	6.8	A	+19.	154 29	+ 5.8	+ 1.4	344 59
2029	ξ Aurigae	46.5	+55 41	4.9	A2	-13.6	94 16	-14.1	-15.0	357 4
2088	β Aurigae	52.2	+44 56	2.1	Ap	-18.1	105 3	-21.4	-23.2	358 15
2095	θ Aurigae	52.9	+37 12	2.7	Ap	+28.5	112 46	+23.2	+21.0	358 20
2238	2 Lynceis	6 10.8	+59 3	4.4	A	- 3.	90 55	- 2.7	- 3.3	2 20
2298	8 Monocerotis	18.5	+ 4 39	4.5	A5	+21.:	145 4	+ 9.1	+ 5.0	7 0
2385	13 Monocerotis	27.5	+ 7 24	4.5	A	+12.4	142 1	+ 1.0	- 3.0	9 42
2414	ξ_2 Canis Majoris	30.9	-22 53	4.5	A	+36.:	170 5	+21.6	+16.8	42 30
2421	γ Geminorum	31.9	+16 29	1.9	A	-11.:	132 53	-20.8	-24.3	9 26
2435	N Carinae	32.8	-52 53	4.4	A	+25.0	156 20	+11.6	+ 7.1	162 5
2491	α Canis Majoris	40.7	-16 35	1.6	A	- 7.4	163 40	-21.5	-26.1	32 57

R.H.P. 1	ψ 12	μ 13	τ 14	v 15	Remarks concerning adopted radial velocities
15	138° 59'	0.213	+0.079	-0.198	Spectroscopic binary: V_0 = mean of Baker's and Ludendorff's values (<i>Publ. A. O.</i> , 1, 22, 1908 and <i>A. N.</i> , 178, 23, 1908).
63	247 23	.052	+ .039	+ 0.34	
127	125 10	.108	+ .048	- .097	
136	115 59	.089	+ .027	- .085	
139	100 28	.066	+ .008	- .065	
191	315 0	.010	- .006	+ .008	Only two observations.
269	79 52	.153	- .101	- .115	
331	94 5	.028	- .005	- .028	Only two observations.
343	94 30	.230	- .100	- .207	
383	117 33	.026	- .003	- .026	Spectroscopic binary: estimated velocity of center of mass.
403	98 40	.305	- .120	- .280	
546	143 8	.135	+ .036	- .130	
553	139 9	.146	+ .028	- .143	Spectroscopic binary: V_0 from orbit by Ludendorff (<i>Ap. J.</i> , 25, 325, 1907).
569	259 10	.096	+ .073	+ .062	
575	275 37	.061	+ .031	+ .053	
596	98 8	.042	- .019	- .038	Spectroscopic binary: estimated velocity of center of mass.
612	80 32	.012	- .005	- .011	
622	106 50	.159	- .067	- .144	Spectroscopic binary: estimated velocity of center of mass.
707	344 3	.015	- .008	+ .013	Y. O. spectroscopic binary: V is mean of five L. O. observations.
718	95 51	.039	- .021	- .033	
813	95 29	.283	- .166	- .229	
837	46 36	.076	- .021	- .073	
898	285 7	.077	- .021	+ .074	
909	6 7	.028	- .023	- .016	
1070	41 59	.013	- .013	- .001	
1181	39 10	.070	- .065	- .025	Only two observations.
1251	171 52	.007	+ .003	- .006	
1324	135 0	.076	- .028	- .071	Spectroscopic binary: V_0 from orbit by Cannon (<i>Journ. R. A. S. Can.</i> , 5, 266, 1911).
1329	206 57	.066	+ .054	- .038	
1367	96 38	.043	- .015	- .040	Only two observations.
1387	115 25	.112	- .070	- .087	
1389	103 9	.110	- .084	- .071	
1465	92 12	.052	+ .040	- .033	
1530	7 42	.037	- .015	- .034	Only two observations.
1568	296 34	.016	+ .012	+ .011	Spectroscopic binary: V_0 from orbit by Harper (<i>Journ. R. A. S. Can.</i> , 5, 112, 1911).
1620	125 3	.082	- .051	- .065	
1638	152 11	.041	- .007	- .040	
1666	228 5	.118	+ .114	- .031	
1702	124 59	.049	- .014	- .047	
1762	45 0	.020	- .020	- .001	
1896	36 52	.005	- .004	+ .003	Y. O. result (<i>Ap. J.</i> , 19, 354-5, 1904).
2029	326 19	.014	+ .007	+ .012	
2088	263 56	.047	+ 0.47	- .004	Spectroscopic binary: weighted V_0 , Baker (<i>Publ. A. O.</i> , 1, 163, 1910).
2095	149 2	.105	- .051	- .092	
2238	346 36	.022	+ .006	+ .021	
2298	255 58	.012	+ .011	- .004	
2385	163 18	.011	- .005	- .010	
2414	24 46	.014	+ .004	+ .013	
2421	136 15	.065	- .052	- .039	Spectroscopic binary: estimated velocity of center of mass.
2435	237 16	.017	- .016	+ .004	
2491	203 34	1.316	- .214	-1.299	Spectroscopic binary: V_0 by Campbell (<i>L. O. B.</i> , 3, 80, 1905).

