THE RADIAL VELOCITIES OF FIVE HUNDRED STARS[1]

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The program of radial velocity work for the Cassegrain spectrograph during the past few years has consisted for the most part of observations on the following classes of stars:

1. A- and B-type stars, mainly between magnitudes 5 and 6.5, a knowledge of whose motions is of particular interest as aiding in the determination of the elements of the two principal star-streams.

2. A, F, G, K, and M stars of magnitudes 5.5 to 6.5 which have very small astronomical proper motions. These may in general be considered as very distant stars of high luminosity, and are of interest as regards both their radial velocities and certain characteristics of their spectra.

3. Stars with measured parallaxes, most of which have very large proper motions. The magnitudes of these stars are chiefly between 5.5 and 8.5.[2]

In addition to these lists a number of brighter stars have been observed, for which determinations of radial velocity have been published from other observatories.

It seems desirable to make the results so far obtained available for the use of astronomers who are engaged in the discussion of stellar motions, and accordingly values are given in this communication for five hundred stars for which, with a few exceptions, three or more observations have been secured. Many other stars have been observed once or twice, and results for these will be published as soon as additional material has been obtained.

Several different optical combinations have been employed in the spectrograph during the course of these observations. The principal consideration which governs the dispersion to be used is, of course, the character of the spectrum of the star, but this has been modified in many cases by other factors. For example, the

[1] *Contributions from the Mount Wilson Solar Observatory*, No. 105.

[2] The radial velocities of 100 of these stars were published in *Mt. Wilson Contr.*, No. 79; *Astrophysical Journal*, **39**, 341, 1914.

spectra of the small proper-motion stars have in almost all cases been photographed with low dispersion, although most of them are of the solar type, and so are well adapted for the use of high dispersion. It seemed desirable in their case to sacrifice accuracy to some extent in order to secure statistical material more rapidly, and to make it possible to institute direct comparisons between their spectra and those of the fainter stars of large proper motion and measured parallax. The different combinations used in the spectrograph may be summarized as follows. The linear scale denotes the number of Ångström units per millimeter. The 18-cm camera has been used in the case of only three of the published results.

TABLE I

No. Prisms	Camera	Linear Scale at Hγ	Stars Observed
2............	38 and 46 cm	21 and 18 A	A, B, and brighter parallax stars
1............	102	16	
1............	46	36	Small p.m. and parallax stars
1............	18	92	Parallax stars fainter than 8.5

Table II contains values for the individual stars. In view of the importance of the *Preliminary General Catalogue* of Boss for determinations of proper motion it has seemed preferable to designate the stars which occur in his catalogue by their numbers rather than to give a heterogeneous collection of names and catalogue numbers. The stars with measured parallaxes have the designations given in *Groningen Publication*, No. 24. Additional stars are indicated by the Lalande number so far as possible, the *B.D.* number being used only in a very few cases. The magnitudes are those of Harvard, with the exception of such as are given in parentheses, which are from miscellaneous sources.

The spectral classification has been made from the Mount Wilson negatives, and most of the determinations, particularly for the A and B stars, are due to Mr. Kohlschütter. Especial attention should be called to the M stars which are marked "peculiar." The peculiarity in nearly all cases consists in the combination of hydrogen lines of an intensity corresponding to that in G- and K-type stars with the bands of the M stars. Some of these stars, classified according to the intensity of their hydrogen lines, have been discussed by Adams and Kohlschütter in a previous communication.[1]

The total proper motion μ is in most cases derived from the values given by Boss. For the parallax stars it is taken from *Groningen Publication*, No. 24. The angle λ is the angle between the star and the sun's apex. The co-ordinates used for the apex are those adopted by Kapteyn,

$$\alpha = 17^{h}59^{m}, \quad \delta = +30.^{\circ}8 ,$$

and the values both for μ and λ are taken from a list calculated under his direction for all of the stars given in Boss's catalogue.

The first of the two columns in Table II denoted by v contains the means of the observed radial velocities; the second the corresponding values published by other observatories. The following abbreviations are used: A, Allegheny Observatory; L, Lick Observatory; Y, Yerkes Observatory.

The final column of the table contains the values of v corrected for the solar motion. The values are given by the equation

$$v' = v + V \cos \lambda$$

in which the value 20 km has been assumed for V, the sun's motion in space.

[1] *Mt. Wilson Contr.*, No. 89; *Astrophysical Journal*, **40**, 385, 1914.

TABLE II

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 5	0h 1m2	+63°38′	5.5	B8	0″009	63°	−6.8	....	+2.3
18	0 4.9	+10 35	5.4	B8	0.034	86	+13.5	....	+14.9
41	0 11.6	+60 59	5.8	G2	0.002	65	−4.1	....	+4.4
43	0 11.9	+38 8	4.6	A2	0.052	74	+0.1	+6.2L	+5.6
56	0 15.5	+7 38	5.6	K0	0.015	89	+16.4	....	+16.7
81	0 22.8	+17 20	5.3	Mbp	0.117	86	+6.8	....	+8.2
90	0 24.9	−4 31	6.0	K5	0.011	98	+5.2	....	+2.4
118	0 30.6	+53 37	5.2	B7	0.021	70	+2.8	....	+9.6
124	0 31.6	+14 41	5.9	B3	0.028	89	−18.3	....	−18.0
125	0 32.0	+34 51	5.6	G0	0.019	79	−0.7	....	+3.1
Pi. 0h130	0 32.2	−25 19	5.7	G5	1.36	109	+15.5	+18:L	+9.0
Boss 131	0 33.6	+48 48	5.7	K1	0.019	73	−9.3	....	−3.5
54 Piscium	0 34.2	+20 43	6.1	K1	0.59	87	−33.9	....	−32.9
Boss 138	0 35.7	+38 55	5.4	G6	0.007	78	−8.6	....	−4.4
Lal. 1198	0 39.9	+1 15	8.1	K4	0.63	100	+6.9	....	+3.4
Boss 165	0 42.2	+6 12	6.2	G6	0.016	96	+14.8	....	+12.7
169	0 43.1	−22 16	5.3	A1	0.036	110	+19.1	....	+12.3
Groom. 145	0 43.2	+69 54	8.0	K0	0.44	65	−28.0	....	−19.6
Boss 183	0 45.2	+50 58	6.5	F5	0.128	73	+1.8	....	+7.6
198	0 50.6	+26 40	5.9	a1	0.006	86	−8.8	....	−7.4
209	0 52.4	+28 27	5.6	K0p	0.017	86	0.0	....	+1.4
210	0 52.7	+13 9	6.4	G4	0.022	95	+15.7	....	+14.0
217	0 54.6	+5 57	6.3	Map	0.023	99	−14.5	....	−17.6
Groom. 211	0 55.6	+44 55	7.0	G4	0.105	78	−71.1	....	−66.9
Boss 223	0 57.3	+40 48	5.8	A6	0.024	80	+3.3	....	+6.8
224	0 57.3	+31 16	5.4	B9	0.039	85	+9.7	....	+11.4
Lal. 1799	0 57.2	+4 31	8.0	K6	0.48	100	+20.2	....	+16.7
Boss 252	1 3.2	+5 7	5.5	A4	0.326	101	+6.6	....	−3.8
261	1 4.5	+19 7	5.6	F3	0.004	94	−8.5	....	−9.9
263	1 5.0	+63 40	5.5	B9	0.038	69	−6.2	....	+1.0
267	1 5.4	+1 55	6.2	K1	0.004	103	−2.1	....	−6.6
284	1 8.8	+15 36	5.7	B2p	0.028	96	−16.1	....	−18.2
295	1 12.6	+3 5	5.4	A2	0.056	104	+4.6	....	−0.2
Lal. 2450	1 16.9	+18 10	8.1	G0	0.57	96	0	....	−2
Boss 305	1 17.5	−0 58	6.5	K0	0.017	107	+14.9	....	+9.1
349	1 30.5	+72 32	5.5	G5	0.008	67	−6.7	....	+1.1
355	1 31.6	+57 28	5.7	G7	0.004	76	−7.6	....	+2.8
Lal. 3022	1 33.9	+27 36	7.8	G7	0.50	94	+57.0	....	+55.6
Boss 375	1 36.0	+29 32	6.0	G4	0.013	93	+5.7	....	+4.7
379	1 36.3	+34 44	5.5	B9	0.053	90	+0.2	....	+0.2
107 Piscium	1 37.1	+19 47	5.3	G8	0.72	99	−34.2	....	−37.3
Boss 410	1 44.6	+21 47	5.9	G9	0.018	99	+3.3	....	+0.2
414	1 45.7	+10 33	5.8	F2	0.074	106	+10.6	....	+5.1
420	1 47.3	+40 14	5.6	K1	0.009	88	−6.4	....	−5.7
430	1 50.0	+36 47	6.1	K1	0.005	91	+7.0	....	+6.7
432	1 50.2	+36 46	5.8	K0	0.180	91	+59.0	....	+58.7
434	1 50.3	+23 5	6.0	G8	0.011	100	+14.1	....	+10.7
457	1 55.6	+63 54	5.7	B8	0.011	74	−20.7	....	−15.2
466	1 57.1	+32 48	5.5	A1	0.023	94	+1.5	....	+0.1
472	1 58.2	+17 46	6.4	K2	0.024	104	+10.4	....	+5.6
478	2 1.7	+57 57	5.9	A4	0.009	78	−36.8	....	−32.6
Lal. 3922	2 2.5	−1 5	7.5	G0	0.51	117	−40.7	....	−49.8
Boss 488	2 4.5	+57 10	6.4	B8	0.013	79	−36.8	....	−33.0
493	2 5.5	+25 28	6.2	K4	0.011	101	−18.3	....	−22.1