R.H.P. 1	Name 2	α (1900) 3	δ (1900) 4	Vis. Mag. 5	Spec. 6	Obs. V 7 km.	d 8	V_1 9 km.	V_2 10 km.	χ 11
2540	θ Geminorum	6 ^h 46 ^m 2	+34° 5'	3.6	A2	+ 8.:	114° 59'	+ 2.2	— 0.2	11° 2'
2746	L ₁ Puppis	7 10.2	—45 0	5.0	Ap	+ 3.5	159 37	—10.2	—14.8	131 24
2763	λ Geminorum	12.3	+16 43	3.6	A2	— 9.:	130 9	—18.2	—21.6	20 35
2818	21 Lyncis	19.2	+49 25	4.4	A	+25.8	98 39	+24.1	+22.9	17 16
2852	ρ Geminorum	22.7	+31 59	4.2	A5	— 4.	114 59	— 9.8	—12.2	19 43
2857	64 Geminorum	23.1	+28 19	5.0	A2	+28.:	118 24	+21.3	+18.7	20 26
2874	A.G.C. 9632	25.6	—22 49	4.8	A3p	+37.1	159 34	+23.4	+18.8	64 53
2890	α Geminorum	28.2	+32 6	2.8	A	+ 2.6	114 29	— 3.1	— 5.5	20 56
3067	ϕ Geminorum	47.4	+27 1	5.0	A2	—22.:	117 28	—28.4	—31.0	26 10
3113	A.G.C. 10482	53.7	—30 4	4.8	A2	+28.5	155 27	+15.2	+10.8	82 56
3226	A.G.C. 10913	8 8.0	—42 41	4.9	A3	+19.3	151 30	+ 6.5	+ 2.2	105 51
3270	q Puppis	14.8	—36 21	4.4	A5	+ 8.:	151 13	— 4.8	— 9.1	92 53
3314	30 Monocerotis	20.7	— 3 35	4.0	A	+14.:	137 32	+ 3.3	— 0.4	47 39
3426	e Velorum	34.2	—42 38	4.1	A5	+21.2	146 50	+ 9.0	+ 4.9	99 34
3449	γ Cancri	37.5	+21 50	4.7	A	+29.:	115 49	+23.0	+20.5	37 37
3487	a Velorum	42.6	—45 40	4.1	A	+24.2	144 46	+12.3	+ 8.3	102 4
3492	ρ Hydrae	43.1	+ 6 13	4.4	A	+14.:	126 43	+ 5.5	+ 2.3	44 53
3556	δ Pyxidis	51.3	—27 18	4.9	A	+ 2.	142 33	— 9.5	—13.5	75 25
3569	ϵ Ursae Majoris	52.4	+48 26	3.1	A5	+ 8.:	92 36	+ 7.9	+ 7.1	36 19
3572	α Cancri	53.0	+12 15	4.3	A5	—15.	120 41	—22.2	—24.9	43 38
3595	ν Cancri	56.9	+24 51	5.4	A	—14.:	110 41	—18.8	—20.9	40 13
3615	α Volantis	9 0.9	—66 0	4.2	A5	+ 6.	134 49	— 4.2	— 7.7	119 56
3619	f Ursae Majoris	1.9	+52 0	4.5	A3p	— 1.1	88 51	— 0.2	— 0.7	38 8
3662	e Ursae Majoris	9.0	+54 26	4.9	A5	—19.:	86 17	—17.4	—17.7	39 35
3685	β Carinae	12.1	—69 18	1.8	A	—16.:	132 15	—25.7	—29.1	199 33
3690	38 Lyncis	12.6	+37 14	3.8	A	+ 4.:	99 4	+ 2.2	+ 0.9	40 47
3787	τ_2 Hydrae	26.9	— 0 44	4.5	A3	+ 5.:	122 53	— 2.7	— 5.6	54 3
3894	ϕ Ursae Majoris	45.4	+54 32	4.5	A2	—12.	82 36	— 9.4	— 9.5	46 38
3970	ν_2 Hydrae	10 0.3	—12 35	4.7	A	+25.	122 3	+17.5	+14.6	62 19
3975	η Leonis	1.9	+17 15	3.6	Ap	+ 1.8	105 2	— 1.5	— 3.3	51 17
3981	15 Sextantis	2.9	+ 0 7	4.5	A	+10.	115 0	+ 4.2	+ 1.8	56 27
4023	q Velorum	10.5	—41 38	4.1	A2	+12.:	129 3	+ 3.0	— 0.3	81 55
4033	λ Ursae Majoris	11.1	+43 25	3.5	A	+17.	86 48	+18.5	+18.1	50 28
4072	A.G.Christiania 1608	16.9	+66 4	4.9	A	— 2.7	72 17	+ 2.6	+ 3.2	54 57
4090	30 Leo. Minoris	20.2	+34 18	4.8	A5	+14.	91 9	+14.3	+13.6	51 45
4138	K Carinae	27.8	—71 29	4.9	A2	+ 8.8	125 35	+ 0.5	— 2.5	101 33
4293	i Velorum	55.5	—41 41	4.6	A2	— 6.	120 47	—13.2	—16.0	75 36
4294	c Leonis	55.6	+ 6 38	5.1	A5	—16.:	100 25	—18.1	—19.5	57 46
4295	β Ursae Majoris	55.8	+56 55	2.4	A	—12.	73 15	— 7.0	— 6.4	60 22
4300	b Leonis	57.0	+20 43	4.4	A	—10.5	92 28	—10.5	—11.3	56 33
4338	A.G.C. 15269	11 4.4	—61 24	5.4	A	—25.	122 35	—32.6	—35.5	86 9
4343	β Crateris	6.7	—22 17	4.5	A2	+ 6.:	111 59	+ 0.9	— 1.3	65 20
4357	δ Leonis	8.8	+21 4	2.6	A2	—18.:	89 58	—17.4	—18.0	57 38
4359	θ Leonis	9.0	+15 59	3.4	A	+ 6.8	92 38	+ 6.7	+ 5.9	57 44
4405	γ Crateris	19.9	—17 8	4.1	A5	+ 8.:	106 56	+ 4.2	+ 2.3	63 4
4442	α_2 Centauri	27.1	—58 58	5.3	A2p	—16.8	119 30	—23.7	—26.4	79 58
4487	A.G.C. 15901	33.5	—61 16	5.3	A	+ 5.	119 6	— 1.8	— 4.5	79 56

R.H.P. 1	ψ 12	μ 13	τ 14	ν 15	Remarks concerning adopted radial velocities
2540	173° 40'	0.054	—0.016	—0.052	
2746	190 43	.113	— .097	+ .058	
2763	224 24	.067	+ .027	— .061	
2818	186 59	.049	— .009	— .048	Five L. O. observations combined with A. O. results (<i>Publ. A. O.</i> , 2, 122, 1911).
2852	39 9	.236	— .079	+ .223	
2857	208 28	.067	+ .009	— .066	A. O. result (<i>Publ. A. O.</i> , 2, 122, 1911).
2874	79 42	.011	— .003	+ .011	
2890	237 15	.203	+ .120	— .164	Spectroscopic binary: V_0 from orbits by Curtis (<i>L. O. B.</i> , 4, 58, 1906 and <i>L. O. B.</i> , 4, 64, 1906).
3067	218 5	.047	+ .010	— .046	Spectroscopic binary: V_0 estimated from L. O. and Y. O. observations (<i>Ap. J.</i> , 32, 302, 1910).
3113	308 40	.013	+ .009	— .009	Spectroscopic binary: only two observations.
3226	191 19	.005	— .005	.000	
3270	306 14	.144	+ .079	— .120	Only two observations.
3314	249 15	.071	+ .026	— .066	
3426	246 48	.015	— .008	— .013	
3449	243 53	.114	+ .050	— .102	Spectroscopic binary: V_0 estimated from five L. O. observations, Y. O. observations (<i>Ap. J.</i> , 32, 302, 1910) and A. O. observations (<i>Publ. A. O.</i> , 2, 122, 1911).
3487	230 54	.021	— .016	— .013	
3492	202 4	.040	— .016	— .037	Only two observations.
3556	149 49	.128	— .123	+ .034	
3569	240 16	.502	+ .204	— .459	
3572	136 30	.054	— .054	— .003	Five L. O. observations combined with A. O. results (<i>Publ. A. O.</i> , 2, 122, 1911).
3595	180 0	.005	— .003	— .004	A. O. result (<i>Publ. A. O.</i> , 2, 122, 1911).
3615	187 49	.103	— .095	+ .039	Spectroscopic binary: estimated velocity of center of mass.
3619	252 31	.133	+ .075	— .110	
3662	45 28	.086	— .009	+ .086	Only two observations.
3685	300 33	.193	+ .003	— .193	Only two observations.
3690	190 30	.137	— .069	— .118	Only two observations.
3787	223 27	.026	— .005	— .026	Six L. O. observations combined with A. O. results (<i>Publ. A. O.</i> , 2, 122, 1911).
3894	0 0	.009	+ .007	+ .006	
3970	287 58	.039	+ .028	— .027	
3975	184 46	.012	— .009	— .008	
3981	246 48	.031	+ .006	— .030	
4023	281 10	.160	+ .053	— .151	Spectroscopic binary: estimated velocity of center of mass.
4033	254 29	.168	+ .068	— .153	
4072	205 34	.025	— .012	— .022	Spectroscopic binary: V_0 from orbit by Schlesinger and Baker (<i>Publ. A. O.</i> , 2, 34, 1910).
4090	218 55	.107	— .024	— .104	
4138	147 32	.039	— .028	+ .027	
4293	106 16	.025	— .013	+ .022	
4294	240 57	.062	+ .003	— .062	A. O. result (<i>Publ. A. O.</i> , 2, 123, 1911).
4295	71 34	.089	— .017	+ .087	P. O. spectroscopic binary: V_0 estimated from L. O. observations.
4300	328 0	.028	+ .028	+ .001	
4338	271 44	.033	+ .003	— .033	Only two observations.
4343	179 26	.101	— .092	— .041	Spectroscopic binary: estimated velocity of center of mass.
4357	134 25	.207	— .202	+ .047	
4359	215 48	.106	— .040	— .098	
4405	268 24	.107	+ .046	— .097	
4442	231 57	.029	— .014	— .026	
4487	273 41	.062	+ .015	— .060	