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 498..	2h 6m6	+66° 3′	6.2	F4	0″003	73°	−12.6	....	−6.8
508..	2 10.0	+32 54	5.3	A0	0.035	96	−3.2	....	−5.3
521..	2 12.6	+19 26	5.5	B9	0.015	106	+11.6	....	+6.1
526..	2 13.2	+28 11	5.3	A2	0.012	100	+4.4	....	+0.9
529..	2 14.2	+46 51	6.1	B7	0.005	88	−0.8	....	−0.1
536..	2 16.6	+40 57	5.8	F0	0.128	92	−35.0	....	−35.7
539..	2 16.8	−0 4	5.6	Map	0.006	119	+23.3	....	+13.6
551..	2 21.1	−12 44	4.9	B8	0.027	127	+0.8	....	−11.2
572..	2 26.3	+1 49	5.4	K4	0.013	120	+27.0	....	+17.0
581..	2 29.5	+36 52	5.9	K0	0.010	96	−5.8	....	−7.9
616..	2 37.1	+10 19	6.2	A2p	0.040	117	+4.7	....	−4.4
619..	2 37.6	+43 52	5.6	F9	0.004	92	−3.8	....	−4.5
648..	2 46.0	+14 40	5.4	B5	0.045	115	+16.9	....	+8.5
654..	2 47.4	+37 56	5.7	F2	0.10	98	+0.6	....	−2.2
660..	2 50.2	+17 56	5.9	Mc	0.018	113	+46.5	....	+38.7
666..	2 51.6	−4 7	5.1	B9	0.054	128	+1.7	....	−10.6
674 N	2 53.5	+20 56	4.7	A3	0.017	112	−7.7	....	−15.2
674 S	2 53.5	+20 56		A3	0.017	112	−5.3	....	−12.8
677..	2 53.7	−3 11	5.1	A2	0.070	128	−4.4	....	−16.7
W.B. 2h927..	2 55.2	+5 36	8.2	G8	0.68	123	+66.7	....	+55.8
Boss 707..	3 1.6	−6 29	5.6	Map	0.002	132	+17.2	....	+3.8
719..	3 6.3	+26 53	5.6	A0	0.019	109	+12.0	....	+5.5
724..	3 8.1	+56 46	5.9	A2	0.004	85	−14.9	....	−13.2
W.B. 3h113..	3 9.4	+8 37	7.8	K0	0.62	123	−21.0	....	−31.9
Boss 742..	3 11.5	+49 51	5.3	B3	0.045	91	−0.6	....	−0.9
757..	3 14.7	+42 58	5.1	A1	0.058	97	−4.6	+2.0L	−7.0
767..	3 16.1	+48 51	5.4	B4	0.035	92	+3.4	....	+2.7
768..	3 16.2	+27 15	5.6	G8	0.020	110	+6.7	....	−0.1
790..	3 22.2	+49 10	4.5	B5	0.044	93	−1.6	....	−2.6
791..	3 22.4	+55 6	5.1	B9p	0.033	88	+1.0	+6.0L	+1.7
800..	3 24.9	−13 1	5.5	A1	0.017	140	+14.7	....	−0.6
801..	3 24.9	+11 0	5.1	B8p	0.021	124	+19.8	....	+8.6
802..	3 25.1	+47 41	5.5	B9	0.040	94	−2.9	....	−4.3
817..	3 29.4	+47 52	4.2	B7p	0.044	94	+0.7	....	−0.7
832..	3 34.5	+59 39	6.0	G8	0.002	84	−9.9	....	−7.8
W.B. 3h617..	3 35.3	−3 32	7.2	F5	0.78	137	+113.7	....	+99.1
Boss 838..	3 35.8	+47 28	3.1	B5	0.046	96	+0.7	....	−1.4
845..	3 38.0	+36 9	5.6	A2	0.055	105	+21.8	....	+16.6
849..	3 38.8	−10 48	5.7	A3	0.020	142	+16.2	....	+0.4
B.D. 23°535..	3 41.4	+23 25	7.9	F3	....	116	−10.5	....	−19.3
Boss 896..	3 48.6	+62 47	5.0	B9	0.005	83	+4	+5:L	+6
898..	3 48.8	+47 35	5.3	B5	0.039	96	+9.9	....	+7.8
933..	3 58.4	+23 50	5.6	F8p	0.022	118	+18.3	....	+8.9
956..	4 4.8	−16 39	5.3	B5	0.013	151	+13.3	....	−4.2
960..	4 5.5	−7 11	5.6	G6	0.010	144	−12.1	....	−28.3
977..	4 9.6	+80 35	5.6	G7	0.020	67	−8.6	....	−0.8
989..	4 11.4	+20 20	4.9	A3	0.066	123	+15.8	+16.8L	+4.9
997..	4 13.5	+20 54	5.4	B9	0.063	122	+13.8	....	+3.2
1014..	4 16.5	+20 35	6.1	G9	0.011	123	−8.5	....	−19.4
1024..	4 18.7	−3 59	5.3	A0	0.072	144	−0.3	....	−16.5
1039..	4 21.3	+22 46	5.4	B5	0.019	121	+10.5	....	+0.2
1064..	4 27.0	+64 3	5.8	A2	0.029	83	−15.7	....	−13.3
1069..	4 28.8	+5 22	5.7	A2	0.028	138	−7.2	....	−22.1
1084..	4 32.1	+0 48	5.3	B5	0.018	142	+22.6	....	+6.8

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 1088..	4h 32m6	− 2° 40′	5.3	A5	0″067	146°	+ 18.2	....	+ 1.6
1089..	4 33.4	+15 36	5.2	A2	0.074	129	+23.0	....	+10.4
1093..	4 33.9	+48 6	5.7	A0	0.052	99	+22.8	....	+19.7
1097..	4 34.5	+12 0	5.3	B9	0.027	133	+ 18.1	....	+ 4.5
1103..	4 35.8	+43 10	5.4	A0	0.067	104	+ 5.6	....	+ 0.8
1128..	4 42.7	+63 20	5.8	Ma	0.111	85	−35.5	....	−33.8
1136..	4 44.0	+15 44	6.3	K0	0.017	130	+13.5	....	+ 0.6
1146..	4 45.7	+42 25	5.6	A1	0.013	105	− 2.4	....	− 7.6
1163..	4 49.4	+10 0	4.7	B9	0.145	136	+17.0	....	+ 2.9
B.D. 35°930..	4 49.7	+36 1	6.2	B3	....	111	−11	....	−18
Boss 1165..	4 50.1	+14 53	5.6	B9	0.025	131	+ 9	....	− 4
1176..	4 51.8	+53 0	6.4	K3	0.012	95	− 1.8	....	− 3.5
1182..	4 53.4	+39 15	6.0	F1	0.013	109	+ 5.7	....	− 0.8
1183..	4 53.5	+39 30	6.9	K5	0.010	108	−23.4	....	−29.6
W.B. 4h1189..	4 55.9	− 5 52	6.5	K9	1.25	151	+20.1	+31:L	+ 2.6
Boss 1195..	4 57.4	+58 50	5.4	B3p	0.007	89	−13.2	....	−12.9
1221..	5 2.9	+19 44	6.6	G3	0.018	127	+ 6.0	....	− 6.0
1234..	5 5.9	+15 55	5.4	K6	0.004	131	− 7.0	....	−20.1
1247..	5 9.4	+ 5 2	5.8	K1	0.017	142	− 7.0	....	−22.8
1268..	5 13.4	+33 51	5.1	A4	0.016	114	− 6.0	....	−14.1
1281..	5 16.2	−21 20	4.7	A0	0.020	166	+29.2	+31.5L	+ 9.8
1295..	5 18.6	− 0 15	5.5	B3	0.015	148	+22.4	....	+ 5.4
1309..	5 20.7	+62 59	5.8	K1p	0.005	86	−18.0	....	−16.6
1310..	5 20.7	+30 7	5.7	B9	0.019	118	+13.6	....	+ 4.2
1318..	5 22.0	+15 47	5.5	B8	0.031	132	+13.6	....	+ 0.2
1332..	5 26.0	+ 3 13	5.6	B3	0.009	145	+21.6	....	+ 5.2
1334..	5 26.3	+74 59	6.4	K5	0.019	74	− 2.5	....	+ 3.0
1348..	5 28.4	+54 22	6.0	K2	0.007	95	+ 1.4	....	− 0.3
1354..	5 29.3	+23 58	5.1	B3	0.032	125	+23.2	....	+11.7
Groom. 990..	5 30.4	+51 23	8.1	K0	0.56	98	−43.8	....	−46.6
Boss 1380..	5 32.4	+65 39	5.8	K3	0.024	83	−18.6	....	−16.2
Pi. 5h146..	5 33.2	+53 26	6.4	K0	0.55	96	+ 1.7	....	− 0.4
Boss 1394..	5 34.9	+61 26	6.4	G5	0.002	88	− 3.1	....	− 2.4
Lal. 10797..	5 39.2	+37 15	7.3	K2	0.72	112	−30.4	....	−37.9
Boss 1424..	5 41.6	+17 41	5.3	F0	0.010	131	+ 6.6	....	− 6.5
1441..	5 44.5	+ 9 50	5.9	G4	0.014	139	+43.7	....	+28.6
1444..	5 44.7	+27 56	5.6	G8	0.009	121	+ 8.1	....	− 2.2
1453..	5 46.5	+55 41	4.8	A2	0.014	93	−15.6	−13.6L	−16.6
1479..	5 52.5	+45 56	4.6	Mbp	0.011	103	+ 0.9	+ 1.3L	− 3.6
1513..	5 59.6	+ 5 26	5.8	G4	0.007	144	+20.4	....	+ 4.2
1514..	5 59.7	+ 4 10	5.7	G3	0.012	144	+32.7	....	+16.5
1523..	6 1.7	− 4 11	5.4	B6p	0.007	153	+16.1	....	− 1.7
1560..	6 8.7	+61 33	5.3	Map	0.005	87	+13.9	....	+14.9
1568..	6 9.7	+16 10	5.2	B9	0.021	133	+29.5	....	+15.9
1572..	6 10.1	+12 35	5.4	B9	0.017	136	+12.6	....	− 1.8
1573..	6 10.2	+24 0	6.1	G4	0.029	125	−20.4	....	−31.9
1575..	6 10.8	+59 3	4.5	A1	0.022	90	− 2.2	−3L, −6Y	− 2.2
1578..	6 10.9	+23 46	6.3	B6	0.014	125	+11.6	....	+ 0.1
1599..	6 15.0	− 2 54	5.2	Ma	0.276	152	+48.3	....	+30.6
1608..	6 18.1	+58 28	5.5	K3	0.011	91	− 4.6	....	− 4.9
1627..	6 22.1	+58 14	6.0	G7	0.33	91	+35.7	....	+35.4
1632..	6 22.6	+46 45	6.0	K3	0.007	103	−46.8	....	−51.3
1643..	6 24.9	+78 5	5.9	K6	0.019	71	−13.9	....	− 7.4

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 1672..	6h29m1	+56°56′	5.8	A0	0″013	92°	+ 0.4	....	− 0.3
23 Hev. Cam..	6 29.2	+79 40	5.6	A2	0.64	69	+12.0	....	+19.2
Boss 1704..	6 35.0	+28 17	6.5	G1	0.017	121	− 3.8	....	−14.1
1739..	6 42.3	−14 19	5.3	B8	0.012	161	+17.3	....	− 1.6
1751..	6 44.1	+16 19	5.8	B9p	0.023	132	+12.8	....	− 0.6
1756..	6 44.8	+13 32	5.9	G9	0.013	134	+26.8	....	+12.9
97 Monoc.....	6 45.7	− 0 25	5.8	A5	0.20	148	−17.2	....	−34.2
Boss 1788..	6 50.9	+10 5	6.0	B8	0.027	137	+33.0	....	+18.4
Lal. 13427..	6 54.0	+48 32	8.2	K1	0.71	100	−22.3	....	−25.8
Boss 1846..	7 5.6	+51 36	5.7	Map	0.019	96	−49.3	....	−51.4
1868..	7 9.7	+28 4	5.9	K3	0.020	119	+22.2	....	+12.5
1873..	7 10.2	+ 0 1	6.5	G4	0.019	145	− 9.6	....	−26.0
Lal. 14146..	7 11.3	−12 53	7.3	F9	0.56	156	+57.0	....	+38.7
Boss 1894..	7 13.5	+60 5	6.3	A7	0.011	88	+ 6.2	....	+ 6.9
1897..	7 14.1	+45 25	5.7	A4	0.036	102	+24.6	....	+20.4
1916..	7 16.5	+81 6	6.5	G5	0.004	68	− 1.5	....	+ 6.0
1926..	7 18.3	+27 50	5.7	F0	0.020	118	− 5.0	....	−14.4
1930..	7 19.4	+11 52	5.3	A2	0.028	133	+ 6.3	....	− 7.3
1935..	7 20.1	−16 0	5.1	B5p	0.034	156	− 7.6	....	−25.9
1956..	7 23.1	+28 19	5.0	A2	0.067	118	+42.8	+28:A	+33.4
2020..	7 36.4	+14 27	5.8	Mbp	0.015	130	−15.6	....	−28.5
28 Hev. Cam..	7 39.8	+80 31	6.5	G6	0.49	68	− 7.8	....	− 0.3
Boss 2054..	7 42.6	+23 23	6.2	F1	0.020	121	− 4.9	....	−15.2
2144..	8 0.4	+22 55	6.2	Map	0.024	119	+26.7	....	+17.0
2148..	8 2.5	+42 43	6.4	K2	0.07	101	+38.4	....	+34.6
2150..	8 2.9	+68 46	5.5	G3	0.006	78	− 9.5	....	− 5.3
2159..	8 4.9	−15 57	5.5	B3	0.014	148	+32.7	....	+15.7
2178..	8 7.4	+60 41	6.4	A2	0.017	85	−16.2	....	−14.5
2203..	8 14.3	+60 57	6.5	G8	0.008	84	− 5.4	....	− 3.3
2220..	8 17.9	+42 20	6.2	K1p	0.011	101	+27.1	....	+23.3
2236..	8 20.6	+45 59	6.3	G1	0.021	126	−34.3	....	−36.7
2245..	8 21.2	+12 59	5.8	Map	0.116	124	− 7.0	....	−18.2
2246..	8 21.5	− 3 40	5.5	A6	0.070	137	+25.5	....	+10.9
2293..	8 31.9	+53 4	6.0	K3	0.04	90	+26.6	....	+26.6
Lal. 16904..	8 33.1	+56 2	8.1	G3	0.44	87	+36.8	....	+37.8
Boss 2335..	8 38.8	− 6 52	4.6	G0	0.007	136	+30.3	....	+15.9
2338..	8 39.2	+31 4	6.1	G3	0.020	107	−12.4	....	−18.2
2357..	8 42.2	− 1 32	5.2	B9	0.046	132	+ 1.6	....	−11.8
2378..	8 46.5	+28 38	6.3	Mbp	0.022	108	+11.8	....	+ 5.6
2400..	8 51.7	+15 42	5.1	A3	0.062	118	− 0.8	....	−10.2
2407..	8 53.0	+12 15	4.1	A3	0.054	121	− 8.3	−15L, A	−18.6
2410..	8 53.5	+18 31	6.6	Mbp	0.089	115	+21.7	....	+13.3
2413..	8 54.2	+42 11	4.1	F5	0.504	97	+23.9	+27.3L	+21.5
2449..	9 3.6	+22 27	5.2	G6	0.008	111	− 6.7	....	−13.9
2455..	9 4.6	+22 24	6.1	G5	0.010	111	− 6.6	....	−13.8
2461..	9 5.8	+73 22	6.0	A3	0.100	71	+ 1.9	....	+ 8.4
81 π Cancri...	9 6.9	+15 24	6.4	G5	0.58	116	+45.9	....	+37.1
Boss 2465..	9 7.3	+43 38	5.4	A0p	0.052	94	+26.6	+16A	+25.2
2490..	9 11.7	− 5 56	5.5	K5	0.004	129	− 7.3	....	−19.9
2492..	9 11.8	− 8 20	5.5	B9	0.040	130	+11.0	....	− 1.9
2584..	9 32.1	+40 41	5.2	A1	0.020	93	− 5.8	....	− 6.8
2598..	9 35.5	+79 36	6.2	A5	0.029	65	− 6.5	....	+ 1.9
Lal. 19022..	9 37.1	+43 10	8.2	K5	0.80	91	−12.9	....	−13.2
Boss 2612..	9 38.3	+14 29	5.6	Map	0.014	111	+ 8.2	....	+ 1.0