R.H.P. 1	Name 2	α (1900) 3	δ (1900) 4	Vis. Mag. 5	Spec. 6	Obs. V 7 km.	d 8	V_1 9 km.	V_2 10 km.	χ 11
4520	λ Muscae	11 ^h 40 ^m 9	—66° 10'	3.8	A5	+17.	119° 7'	+10.2	+ 7.5	81° 2'
4534	β Leonis	44.0	+15 8	2.2	A2	+ 1.3	85 51	+ 3.0	+ 2.7	60 1
4554	γ Ursae Majoris	48.6	+54 15	2.5	A	— 9.:	67 37	— 2.6	— 1.6	69 17
4660	δ Ursae Majoris	12 10.5	+57 35	3.4	A2	—11.:	63 41	— 3.6	— 2.4	74 50
4663	6 Comae Bereniceis	10.9	+15 28	5.1	A2	+ 5.:	80 2	+ 8.3	+ 8.4	61 26
4689	η Virginis	14.8	— 0 7	4.0	A	+ 2.2	86 51	+ 3.7	+ 3.3	59 57
4789	23 Comae Bereniceis	29.9	+23 11	4.8	A	—20.:	72 31	—14.8	—14.2	64 12
4819	γ Centauri	36.0	—48 25	2.4	A	— 9.:	106 30	—12.7	—14.5	63 8
4889	η Centauri	47.9	—39 38	4.3	A5	— 1.	100 24	— 3.1	— 4.5	59 28
4905	ϵ Ursae Majoris	49.6	+56 30	1.7	Ap	— 9.	58 42	— 0.4	+ 1.1	81 52
4915	α_2 Can. Ven.	51.4	+38 52	2.9	Ap	— 1.6	62 22	+ 6.1	+ 7.4	72 22
4963	θ Virginis	13 4.8	— 5 0	4.4	A	+ 0.6	78 38	+ 4.2	+ 4.4	58 1
5017	20 Can. Ven.	13.1	+41 6	4.7	A5	+ 9.5	57 46	+18.3	+19.9	76 26
5028	ι Centauri	15.0	—36 11	2.9	A2	+ 2.0	94 3	+ 1.5	+ 0.6	55 17
5054	ζ_1 Ursae Majoris	19.9	+55 27	2.4	Ap	— 7.0	54 35	+ 2.5	+ 4.3	87 12
5062	g Ursae Majoris	21.2	+55 30	4.0	A5	—12.:	54 23	— 2.5	— 0.7	87 29
5071	K Centauri	23.3	—50 39	5.3	A	—26.:	101 3	—28.3	—29.7	55 33
5105	σ Virginis	29.1	+ 4 10	4.9	Ap	— 6.:	68 40	+ 0.2	+ 1.1	59 21
5112	24 Can. Ven.	30.4	+49 32	4.6	A3	—19.:	53 23	— 9.3	— 7.4	84 54
5127	25 Can. Ven.	33.0	+36 48	4.9	A	— 6.:	55 2	+ 3.4	+ 5.2	76 12
5264	τ Virginis	56.6	+ 2 2	4.3	A2	—10.:	63 56	— 2.7	— 1.4	57 20
5291	α Draconis	14 1.7	+64 51	3.6	A	—16.7	50 17	— 6.3	— 4.2	103 52
5303	η Apodis	5.7	—80 32	5.0	A1	— 8.:	114 46	—13.8	—16.2	54 28
5329	κ Bootis	9.9	+52 16	4.6	A5	—19.:	47 9	— 8.0	— 5.7	94 50
5350	ι Bootis	12.6	+51 50	4.8	A5	—18.:	46 43	— 6.9	— 4.6	95 0
5359	λ Virginis	13.7	—12 55	4.6	A2	— 4.:	69 19	+ 2.0	+ 2.9	50 35
5413	A.G.C. 19597	23.7	—49 4	5.5	A2	+ 9.	92 34	+ 8.9	+ 8.1	44 35
5475	π Bootis	36.0	+16 51	4.9	A	— 1.5	48 12	+ 9.3	+11.5	64 32
5478	ζ Bootis	36.4	+14 9	4.4	A2	— 6.:	49 20	+ 4.7	+ 6.7	62 25
5570	16 Librae	52.0	— 3 56	4.6	A2	+20.:	56 18	+29.1	+30.8	49 35
5586	δ Librae	55.6	— 8 7	4.8	A	—45.0	58 24	—36.4	—34.8	47 6
5634	ϵ Bootis	15 2.9	+25 16	5.0	A5	— 7.	39 16	+ 5.5	+ 8.1	72 46
5652	ι Librae	6.5	—19 25	4.7	Ap	—17.	64 42	— 9.8	— 8.7	41 8
5670	β Circini	9.6	—58 26	4.2	A3	+10.2	95 17	+ 9.4	+ 8.4	36 4
5676	χ Bootis	10.3	+29 32	5.3	A	—18.:	36 37	— 5.1	— 2.3	78 24
5719	ν Lupi	18.2	—39 22	5.4	A	— 9.	78 54	— 5.4	— 5.3	34 56
5733	μ Bootis	20.7	+37 44	4.5	A3	— 8.	33 42	+ 5.4	+ 8.2	91 12
5735	γ Ursae Minoris	20.9	+72 11	3.1	A2	— 8.:	47 11	+ 3.0	+ 5.3	130 57
5793	α Cor. Borealis	30.5	+27 3	2.3	A	+ 0.4	32 50	+13.9	+16.8	75 52
5892	ϵ Serpentis	45.8	+ 4 47	3.8	A	—10.0	40 28	+ 2.3	+ 4.8	47 32
5980	δ Normae	59.5	—44 54	4.8	A3p	—16.	79 46	—12.6	—12.5	26 13
6023	ϕ Herculis	16 5.6	+45 12	4.3	A	—15.6	27 3	— 1.3	+ 1.8	114 18
6031	ψ Scorprii	6.6	— 9 48	4.9	A2	— 8.9	48 15	+ 1.9	+ 4.1	33 27
6070	d Scorprii	12.1	—28 22	4.9	A	—11.4	63 48	— 4.0	— 2.8	25 58
6081	σ Scorprii	14.6	—23 56	4.8	A3	— 8.:	59 34	+ 0.4	+ 1.9	26 28
6117	ω Herculis	20.8	+14 16	4.5	Ap	— 6.1	27 44	+ 8.1	+11.2	51 20
6129	ν Ophiuchi	22.4	— 8 9	4.7	A2	—30.8	44 46	—19.3	—17.0	30 32
6234	14 Herculis	42.8	+ 5 25	5.3	Ap	—17.:	30 35	— 3.2	— 0.2	34 15
6254	52 Herculis	46.3	+46 10	4.9	A2p	+ 0.4	21 37	+15.3	+18.5	132 0

R.H.P. 1	ψ 12	μ 13	τ 14	ν 15	Remarks concerning adopted radial velocities
4520	285° 57'	0".102	+0".043	-0".093	
4534	256 3	.511	+ .141	- .491	
4554	88 10	.094	- .030	+ .089	
4660	88 26	.111	- .026	+ .108	Only two observations.
4663	245 23	.079	+ .005	- .079	A. O. result (<i>Publ. A. O.</i> , 2, 123, 1911).
4689	247 43	.066	+ .009	- .065	Spectroscopic binary: V_0 from orbit by Harper (<i>Ap. J.</i> , 27, 160, 1908).
4789	275 33	.072	+ .037	- .061	Spectroscopic binary: V_0 estimated from six L. O. observations and Y. O. results (<i>Ap. J.</i> , 32, 304, 1910).
4819	265 43	.200	+ .077	- .185	
4889	119 34	.077	- .067	+ .038	
4905	95 28	.116	- .027	+ .113	P. O. spectroscopic binary: estimated velocity of center of mass.
4915	280 30	.236	+ .111	- .208	
4963	222 53	.057	- .015	- .055	Y. O. spectroscopic binary: estimated velocity of center of mass.
5017	271 50	.125	+ .033	- .120	
5028	254 33	.353	+ .116	- .333	
5054	103 24	.129	- .036	+ .124	H. C. O. spectroscopic binary: estimated velocity of center of mass.
5062	101 13	.123	- .029	+ .119	
5071	229 11	.029	- .003	- .029	Only two observations.
5105	126 26	.052	- .048	+ .020	Y. O. spectroscopic binary: mean of three L. O. observations.
5112	277 18	.118	+ .025	- .115	Only two observations.
5127	277 44	.104	+ .038	- .097	A. O. result (<i>Publ. A. O.</i> , 2, 123, 1911).
5264	142 46	.031	- .031	+ .002	
5291	286 5	.054	+ .002	- .054	Spectroscopic binary: V_0 from orbit by Harper (<i>Journ. R. A. S. Can.</i> , 1, 244, 1907).
5303	208 18	.089	- .039	- .080	Spectroscopic binary: estimated velocity of center of mass.
5329	119 19	.065	- .027	+ .059	
5350	300 30	.169	+ .073	- .153	Six L. O. observations combined with A. O. results (<i>Publ. A. O.</i> , 2, 123, 1911).
5359	316 16	.032	+ .032	- .002	
5413	218 25	.074	- .008	- .074	Spectroscopic binary: estimated velocity of center of mass.
5475	82 52	.016	- .005	+ .015	
5478	116 9	.061	- .049	+ .036	Ludendorff's result (<i>A. N.</i> , 170, 168, 1905-6).
5570	211 22	.192	- .060	- .182	Eight L. O. observations combined with A. O. results (<i>Publ. A. O.</i> , 2, 123, 1911).
5586	260 49	.070	+ .039	- .058	Spectroscopic binary: V_0 from orbit by Schlesinger (<i>Publ. A. O.</i> , 1, 126, 1910).
5634	134 23	.261	- .230	+ .124	
5652	217 3	.061	- .004	- .061	
5670	213 47	.178	- .007	- .178	
5676	286 9	.079	+ .037	- .070	A. O. result (<i>Publ. A. O.</i> , 2, 123, 1911).
5719	217 11	.073	+ .003	- .073	
5733	297 38	.168	+ .075	- .150	
5735	315 0	.017	+ .001	- .017	
5793	130 22	.157	- .128	+ .091	Spectroscopic binary: V_0 from orbits by Jordan and Cannon (<i>Publ. A. O.</i> , 1, 89, 1909 and <i>Journ. R. A. S. Can.</i> , 3, 152, 1909).
5892	65 19	.136	- .041	+ .129	
5980	3 22	.017	+ .007	+ .016	
6023	316 16	.032	+ .012	- .030	
6031	188 25	.027	- .011	- .024	
6070	197 19	.114	- .017	- .113	
6081	199 17	.042	- .005	- .042	
6117	145 54	.078	- .078	- .006	
6129	276 3	.086	+ .078	- .036	
6234	208 4	.051	- .006	- .051	A. O. result (<i>Publ. A. O.</i> , 2, 124, 1911).
6254	163 14	.076	- .039	+ .065	