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 2614..	9h 39m4	+57° 35′	5.4	Mbp	0.″025	80°	+ 9.4	....	+12.9
Lal. 19229..	9 43.5	+14 14	8.4	A2p	0.83	110	−23.2	....	−30.0
Boss 2647..	9 47.0	+ 2 55	5.9	A2	0.204	116	+95.8	....	+87.0
2650..	9 47.6	− 7 38	5.1	A1	0.076	122	+15.4	....	+ 4.8
2701..	10 5.0	+41 9	6.5	K0	0.017	88	+13.4	....	+14.1
Lal. 19896..	10 8.9	+ 3 39	7.7	G0	0.47	111	−24.7	....	−31.9
Boss 2726..	10 10.8	+65 36	5.8	A3	0.090	72	− 1.8	....	+ 4.4
2737..	10 13.4	+69 15	5.9	A2	0.065	70	+ 3.9	....	+10.7
2745..	10 15.2	+84 46	5.7	A2	0.130	62	+10.0	....	+19.4
2756..	10 17.3	+34 25	5.9	A1	0.027	91	−12.7	....	−13.0
2773..	10 21.5	+42 7	5.9	A1	0.102	86	+ 5.2	....	+ 6.6
2787..	10 24.3	+39 26	5.9	A1	0.011	88	+ 8.2	....	+ 8.9
2795..	10 25.7	+81 1	6.6	G6	0.016	63	−11.5	....	− 2.4
2808..	10 27.8	+35 30	5.6	A1	0.040	88	+ 2.6	....	+ 3.3
2813..	10 28.7	+57 36	5.2	A8	0.074	75	− 9.2	....	− 4.0
2819..	10 30.6	+36 51	6.2	A6	0.050	87	−24.2	....	−23.2
2822..	10 31.6	−11 42	5.7	F1	0.67	115	− 9.0	....	−17.4
2829..	10 33.1	+32 30	4.8	G0	0.008	90	− 7.6	− 6.3L	− 7.6
2887..	10 44.4	+28 30	6.1	A7	0.021	89	+ 2.4	....	+ 2.7
2909..	10 50.2	+25 17	4.3	A3	0.077	91	+ 6.1	....	+ 5.8
2910..	10 50.2	+34 2	5.9	G8	0.15	86	−23.4	....	−22.0
2915..	10 50.8	+ 6 43	6.0	Mcp	0.023	101	−12.3	....	−16.1
2921..	10 54.0	+36 38	6.2	Ma	0.095	83	−22.7	....	−20.3
Lal. 21258..	11 0.5	+44 2	8.9	Ma	4.46	78	+65	....	+69
Boss 2976..	11 9.9	+23 38	4.9	Map	0.018	88	+15.2	+16.0L	+15.9
2983..	11 12.1	+ 2 34	5.4	K8	0.159	99	−57.5	....	−60.6
2987..	11 13.7	+38 44	4.8	A0	0.102	80	+ 5.7	....	+ 9.2
83 Leonis Br..	11 21.7	+ 3 33	6.5	G8	0.76	96	− 2.4	....	− 4.5
83 Leonis Ft..	11 21.7	+ 3 33	7.6	K8	0.76	96	+ 2.2	....	+ 0.1
Boss 3045..	11 29.5	+17 21	5.8	B3	0.011	88	+17.8	....	+18.5
3055..	11 31.6	− 9 15	5.0	B9	0.061	100	− 8.0	....	−11.5
3063..	11 33.0	+44 11	5.6	A3	0.154	74	+ 5.6	....	+11.1
3067..	11 33.3	+ 8 41	5.5	Mb	0.013	91	+ 1.4	....	+ 0.9
Groom. 1822..	11 40.3	+48 14	7.9	G0	0.67	70	+23.9	....	+30.7
Boss 3089..	11 40.7	+ 7 5	4.2	Map	0.188	90	+51.2	+51.2L	+51.2
3125..	11 50.8	+57 9	5.9	G9	0.012	66	+13.1	....	+21.2
3137..	11 55.6	− 9 53	6.4	G6	0.47	96	0.0	....	− 2.1
3143..	11 57.0	+43 36	4.9	A5	0.323	69	+ 8.2	....	+15.4
3150..	11 59.2	+22 1	5.9	A5	0.044	79	+ 4.3	....	+ 8.1
3177..	12 6.5	+82 16	6.3	K4	0.019	59	−26.0	....	−15.7
3178..	12 6.6	+ 4 37	(7.2)	A8	0.006	86	− 6.0	....	− 4.6
W.B. 12h69..	12 7.4	− 2 32	7.3	G4	0.74	90	+11.3	....	+11.3
Lal. 22908..	12 8.1	+11 24	7.5	G3	0.59	82	−30.0	....	−27.2
Boss 3183..	12 8.3	+10 49	5.8	A8	0.096	82	+ 3.4	....	+ 6.2
3193..	12 11.1	+41 13	5.7	K3	0.051	68	−14.4	....	− 6.9
3206..	12 14.3	+23 35	6.1	A7	0.038	75	+ 1.2	....	+ 6.4
3215..	12 15.4	−21 40	5.4	B8	0.092	98	−20.9	....	−23.7
3217..	12 15.8	−13 1	5.5	K2	0.002	93	+12.5	....	+11.5
3234..	12 20.3	+57 20	6.0	Map	0.028	62	−16.7	....	− 7.3
3248..	12 22.8	+56 16	5.8	Ma	0.031	62	+17.6	....	+27.0
3266..	12 26.0	+25 7	5.4	A2	0.020	71	− 0.5	....	+ 6.0
3290..	12 31.6	− 5 17	5.9	A0	0.040	84	− 3.6	....	− 1.5
3294..	12 33.3	+ 2 24	6.0	Mb	0.090	81	−15.0	....	−11.9
3309..	12 36.8	+10 47	4.8	B8	0.135	76	+ 3.5	....	+ 8.3

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 3310. .	12h 36m 9	+ 7° 21′	5.4	A0	0″078	78°	+ 2.2	....	+ 6.4
3331. .	12 42.8	+ 4 7	6.7	Ma	0.013	78	+ 8.7	....	+ 12.9
3332. .	12 43.0	+63 20	5.8	A4	0.022	58	− 18.0	....	− 7.4
3334. .	12 43.2	+14 6	6.4	A0	0.068	73	− 0.2	....	+ 5.6
3336. .	12 43.5	+67 20	5.6	G5	0.008	58	+ 9.0	....	+ 19.6
3337. .	12 43.9	+14 40	5.7	A0	0.051	74	− 7.0	....	− 1.5
3338. .	12 44.1	+49 1	6.1	A5	0.055	60	− 2.4	....	+ 7.6
3339. .	12 44.4	+28 6	5.7	A0	0.095	68	+ 1.4	....	+ 8.9
3348. .	12 47.2	+17 37	6.5	G9	0.023	71	− 0.4	....	+ 6.1
3360. .	12 48.8	+12 58	6.2	A3	0.067	73	− 3.8	....	+ 2.0
3367. .	12 50.6	+ 3 56	3.7	Mbp	0.479	77	− 17.4	−17.6L	− 12.9
3382. .	12 56.4	+56 54	4.9	A2p	0.101	57	− 3.1	....	+ 7.8
3406. .	13 4.2	+10 33	6.0	G7	0.020	70	+ 0.1	....	+ 6.9
3408. .	13 4.5	− 9 48	6.2	K6	0.023	81	− 6.8	....	− 3.7
3442. .	13 11.5	+81 0	6.3	G5	0.008	56	− 10.0	....	+ 1.2
3462. .	13 17.1	+ 5 41	5.8	A1	0.080	70	− 11.4	....	− 4.6
3478. .	13 20.3	+24 23	5.8	A1	0.014	61	+ 1.6	....	+ 11.3
Lal. 25012. .	13 26.6	− 1 49	7.5	G6	0.94	72	− 53.9	....	− 47.7
Boss 3499. .	13 26.8	− 5 44	4.9	K5	0.112	75	− 19.1	−19.2L	− 13.9
3506. .	13 29.1	+ 4 10	5.0	A2p	0.052	68	− 8.4	− 6:L	− 0.9
3534. .	13 36.4	− 8 12	6.2	Ma	0.018	74	− 32.7	....	− 27.2
3542. .	13 39.1	−15 41	5.7	F8	0.009	78	+ 0.2	....	+ 4.4
3580. .	13 46.7	+35 16	6.6	A2	0.033	53	− 12.3	....	− 0.3
3585. .	13 47.4	+12 40	5.9	A1	0.038	60	− 17.1	....	− 7.1
3589. .	13 48.5	+65 13	4.8	Map	0.004	51	− 10.4	− 9.9L	+ 2.2
3629. .	14 3.7	− 9 52	6.5	G8	0.016	70	− 19.6	....	− 12.8
3653. .	14 9.9	−17 44	5.5	B9	0.044	74	− 15.7	....	− 10.2
3654. .	14 9.9	+52 15	4.4	A5	0.067	46	− 15.9	−19:L	− 2.0
3663. .	14 11.4	+19 23	5.9	A7	0.055	52	+ 6.3	....	+ 18.6
Lal. 26196. .	14 14.4	− 4 41	7.6	K1	0.68	64	− 13.0	....	− 4.2
Boss 3684. .	14 15.7	+39 15	6.0	A0	0.030	46	− 12.6	....	+ 1.3
3703. .	14 21.4	+38 51	6.3	K1	0.019	45	+ 25.8	....	+ 39.9
3706. .	14 22.2	− 5 40	6.1	A1	0.098	63	− 15.6	....	− 6.5
3734. .	14 31.7	−11 53	6.0	F5	0.97	66	− 70.5	....	− 62.4
3743. .	14 35.1	+54 27	5.5	A1	0.027	43	+ 4.2	....	+ 18.8
3756. .	14 37.4	−24 34	5.6	B9	0.026	74	− 4.2	....	+ 1.3
Lal. 27298. .	14 52.4	+54 4	7.9	K0	1.08	40	− 14.4	....	+ 0.9
A.Oe. 14320. .	15 4.7	−15 54	9.2	G0	3.76	63	+290	....	+299
Boss 3867. .	15 7.5	+19 21	6.0	Mbp	0.004	40	− 34.2	....	− 18.9
3875. .	15 8.9	−17 24	6.3	B8	0.029	63	− 25.9	....	− 16.8
3883. .	15 10.3	+29 32	5.2	A2	0.078	36	− 18.8	....	− 2.6
3885. .	15 10.7	+ 0 45	5.7	A2	0.109	50	− 5.5	....	+ 7.4
3893. .	15 13.5	+67 44	5.2	F3	0.459	44	− 45.4	....	− 31.0
3918. .	15 18.6	− 0 40	6.0	A3	0.077	50	− 2.7	....	+ 10.2
3942. .	15 25.0	−16 16	5.9	K0	0.019	60	− 1.2	....	+ 8.8
3955. .	15 29.0	− 8 51	5.1	B7p	0.029	54	− 4.3	....	+ 7.5
3985. .	15 35.1	+47 8	5.8	A8	0.162	32	− 2.3	....	+ 14.7
4007. .	15 40.4	+ 5 46	5.5	A2	0.033	41	− 7.3	....	+ 7.8
4022. .	15 45.2	+55 41	5.9	F2	0.010	34	− 1.9	....	+ 14.7
4026. .	15 45.8	+ 4 47	3.8	A6	0.136	40	− 10.6	−10.0L	+ 4.7
39 Serpentis. .	15 48.5	+13 31	6.2	F8	0.56	34	+ 38.7	....	+ 55.3
Boss 4070. .	15 55.4	− 8 8	5.4	A0	0.034	49	− 19.4	....	− 6.3
4096. .	16 2.0	−26 4	5.6	Map	0.122	63	− 21.2	....	− 12.1
4103. .	16 3.6	+ 8 48	5.9	Mbp	0.024	34	− 21.6	....	− 5.0