R.H.P. 1	Name 2	α (1900) 3	δ (1900) 4	Vis. Mag. 5	Spec. 6	Obs. V 7	d 8	V_1 9	V_2 10	χ 11
6324	ϵ Herculis	16 ^h 56 ^m 5	+31° 4'	3.9	A	—24.0	13° 42'	— 8.5	— 5.0	90° 25'
6355	60 Herculis	17 0.7	+12 53	4.9	A3	— 4.	21 56	+10.8	+14.1	36 23
6378	η Ophiuchi	4.6	—15 36	2.6	A	— 1.1	47 31	+ 9.9	+12.1	16 20
6436	e Herculis	14.2	+37 24	4.8	A	— 4.:	12 3	+11.6	+15.1	124 33
6446	ν Serpentis	15.2	—12 45	4.4	A	+ 8.	44 6	+19.6	+22.0	13 59
6485	ρ Herculis	20.2	+37 14	4.5	A	—15.	10 59	+ 0.6	+ 4.1	128 15
6549	π Arae	29.9	—54 26	5.3	A	—13.	84 41	—11.0	—11.2	6 32
6554	ν_1 Draconis	30.2	+55 15	5.0	A5	—14.	25 48	+ 0.4	+ 3.6	165 3
6561	ξ Serpentis	31.9	—15 20	3.6	A5	—42.8	45 50	—31.5	—29.2	8 29
6581	$\circ$ Serpentis	35.8	—12 49	4.4	A2	—33.:	43 12	—21.2	—18.8	7 39
6631	ι_2 Scorpii	43.1	—40 4	4.9	A2p	—18.	70 11	—12.2	—11.4	3 53
6730	95 Herculis	57.2	+21 36	5.1	A	—27.	8 25	—11.2	— 7.7	4 9
6745	π Pavonis	58.9	—63 40	4.4	A5	—19.6	93 40	—19.9	—20.8	0 14
6771	72 Ophiuchi	18 2.6	+ 9 33	3.7	A2	—24.	20 27	— 9.0	— 5.7	358 23
6879	ϵ Sagittarii	17.5	—34 26	2.0	A	—11.:	64 34	— 3.8	— 2.6	355 48
7001	α Lyrae	33.6	+38 41	0.1	A	—13.8	11 6	+ 1.8	+ 5.3	221 4
7141	θ Serpentis	51.2	+ 4 4	4.5	A5	—38.:	28 37	—23.9	—20.9	336 23
7145	ξ_1 Sagittarii	51.4	—20 47	5.1	A	+ 3.1	52 16	+13.1	+15.0	345 54
7178	γ Lyrae	55.2	+32 33	3.3	A	—20.:	12 3	— 4.4	— 0.9	261 28
7194	ζ Sagittarii	56.3	—30 1	2.7	A2	+22.:	61 30	+29.9	+31.3	346 8
7371	π Draconis	19 20.2	+65 31	4.6	A2	—27.5	37 37	—14.8	—12.1	209 6
7387	ν Aquilae	21.4	+ 0 9	4.9	A8	— 1.7	35 36	+11.4	+14.2	328 50
7531	A.G.C. 27100	42.2	—59 26	5.5	A2	+ 6.	91 54	+ 6.1	+ 5.4	338 3
7557	α Aquilae	45.9	+ 8 36	0.9	A5	—33.	32 44	—19.5	—16.6	314 25
7587	A.G.C. 27237	48.7	—59 10	5.4	A	— 0.1	91 59	0.0	— 0.8	336 41
7590	ϵ Pavonis	49.0	—73 10	4.1	A	— 0.:	104 49	— 3.3	— 5.0	335 47
7592	13 Vulpeculae	49.2	+23 50	4.5	A	—28.:	25 3	—13.5	—10.3	290 15
7624	θ_2 Sagittarii	53.3	—34 58	5.3	A3	—16.	70 14	—10.2	— 9.4	334 7
7653	15 Vulpeculae	57.0	+27 29	4.7	A5	—21.9	25 42	— 7.5	— 4.3	282 39
7710	θ Aquilae	20 6.1	— 1 7	3.4	A	—28.0	43 16	—16.2	—13.8	318 38
7736	b_3 Cygni	10.8	+36 30	5.0	A	—22.:	27 58	— 7.9	— 4.8	266 8
7773	ν Capricorni	15.1	—13 4	4.8	A	— 1.3	53 58	+ 8.3	+10.2	323 28
7871	ζ Delphini	30.6	+14 20	4.7	A	—22.	37 59	— 9.3	— 6.6	300 45
7891	29 Vulpeculae	34.1	+20 51	4.8	A	—15.	35 48	— 2.0	+ 0.8	292 45
7913	β Pavonis	36.0	—66 34	3.6	A5	+ 9.4	101 1	+ 7.1	+ 5.7	326 16
7924	α Cygni	38.0	+44 55	1.3	A2	— 4.	34 17	+ 9.3	+12.1	257 56
7928	δ Delphini	38.8	+14 43	4.5	A2	+ 8.5	39 31	+20.9	+23.5	299 36
7943	ι Microscopii	41.7	—44 22	5.1	A5	—19.:	83 1	—16.5	—16.6	325 33
7950	ϵ Aquarii	42.3	— 9 52	3.8	A	—16.	55 47	— 6.8	— 5.0	317 3
8060	η Capricorni	58.7	—20 15	4.9	A3	+26.	66 7	+32.8	+33.9	318 15
8075	θ Capricorni	21 0.3	—17 38	4.2	A	—31.:	64 27	—23.8	—22.6	317 11
8135	ϵ Microscopii	11.9	—32 35	4.8	A	+ 5.:	77 20	+ 9.0	+ 9.3	318 45
8140	θ Indi	12.7	—53 52	4.6	A5	—14.	93 38	—14.3	—15.2	319 43
8151	θ_1 Microscopii	14.4	—41 14	4.9	A2p	+ 5.:	84 12	+ 7.2	+ 7.0	319 14
8264	ξ Aquarii	32.4	— 8 18	4.8	A5	—20.:	63 45	—12.6	—11.4	309 27
8305	ι Pisces Austr.	39.0	—33 29	4.4	A	+ 6.:	81 54	+ 8.8	+ 8.7	314 25
8334	ν Cephei	42.6	+60 40	4.5	A2p	—24.1	47 32	—13.0	—10.9	255 47
8343	14 Pegasi	45.4	+29 43	5.0	A	—20.:	48 21	— 9.2	— 7.0	285 15

R.H.P. 1	ψ 12	μ 13	τ 14	v 15	Remarks concerning adopted radial velocities
6324	294° 33'	0.051	+0.021	—0.047	Spectroscopic binary: V_0 from orbit by Baker (<i>Publ. A. O.</i> , 2, 21, 1910).
6355	107 47	.056	— .053	+ .018	
6378	22 43	.093	— .010	+ .092	
6436	322 57	.066	+ .021	— .063	
6446	86 54	.037	— .035	+ .011	
6485	263 59	.038	— .027	— .027	
6549	189 2	.153	+ .007	— .153	Only two observations.
6554	72 0	.165	+ .165	— .009	
6561	211 12	.083	+ .032	— .077	Spectroscopic binary: V_0 from orbit by Young (<i>L. O. B.</i> , 6, 161, 1911).
6581	231 20	.090	+ .062	— .065	
6631	160 21	.015	— .006	— .014	
6730	27 24	.030	— .012	+ .028	Only two observations.
6745	175 13	.192	— .017	— .191	
6771	322 54	.103	+ .060	+ .084	Spectroscopic binary: five L. O. observations combined with results of Ludendorff, and Frost and Lee (<i>A. N.</i> , 173, 6, 1906-7 and <i>Ap. J.</i> , 30, 65, 1909).
6879	198 3	.139	+ .053	— .128	
7001	36 10	.346	— .029	— .345	
7141	59 35	.053	— .053	+ .006	
7145	237 6	.020	+ .019	— .006	
7178	203 12	.008	+ .007	+ .003	Spectroscopic binary: V_0 estimated from five L. O. observations and Y. O. results (<i>Ap. J.</i> , 30, 240, 1909).
7194	270 0	.021	+ .020	+ .005	
7371	24 52	.045	— .003	— .045	
7387	296 34	.011	+ .006	+ .009	
7531	50 12	.023	— .022	+ .007	
7557	54 37	.656	— .646	— .116	Vogel's result (<i>Ap. J.</i> , 9, 10, 1899).
7587	149 56	.022	— .003	— .022	
7590	152 4	.149	— .010	— .149	
7592	46 0	.040	— .036	— .017	Spectroscopic binary: V_0 estimated from four L. O. observations and Y. O. results (<i>Ap. J.</i> , 32, 307, 1910).
7624	132 54	.116	— .042	— .108	
7653	83 25	.052	— .017	— .049	
7710	84 28	.031	— .025	— .018	Spectroscopic binary: V_0 from orbits by Baker and Harper (<i>Publ. A. O.</i> , 1, 50, 1908 and <i>Journ. R. A. S. Can.</i> , 3, 87, 1909).
7736	43 42	.094	— .063	— .069	
7773	157 37	.018	+ .004	— .017	
7871	83 59	.038	— .023	— .030	
7891	91 0	.057	— .021	— .053	
7913	285 28	.049	+ .032	+ .037	
7924	180 0	.001	+ .001	.000	Spectroscopic binary: estimated velocity of center of mass.
7928	204 16	.056	+ .056	— .005	
7943	120 9	.193	— .083	— .174	Only two observations; after using, found to be spectroscopic binary; V_0 unknown.
7950	140 32	.044	+ .003	— .044	
8060	224 20	.060	+ .060	— .004	
8075	129 10	.104	— .014	— .103	
8135	120 49	.066	— .020	— .063	
8140	122 59	.136	— .039	— .130	
8151	90 0	.084	— .064	— .055	Spectroscopic binary: estimated velocity of center of mass.
8264	102 12	.114	— .052	— .101	
8305	157 17	.093	+ .036	— .086	Spectroscopic binary: estimated velocity of center of mass.
8334	270 0	.002	.000	+ .002	
8343	136 5	.037	+ .019	— .032	

R.H.P. 1	Name 2	α (1900) 3	δ (1900) 4	Vis. Mag. 5	Spec. 6	Obs. V 7 km.	d 8	V_1 9 km.	V_2 10 km.	χ 11
8353	γ Gruis	21h 47m9	$-37^\circ 50'$	3.2	A	$-3.$	$86^\circ 13'$	-1.4	-1.7	$313^\circ 18'$
8386	η Piscis Austr.	55.1	$-28 56$	5.4	A	$-10.:$	81 19	-7.1	-7.1	311 29
✓ 8417	ξ Cephei	22 0.9	$+64 8$	4.4	A8	-4.5	50 23	$+5.9$	$+7.9$	257 20
8444	A.G.C. 30290	4.1	$-34 31$	5.5	A5	$-30.$	86 25	-28.5	-28.8	310 37
8478	λ Piscis Austr.	8.6	$-28 16$	5.4	A	-1.3	83 8	$+1.1$	$+1.0$	309 32
8494	ϵ Cephei	11.3	$+56 33$	4.2	A5	-0.2	50 34	$+10.1$	$+12.2$	265 57
8576	β Piscis Austr.	25.9	$-32 52$	4.4	A	$+8.$	88 55	$+8.9$	$+8.4$	307 25
8613	9 Lacertae	33.2	$+51 1$	4.8	A5	$+13.$	53 50	$+22.6$	$+24.5$	274 40
8641	σ Pegasi	37.0	$+28 48$	4.8	A	$+8.7$	59 21	$+17.1$	$+18.6$	289 44
8695	γ Piscis Austr.	47.0	$-33 24$	4.5	A	$+18.$	92 48	$+17.9$	$+17.0$	304 35
✓ 8709	δ Aquarii	49.3	$-16 21$	3.5	A2	$+22.$	83 36	$+24.3$	$+24.2$	303 52
8717	ρ Pegasi	50.2	$+8 17$	5.0	A	$-10.$	70 47	-4.3	-3.6	298 58
8728	α Piscis Austr.	52.1	$-30 9$	1.3	A3	$+6.7$	91 51	$+6.8$	$+6.1$	304 2
8880	τ Pegasi	23 15.7	$+23 12$	4.6	A5	$-22.:$	69 31	-16.0	-15.2	294 53
✓ 8911	κ Piscium	21.8	$+0 42$	4.9	A2	-3.7	81 23	-0.8	-0.8	300 15
8949	ι Phoenicis	29.7	$-43 10$	4.8	A2p	$+26.$	105 0	$+22.7$	$+20.9$	297 17
8984	λ Piscium	36.9	$+1 14$	4.6	A5	$+8.1$	84 23	$+10.2$	$+10.0$	300 3

but perhaps the differences are no greater than we should expect from the use of twenty per cent more stars in 1912 than in 1911.

The solar motion components were eliminated from the individual observed velocities, using the new values of V_0 and K ; giving the velocities V_1 with reference to the Class A system, as quoted in column 9. These residuals were grouped as follows:

98 stars	Class A	Average numerical velocity	10.27 km.
67 stars	Class A1-A4	Average numerical velocity	11.38
47 stars	Class A5-A9	Average numerical velocity	12.58
212 stars	Class A-A9	Average numerical velocity	11.1 km.