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 4119..	$16^h\ 6^m5$	−9°48′	5.1	A2	0″027	48°	−1.7	−8.9L	+11.7
4120..	16 6.7	−8 17	5.5	A2	0.041	47	−6.4	....	+7.2
4122..	16 7.0	+16 55	5.9	A2	0.014	29	−12.6	....	+4.9
4125..	16 7.4	+23 45	6.0	Mbp	0.028	26	−24.2	....	−6.2
4131..	16 8.3	−11 35	5.5	K6	0.020	50	−26.3	....	−13.4
4134..	16 9.1	−3 26	3.0	Map	0.161	43	−17.5	−19.5L	−2.9
4137..	16 10.2	−8 6	5.9	G1	0.53	47	+11.2	....	+24.8
4138 Ft.	16 10.9	+34 7	6.8	F5	0.29	23	−18.1	....	+0.3
4146..	16 12.7	+29 24	5.6	A1	0.028	24	+6.4	....	+24.7
4159..	16 15.6	+60 0	5.6	Map	0.022	34	−35.2	....	−18.6
4182..	16 20.8	+14 16	4.4	A0	0.079	28	−2.4	−6.1L	+15.3
4188..	16 22.3	−7 22	5.4	Map	0.176	44	+97.1	....	+111.5
B.D. 51°2097..	16 23.0	+51 22	7.5	A1	0.109	27	−17.6	....	+0.2
Boss 4210..	16 27.7	+5 44	5.5	A0	0.023	32	−26.9	....	−9.9
4221..	16 31.0	+61 2	5.8	A1	0.021	34	−11.6	....	+5.0
Lal. 30271..	16 32.6	+31 9	7.2	F2	0.46	18	−8.0	....	+11.0
Boss 4228..	16 33.3	+46 49	6.0	G9	0.020	23	−16.8	....	+1.6
4229..	16 33.8	+53 6	5.7	A0	0.026	28	−7.0	....	+10.7
4291..	16 47.5	+15 9	6.3	B9	0.011	23	−22.8	....	−4.4
4300..	16 49.2	+31 52	5.3	A6	0.098	15	−21.4	....	−2.1
4303..	16 50.3	−16 39	6.5	G8	0.089	51	−2.2	....	+10.4
4316..	16 53.4	+25 30	6.7	G5	0.009	20	+9.1	....	+27.9
4332..	16 57.9	+33 43	5.3	A5	0.012	13	−13.2	....	+6.3
Lal. 31055..	16 59.8	−4 54	7.9	K5	1.47	38	+27.5	....	+43.3
Boss 4395..	17 15.2	−12 45	4.3	A1	0.036	45	+3.8	+8L	+17.9
4418..	17 20.0	+16 24	5.7	A8	0.044	17	+10.8	....	+29.9
W.B. 17^h322..	17 20.8	+2 14	7.8	K9	1.36	30	−27.8	....	−10.5
Boss 4427..	17 22.5	+20 10	5.4	B6	0.016	13	−28.2	....	−8.7
4438..	17 26.7	+26 11	4.5	K2	0.021	9	−25.2	−26.1L	−5.4
Lal. 31905..	17 26.5	+1 45	7.2	K4	....	30	−15.4	....	+1.9
W.B. 17^h514..	17 29.9	+6 4	8.6	F1	0.58	26	−148	....	−131
Boss 4461..	17 31.7	+21 4	5.8	A4	0.028	11	−17.5	....	+2.1
4494..	17 41.9	+53 51	5.6	A0	0.043	23	+1.8	....	+20.2
4514..	17 47.4	+48 25	6.4	B2p	0.008	17	−16.3	....	+2.8
4530..	17 51.6	+22 29	5.7	K4	0.002	8	−43.1	....	−23.3
4546..	17 55.6	−17 9	6.3	K0	0.012	48	−21.5	....	−8.1
4547..	17 55.6	+16 45	4.7	G8	0.012	14	−24.4	−21.5L	−5.0
4554..	17 56.9	+72 0	5.5	F2	0.009	41	−5.9	....	+9.2
4592..	18 4.6	+20 2	5.2	A3	0.027	11	−16.1	....	+3.5
Lal. 33439..	18 6.3	+38 27	6.7	K2	0.65	8	−17.7	....	+2.1
Boss 4601..	18 6.5	+36 27	5.9	G7	0.009	6	−25.9	....	−6.0
4620..	18 12.5	+42 8	5.2	B8	0.009	12	−20.4	....	−0.8
4629..	18 15.1	+24 24	5.5	K0	0.016	8	+0.5	....	+20.3
4630..	18 15.4	−24 58	6.4	Mbp	0.011	56	+3.9	....	+15.1
B.D. 8°3689..	18 21.4	+8 44	7.7	G1	0.50	23	−22.5	....	−4.1
Boss 4668..	18 22.1	−17 52	6.0	B8	0.007	49	−34.9	....	−21.8
4685..	18 25.6	−18 28	5.2	B8	0.035	49	−37.8	....	−24.7
4686..	18 25.7	+65 30	5.0	G9	0.104	35	+30.0	+33.4L	+46.4
4702..	18 29.0	+30 29	5.4	B9	0.007	7	−11.2	....	+8.7
4707..	18 30.9	+56 58	5.1	F8	0.011	27	−9.9	−10.4L	+7.9
4719..	18 32.5	−0 24	5.8	A3	0.026	32	+13.3	....	+30.3
4724..	18 34.6	+77 28	5.8	K0	0.006	46	+1.6	....	+15.5
4740..	18 39.8	+1 57	4.9	B7	0.022	30	−2.2	....	+15.1
4748..	18 41.0	+39 34	6.7	A0	0.06	12	−37.1	....	−17.5