There appears to be some evidence that the average velocities increase with advancing subdivisions in Class A. This result differs from that obtained in 1911,⁴ but we must remember that the numbers of stars in the three subdivisions, in both years, are really too small to have great statistical weight. The individual velocities with reference to the stellar system V_2 , as quoted in column 10, have been computed for the assumed vertex $\alpha = 270^\circ$, $\delta = +30^\circ$, using $V_0 = -19.5$ km. per second, as determined in 1911 from 1193 velocities⁵ and with $K = 0$.

⁴ *L. O. Bulletin*, 6, 135, 1911.

⁵ *L. O. Bulletin*, 6, 127, 1911.

AVERAGE STELLAR RADIAL VELOCITIES WITH REFERENCE TO ANGULAR DISTANCES FROM NORTH GALACTIC POLE,
AND FROM KAPETYN'S VERTEX AT $\alpha = 93^\circ$, $\delta = +12^\circ$

	K.V.D.	0°-30°		30°-60°		60°-120°		0°-180°	
		150-180		120-150		.....		.....	
		n	V km.	n	V km.	n	V km.	n	V km.
Class A Stars (1911)	0°-30 and 150°-180°	....	.....	....	.....	17	5.26	17	5.3
$V_0 = -19.5$ km.	30-60 and 120-150	....	.....	32	9.15	31	7.60	63	8.4
$K = +1.9$ km.	60-90 and 90-120	29	16.38	34	10.45	33	11.92	96	12.7
	Total	29	16.4	66	9.8	81	8.9	.....	.....
Class A Stars (1912)		....	.....	....	.....	29	9.44	29	9.4
$V_0 = -15.3$ km.		....	.....	46	10.86	36	7.67	82	9.5
$K = -0.6$ km.		33	16.30	33	11.04	35	11.39	101	12.9
	Total	33	16.3	79	10.9	100	9.5	.....	.....
Class A Stars (1912)		....	.....	....	.....	29	9.32	29	9.3
$V_0 = -19.5$ km.		....	.....	46	11.18	36	7.61	82	9.6
$K = 0.0$ km.		33	15.93	33	10.34	35	11.66	101	12.6
	Total	33	15.9	79	10.3	100	9.5	.....	.....

R.H.P. 1	ψ 12	μ 13	τ 14	v 15	Remarks concerning adopted radial velocities
8353	98 47	.111	— .063	— .091	
8386	81 52	.014	— .011	— .009	Only two observations.
8417	66 30	.226	— .042	— .222	
8444	300 15	.042	+ .008	+ .041	Only two observations.
8478	97 8	.024	— .013	— .020	Only two observations.
8494	84 25	.452	— .012	— .452	
8576	107 14	.061	— .021	— .057	
8613	209 26	.116	+ .105	+ .049	
8641	191 19	.036	+ .036	— .005	
8695	223 9	.044	+ .044	+ .007	
8709	246 22	.052	+ .044	+ .028	
8717	78 51	.073	— .047	— .056	
8728	117 8	.364	— .044	— .361	
8880	126 52	.035	+ .007	— .034	Only two observations.
8911	136 38	.124	+ .035	— .119	
8949	109 48	.027	— .004	— .027	
8984	223 47	.199	+ .193	+ .047	

The stellar velocities of 176 Class A stars observed up to 1911, and of the 212 Class A stars observed up to 1912, are tabulated, in averages, in the following table with reference to their angular distances from the north galactic pole, as expressed in the first column, and their angular distances from Kapteyn's vertex $\alpha = 93^\circ$, $\delta = +12^\circ$ as expressed in the horizontal headings. The constants employed in the three sets of Class A residuals are expressed in the table. The number of stars in each compartment, with average radial velocity V , is denoted by n .

The tabulations for the 1911 Class A results seemed to show that the stellar velocities of this class are functions of galactic latitudes as well as of angular distances from the Kapteyn vertices. The results for the greater number of 1912 Class A stars seem to show a smaller dependence of radial velocities upon galactic latitudes, and to reduce in amount their apparent dependence upon distances from the Kapteyn vertices. The tabulations with $V_0 = -15.3$ km. and $V_0 = -19.5$ km. are in almost perfect agreement.

Inasmuch as the velocities of the brighter Class B stars discussed in 1911⁶ indicated that they are independent of the Kapteyn vertices, and as the Class A velocities appeared to have a certain dependence upon these vertices, I suggested to Mr. H. C. Plummer, of the Oxford University Observatory, early in June,

1911, that it would be profitable to determine at just what point in the Classes A–B stars the Kapteyn preferential motion seems to enter; and for this purpose I supplied Mr. Plummer with all available Classes A and B radial velocities. His valued study of the subject, from a somewhat different point of view, is contained in the following Bulletin, No. 212. Some of the velocities used in Mr. Plummer's discussion are changed in the table of the present Bulletin, on account of additional observations secured in the calendar year 1911.

There seems to be no doubt, at least so far as the stars thus far observed are concerned, that Class B radial velocities do not increase as their angular distances from Kapteyn's vertices decrease, but that Class A velocities do show increase; in fact the preferential-motion effect is apparently stronger for Class A stars than for stars of Classes F, G, K, and M.

Solutions for the elements of the solar motion and the tabulations of the individual velocities described in this paper were made by Miss A. M. Hobe, Carnegie Institution Assistant, and Dr. R. E. Wilson, Assistant.

For the opportunity to secure the results contained in this Bulletin I am indebted to the late Mr. D. O. Mills, to Mr. Ogden Mills, to the Carnegie Institution of Washington, and to many of my colleagues.

W. W. CAMPBELL.

March 24, 1912.

⁶ *L. O. Bulletin*, 6, 119, 1911.