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 4750..	18h41m2	−10° 14′	5.8	F5	0″005	42°	+ 9.8	....	+ 24.7
4758..	18 42.0	+26 33	4.9	K0	0.029	10	− 17.2	−16.6L	+ 2.5
4763..	18 43.1	+60 57	6.2	G5	0.010	31	− 24.2	....	− 7.1
Lal. 34986..	18 43.8	+10 39	8.1	K5	0.45	23	− 17.4	....	+ 1.0
Boss 4772..	18 46.0	+32 42	5.8	B3	0.014	10	− 16.1	....	+ 3 6
4780..	18 48.0	−21 29	5.8	G3	0.012	53	− 3.8	....	+ 8.2
4783..	18 49.0	−15 44	5.0	B7	0.023	48	− 6.3	....	+ 7.1
4805..	18 51.7	+41 28	5.6	G5	0.007	15	− 8.2	....	+ 11.1
4816..	18 53.8	−12 59	5.4	B8p	0.025	46	− 12.5	....	+ 1.4
4842..	18 57.7	+50 23	5.1	B3	0.025	22	− 19.3	....	− 0.8
4866..	19 2.5	+24 6	5.6	A4	0.056	15	− 23.0	....	− 3.7
4873..	19 3.7	+35 57	5.2	B6	0.009	14	− 30.5	....	− 11.1
4898..	19 10.8	+14 55	5.6	K1	0.020	23	− 22.4	....	− 4.0
4899..	19 11.0	+21 3	5.5	A2	0.044	19	− 23.9	....	− 5.0
4910..	19 12.7	+49 54	6.3	G6	0.014	24	+ 6.5	....	+ 24.8
4912..	19 12.9	+37 57	4.5	G8	0.010	17	− 30.7	−30.3L	− 11.6
4914..	19 13.1	+11 25	5.1	A3	0.011	26	− 16.2	....	+ 1.8
4917..	19 13.5	+22 51	5.2	B3	0.014	18	0.0	....	+ 19.0
4919..	19 13.7	+ 0 9	6.3	K1	0.009	36	− 28.0	....	− 11.8
4942..	19 18.8	+26 4	4.8	B8p	0.015	18	− 12.2	−12.2L	+ 6.8
4967..	19 22.1	+19 42	6.1	K8	0.057	22	− 35.1	....	− 16.6
4974..	19 24.0	+ 1 45	5.7	B8	0.037	35	+ 16.8	....	+ 33.2
4976..	19 24.5	+24 28	4.6	K5	0.170	20	− 86.6	−85.0L	− 67.8
4978..	19 24.8	+24 34	6.0	G6	0.012	20	− 26.4	....	− 7.6
5024..	19 36.2	+42 35	5.4	A0	0.032	23	− 38.8	....	− 20.4
5044..	19 40.5	−20 0	5.1	G9	0.165	56	+ 16.5	+23L	+ 27.7
5063..	19 45.9	+38 27	6.2	G2	0.016	23	+ 10.6	....	+ 29.0
5073..	19 47.9	+18 25	6.3	B2p	0.007	28	− 10.9	....	+ 6.8
5088..	19 49.2	− 8 30	6.5	B7	0.029	48	− 13.4	....	0.0
5096..	19 51.2	+36 44	5.8	F5	0.008	24	− 24.2	....	− 5.9
5122..	19 54.7	+30 43	5.4	B8	0.031	25	− 0.2	....	+ 17.9
5125..	19 55.5	+17 15	5.6	Map	0.015	30	− 16.9	....	+ 0.4
5134..	19 57.8	+24 39	5.2	A3p	0.099	27	− 33.8	....	− 16.0
5142..	19 59.2	− 0 59	5.8	K2	0.119	43	+ 0.8	....	+ 15.4
B.D. 36°3883..	20 3.5	+36 16	(7.1)	Map	....	26	− 32.0	....	− 14.0
Boss 5177..	20 7.6	+26 31	5.8	G9	0.020	28	− 22.2	....	− 4.5
5188..	20 10.8	+36 30	5.1	B9	0.094	28	− 13.4	−22:L	+ 4.3
5213..	20 14.8	+34 40	5.2	F0	0.017	29	− 4.0	....	+ 13.5
5218..	20 15.9	+55 5	5.8	A2	0.021	34	− 2.8	....	+ 13.8
5220..	20 16.6	+39 5	6.1	A0	0.022	29	0.0	....	+ 17.5
5224..	20 17.8	+24 8	5.4	B8p	0.018	31	− 9.1	....	+ 8.0
A.Oe. 20452..	20 17.7	−21 40	8.1	G0p	1.21	62	−179	....	−170
Boss 5240..	20 21.6	−18 32	5.1	B8p	0.016	61	− 18.4	....	− 8.7
5258..	20 25.5	+36 7	5.9	A1	0.014	31	− 18.0	....	− 0.9
5267..	20 27.2	+36 36	6.3	F7	0.013	31	− 22.7	....	− 5.6
5284..	20 31.5	− 2 54	5.2	K2	0.011	50	− 10.9	....	+ 2.0
5296..	20 33.5	+31 10	6.4	A3	0.069	33	+ 1.8	....	+ 18.6
5301..	20 34.1	+20 51	4.7	A1	0.058	36	− 19.2	−15L	− 3.0
5307..	20 34.4	+15 29	5.9	B3	0.025	39	− 2.0	....	+ 13.5
5316..	20 36.0	+45 19	6.5	B6	0.010	34	− 15.1	....	+ 1.5
5317..	20 36.6	+14 14	6.2	K2	0.012	39	− 31.1	....	− 15.6
5319..	20 37.0	+31 57	5.7	G7	0.018	33	− 28.0	....	− 11.2
5325..	20 39.1	+49 59	5.4	B3	0.006	36	− 2.6	....	+ 13.6
5366..	20 46.9	− 5 53	5.5	A0p	0.011	54	− 4.2	....	+ 7.6

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
Boss 5373..	20h47m.8	+26° 43′	4.8	G8	0″.103	37°	+ 3.3	− 0.2L	+19.3
Lal. 29208..	20 50.6	+40 19	6.5	B8p	0.025	36	−21.3	....	− 5.1
Fed. 3638..	20 52.4	+74 23	7.8	G4	0.70	49	−30.4	....	−17.3
Boss 5389..	20 52.5	+47 2	5.7	B8	0.006	37	−15.3	....	+ 0.7
5397..	20 53.8	+21 56	5.6	K5	0.005	40	−27.3	....	−12.0
5417..	20 58.7	−20 15	5.0	A2	0.060	67	+23.7	+26L	+31.5
5420..	20 59.2	+38 16	6.2	G7	0.012	37	− 2.5	....	+13.5
W.B.20h1454..	20 59.1	+ 2 36	8.0	F3	0.56	51	− 9.3	....	+ 3.3
Boss 5422..	20 59.6	+ 5 6	5.9	K6	0.019	50	−15.2	....	− 2.3
5432..	21 2.3	+30 47	5.9	F5	0.010	39	− 6.0	....	+ 9.5
B.D. 38°4362..	21 5.2	+38 19	7.9	K0	....	39	− 8.1	....	+ 7.4
Boss 5456..	21 9.9	−21 4	5.4	G8	0.007	69	− 6.9	....	+ 0.3
5481..	21 16.5	+58 12	5.8	F8	0.014	43	−21.1	....	− 6.5
5486..	21 16.8	+76 35	6.2	K2	0.020	51	+15.5	....	+23.1
Lal. 30218..	21 18.5	+13 36	(6.6)	B6p	....	49	− 9.0	....	+ 4.1
Boss 5498..	21 19.5	+23 51	5.8	A6	0.124	45	−18.9	....	− 4.8
5512..	21 21.7	+36 14	5.9	B3	0.011	42	+ 1.7	....	+16.6
5522..	21 25.4	+23 12	4.8	Ma	0.017	46	−19.4	−17.5L	− 5.5
5542..	21 30.1	− 4 26	5.8	G5	0.021	61	− 0.3	....	+ 9.4
5546..	21 30.7	+38 5	5.0	G8	0.148	44	−63.9	−65.5L	−51.1
5550..	21 32.4	− 0 50	6.2	A0	0.026	60	+16.9	....	+26.9
5555..	21 33.1	+18 52	5.3	A1	0.100	49	−38.6	....	−25.5
5558..	21 34.4	+19 49	5.8	A3	0.117	49	−13.4	....	− 0.3
5583..	21 39.1	+40 42	5.6	K3	0.026	45	−25.9	....	−11.8
5589..	21 39.7	− 9 33	5.3	G4	0.010	67	− 6.5	....	+ 1.3
5590..	21 39.8	+16 53	4.3	G7	0.029	52	−25.5	−22.1L	−13.2
5599..	21 41.5	+22 29	5.4	G0	0.016	50	−10.7	....	+ 2.2
5614..	21 44.5	+60 14	5.6	K4	0.006	47	−19.4	....	− 5.8
5650..	21 53.8	+63 9	5.4	Map	0.012	49	−19	....	− 6
5655..	21 56.0	+ 0 7	5.8	K1	0.006	64	+ 7.2	....	+16.0
5657..	21 56.2	+ 7 47	5.8	K2	0.022	60	−22.8	....	−12.8
B.D. 61°2233..	21 57.4	+61 59	6.5	B6	0.013	49	−21.0	....	− 7.9
Boss 5664..	21 58.2	+52 24	5.7	B9	0.004	48	−22.1	....	− 8.7
5669..	21 58.9	+44 10	5.3	A1	0.039	48	+ 0.9	....	+14.3
Groom. 3689..	22 3.1	+52 39	8.1	G8	0.61	49	−35.6	....	−22.5
Boss 5749..	22 11.9	− 5 53	5.8	G5	0.020	71	+ 6.9	....	+13.4
5757..	22 15.4	+ 5 17	5.2	B7	0.019	65	−15.5	....	− 7.1
5769..	22 18.3	− 7 42	6.1	G4	0.006	73	−13.7	....	− 7.9
5805..	22 25.4	+57 54	(7.5)	B8	0.028	52	−25.7	....	−13.4
5858..	22 37.1	+28 47	4.8	A3	0.039	59	+ 7.1	+ 8.7L	+17.4
5868..	22 39.6	+38 56	6.1	K4	0.016	57	−26.6	....	−15.7
5904..	22 49.3	−16 21	3.5	A2	0.052	84	+13.4	+22L	+15.5
5920..	22 53.5	+ 8 50	6.5	F5	0.420	71	−26.9	....	−20.4
5923..	22 54.3	−13 36	6.3	K2	0.014	84	+13.2	....	+15.3
Lal. 45028..	22 56.6	− 4 23	7.8	K2	0.50	79	−50.7	....	−46.9
Boss 5940..	22 58.9	+27 32	2.6	Map	0.234	64	+10.6	+ 8.4L	+19.4
5962..	23 4.5	+ 8 8	5.4	Mbp	0.004	74	+13.4	....	+18.9
5967..	23 5.0	+ 9 17	5.4	B9	0.024	74	+11.8	....	+17.3
5969..	23 5.5	+58 47	5.6	A3	0.015	57	−11.8	....	− 0.9
5972..	23 5.8	+43 0	5.8	F2	0.275	60	−43.9	....	−33.9
5973..	23 6.7	+ 8 11	5.1	B9p	0.017	75	+ 5.6	....	+10.8
5981..	23 10.7	− 9 38	4.5	G8	0.367	85	−28.4	−26.9L	−26.7
5982..	23 10.9	+27 42	6.5	K0	0.015	67	+ 3.5	....	+11.3
6016..	23 18.1	+59 35	5.9	G9	0.003	59	−11.2	....	− 0.9

TABLE II—*Continued*

Star	α 1900	δ 1900	Mag.	Spec.	μ	λ	v	v	v′
A.Oe. 25685..	23h26m5	+58°37′	7.5	K1	1″08	60	−24.7	....	−14.7
B.D. 62°2244..	23 28.2	+62 36	7.3	G4	0.44	60	+ 8.0	....	+18.0
Boss 6063..	23 29.7	+39 41	5.4	A0p	0.042	66	+13.2	....	+21.3
6089..	23 38.3	+ 9 47	5.4	Map	0.007	81	−35.2	....	−32.1
6105..	23 42.1	+56 54	5.8	K0	0.021	62	− 5.4	....	+ 4.0
6106..	23 42.2	+58 6	5.1	G9	0.087	62	−22.9	−20.3L	−13.4
6111..	23 44.0	+61 40	5.6	A3p	0.010	61	−55.7	....	−46.0
6113..	23 44.3	+ 0 31	5.8	A3	0.027	86	+ 9.4	....	+10.7
6123..	23 46.8	+ 2 22	5.8	K1	0.020	86	+ 0.9	....	+ 2.3
6133..	23 48.0	+ 1 32	6.2	A1	0.013	87	+ 9.7	....	+10.7
6135..	23 49.4	+56 57	5.0	F9p	0.007	63	−42.6	−42.1L	−33.5
6145..	23 52.0	+42 6	6.0	F2p	0.012	69	− 7.7	....	− 0.5
6166..	23 56.5	+60 40	5.7	A6	0.007	63	−22.4	....	−13.3
6176..	23 57.5	+65 33	5.8	K0	0.018	62	−16.9	....	− 7.5
6180..	23 59.1	+61 44	6.0	A0	0.008	63	−18.9	....	− 9.8

ACCURACY OF THE OBSERVATIONS

The great variety of spectral types among the stars of Table II involves a wide range in the accuracy of the determinations of radial velocity. Many of the A- and B-type stars have vague and very ill-defined lines, and for such stars the accuracy necessarily is low. In some cases as many as seven or eight determinations have been made to guard against the inclusion of possible spectroscopic binaries, and the range among the individual plates occasionally amounts to more than 10 km. On the other hand, the results for spectra having well-defined lines are usually in excellent agreement. The accompanying short table (III) shows the average of the probable errors of *v* for ten stars of each type selected at random from Table II.

TABLE III

Type	Quality for Measurement	Average No. Plates	Linear Scale of Plates	Probable Error
			per mm	
A and B.........	Poor	5	16 A	±1.16 km
A and B.........	Good	3	16	0.73
F...............	Good	3	36	0.98
G and K.........	Good	3	36	0.97
M...............	Good	3	36	±1.09

For the sake of uniformity it has seemed preferable to retain the fractional part of the kilometer for *v* wherever three observations are available, although it can have little significance in the case of individual stars photographed with such relatively low dispersion. The fact that the linear scale of the spectra of the A and B stars is over twice that of the F, G, K, and M stars aids in counteracting the effect of the poorer quality of their lines, and so tends to make the accuracy of the determinations for all of the stars in Table II more nearly the same.

COMPARISON WITH RESULTS OF OTHER OBSERVERS

There are fifty stars in the list for which determinations of radial velocity have been published by other observers, a very large proportion being from the Lick Observatory photographs. The Lick spectrograms were in most cases taken with a dispersion of three prisms, and have a linear scale about three times that employed for most of the F, G, K, and M stars of Table II. A comparison by spectral types with the Lick Observatory results gives the values shown in Table IV.

TABLE IV

Type	No. Stars	Lick−Mount Wilson
B and A.........	21	+0.9 km
F and G.........	14	+1.6
K and M........	12	+0.4

The star W.B. 4^h1189 has been omitted from this comparison, as it seems probable that the large difference between the two results may be due to the fact that the star has a variable velocity. The same remark may apply to one or two other stars in the list, particularly Boss 5904 and 5044. The exclusion of these stars would reduce the difference for the B and A stars from +0.9 to +0.4 km, and for the F and G stars from +1.6 to +1.1 km.

A large number of observations on the two stars α Boötis and α Tauri have been made during the period covered by the results shown in Table II. The values for these stars are given in Table V.

The evidence seems to indicate a small systematic difference in the direction of larger negative or smaller positive values for the Mount Wilson results, but it is probably no larger than may be accounted for by the wave-lengths of the lines employed. A slight difference might arise from the fact that the iron arc has been used for comparison purposes at Mount Wilson, and that Rowland's wave-lengths have been utilized both for comparison lines and for such stellar lines as appear in the sun. The adopted values of the

TABLE V

Star	No. Plates	Mount Wilson	Lick	Yerkes
α Boötis.........	31	− 4.3 km	− 3.9 km	−4.5 km
α Tauri..........	16	+54.0	+55.1	....

laboratory wave-lengths used for the helium lines of type B and the magnesium line λ 4481 of type A may also differ to some extent. In view of the fact that the Mount Wilson results are based mainly on comparatively low-dispersion photographs, the agreement with the Lick Observatory values must be considered as quite satisfactory.

SOME INDIVIDUAL STARS

Among the stars with exceptionally high velocities the following are of especial interest:

	v'		v'
A.Oe. 14320........	+299 km	Lal.21258........	+69 km
A.Oe. 20452........	−170	Boss 2647........	+87.0
W.B. 17^h514.......	−131		

The first of these stars has a proper motion of 3″.76 and a parallax, as determined by Russell, of +0″.035. Its motion in space as based on these values and its radial velocity would amount to 577 km, directed toward the vertex $\alpha=189°$, $\delta=-70°$. At a distance of 5′ there is a second star which shares in the proper motion. The spectrum of this star is Go.

The star Lalande 21258 has a proper motion of 4″.46 and a parallax of 0″.20. Its absolute brightness is extremely small, its magnitude being 10.4 (sun=5.5): In proper motion, absolute magnitude, and spectrum it resembles very strongly Lalande 21185, but the radial velocities of the two stars, though both large, are of opposite sign.

Boss 2647 is one of the very few stars of type A with a high radial velocity.

A star of exceptional interest because of the character of its spectrum is Lalande 19229. The spectral type is A2, but the line λ 4481, usually so prominent in stars of this type, is either absent or very faint. Two stars with a very similar spectrum had been found previously in the list of those having large proper motions. The data for the three stars are given in Table VI.

TABLE VI

Star	Mag.	μ	π	Spectrum
Lal. 5761.......	8.0	0".90	+0".039	A3p
Lal. 19229.......	8.4	0.83	−0.046	A2p
Lal. 28607.......	7.3	1.17	+0.029	A2p

The hydrogen lines in these stars are exceptionally narrow and well defined. Although the measured parallaxes are small, it seems probable that these stars are of comparatively low luminosity, and the suggestion may be made that the normal A-type spectrum is modified in this way in the case of stars of small absolute brightness. If such is the case, these spectral peculiarities should serve as a valuable criterion for the discovery of stars of this character. On physical grounds the absence of the spark line of magnesium at λ 4481, which is associated in the laboratory with high vapor-density and probably high temperature, and the narrowness and sharpness of the hydrogen lines, which would indicate a hydrogen atmosphere of low density, would be in harmony with this hypothesis.

Attention was called in the publication already referred to on the radial velocities of 100 stars with measured parallaxes[1] to the marked preponderance of the negative sign among the highest velocities. There seems to be no such noticeable effect in the case of the velocities given in Table II. The number of positive and negative velocities is essentially equal if $v' = 50$ km is set as a limit. Between 45 and 50 km, however, there are six negative velocities and only one with the positive sign.

[1] *Mt. Wilson Contr.*, No. 79; *Astrophysical Journal*, **39**, 341, 1914.

RADIAL VELOCITY AND PROPER MOTION

It is well known that, in general, the proper motions of the stars of type B are extremely small, those of type A considerably larger, and those of types F, G, and K larger still. The M-type stars have proper motions averaging about the same as the A stars. An observing list of stars of different types selected on the basis of apparent magnitude alone would, therefore, contain material which would not be homogeneous as regards the distances of the stars. Since large proper motions when treated statistically indicate not only small distance, but also high velocity, as is shown clearly by the values for stars of large proper motion,[1] the tendency would be in such an observing list to compare rapidly moving stars of one type with slowly moving stars of another type.

Most of the F, G, K, and M stars and some of the A stars which appear in Table II have been selected for observation because of their small proper motions. A knowledge of their radial velocities enables us to institute a comparison between the average velocities of groups of stars having these spectra with those of types B and A of the same average proper motion. In Table IV are collected the radial velocities of all of the stars in Table II, for which the proper motion is less than 0.″030 annually. One K-type star and one M star with velocities exceeding 50 km have been omitted. This makes it possible to compare directly with a similar table published by Professor Campbell based on his velocities of stars of all types.[2] For the present purpose Campbell's first table based on 1034 stars is used, no constant correction K having been applied to these results. The proper motions for Campbell's stars have been taken from Boss's catalogue for the individual stars published in *Lick Observatory Bulletins*, Nos. 195, 211, and 229. Not all of these stars are used in Campbell's table, and, accordingly, the average proper motions derived are not strictly correct. In view of the large number of stars used, however, it does not seem probable that the values can be materially in error.

[1] The average value of the radial velocity (corrected for the sun's motion) of 135 stars of large proper motion, $\mu=0.''82$, as determined at Mount Wilson is 24.3 km. Stars with velocities exceeding 100 km are omitted.

[2] *Lick Observatory Bulletin*, No. 196.

The peculiar feature of this comparison is the relatively close agreement of the A and B stars and the large difference for the other stars. The question at once arises whether this may not be associated with the great increase in proper motion for Campbell's stars between type A and type F. In a recent publication by Kapteyn and Adams,[1] Professor Kapteyn has made a computation of the relationship between radial velocity and proper motion for the K stars, using as a basis Campbell's published values of radial

TABLE VII

Spectral Types	Campbell				Mount Wilson		
	No. Stars for v'	No. Stars for P.M.	Proper Motion	v' km	No. Stars	Proper Motion	v' km
O and B......	141	224	0.″031	8.99	61	0.″016	8.23
A............	133	206	0.094*	9.94	55	0.019	10.04
F............	159	192	0.234	13.90	20	0.011	10.14
G and K.....	529	549	0.202	15.15	119	0.014	11.03†
M...........	72	78	0.074	16.55	27	0.015	12.56

*The omission of 5 stars would reduce this value to 0.″079.

†The separate values of the G and K stars are G: 63, 0.″013, 10.60; K: 56, 0.″014, 11.53.

velocity and some of the Mount Wilson observations. The stars were selected in such a way as to eliminate so far as possible the effect of stream motion, and the components of the linear velocities were computed by aid of the mean parallaxes for stars of known proper motion and magnitude given in *Groningen Publication*, No. 8. If we assume that the results of this computation for the K stars may be applied to stars of other types, we have Table VIII connecting proper motion and radial velocity.

TABLE VIII

μ	v'	μ	v'
0.″000 to 0.″025	......12.1 km	0.″100 to 0.″119	......14.3 km
0.026 " 0.039	......12.5	0.120 " 0.149	......14.8
0.040 " 0.059	......12.9	0.150 " 0.199	......15.9
0.060 " 0.079	......13.3	0.200 " 0.299	......17.7
0.080 " 0.099	......13.7	≧ 0.300	......24.5

[1] *Communications to the National Academy of Sciences*, No. 1; *Proceedings of the National Academy of Sciences*, **1**, 14, 1915.

The use of these values gives the following corrections to the radial velocities for the proper motions of the Campbell stars in Table VII in order to reduce to the average proper motion 0."031 of the O and B stars:

$$A, -1.3;\ F, -4.9;\ G \text{ and } K, -4.1;\ M, -1.0 \text{ km.}$$

Table IX shows the values with these corrections applied, and also with the reductions applied to correct for stream motion which have been calculated by Eddington.[1]

TABLE IX

Type	v' km	Campbell v' Corrected for Stream Motion	Proper Motion	v' km	Mount Wilson v' Corrected for Stream Motion	Proper Motion
O and B...	9.0	9.0 km	0."031	8.2	8.2 km	0."016
A........	8.6	6.8	"	10.0	7.7	0.019
F........	9.0	7.8	"	10.1	8.8	0.011
G........	11.0	9.6	"	10.6	9.2	0.013
K........				11.5	10.0	0.014
M........	15.6	13.6	"	12.6	10.9	0.015

In his definitive solutions of the solar motion for the several spectral types[2] Campbell has given the average radial velocity for each type with a constant correction K applied to the velocity of each star. This constant has a value ranging from about zero for the F and G stars to over 4 km for the B stars. If we treat these values in the same way as those of Table VII we obtain Table X.

TABLE X

Type	v'	v' Corrected for Stream Motion	Proper Motion
O and B.....	6.5 km	6.5 km	0."031
A...........	9.6	7.4	"
F...........	9.5	8.3	"
G...........	9.1	7.9	"
K...........	13.2	11.5	"
M...........	16.1	14.0	"

The value of the constant *K* as used by Campbell is the average velocity v' taken according to sign for the stars of the several spectral types, and is, of course, dependent upon the value of the solar

[1] *Stellar Movements*, p. 157.
[2] *Lick Observatory Bulletin*, No. 196.

motion V as derived for each type. Since the same value of V has been used for all of the Mount Wilson stars, no direct comparison is possible. It is, however, of interest to note how the value $V=20$ km satisfies the stars of the several types. The average velocity v' taken according to sign for the stars of Table VII is as follows:

B, +1.26; *A*, −0.24; *F*, −0.86; *G*, +0.05; *K*, −1.18; *M*, +0.31 km.

A change in the value of V from 20 to 19 km would reduce the residual for the B stars from +1.26 to +1.06 km. These quantities must be regarded as very moderate in size. The number of stars used is not very large, however, and hence the values might be changed materially by the inclusion of additional velocities. Thus if all of the M stars both of large and of small proper motion in Table II are included, together with one or two stars for which only a single observation is available, we obtain the following result:

No. Stars	μ	v'	v' According to Sign
43	0″058	14.54 km	−0.97 km

A similar computation for the B stars gives:

No. Stars	μ	v'	v' According to Sign
113	0″028	8.89 km	+1.62 km

The value +1.62 km would be reduced about 10 per cent by employing a value of the solar motion $V=19$ km.

The Mount Wilson results of Table IX seem to indicate, if interpreted directly, that among the very distant stars the change of velocity with spectral type is slight, and Campbell's results, except perhaps in the case of the M-stars, point to the same conclusion when allowance has been made for the effect of the large number of relatively near stars included among his F- to M-type spectra. This would be in agreement with the hypothesis put forward by Eddington in 1911,[1] but later entirely disproved, as he

[1] *British Association Report*, 1911.

considered, by the evidence of the A stars,[1] that the relation between velocity and spectral type might be a relation between velocity and distance, the stars nearest the sun, which are mainly of types F to K, moving more rapidly than the distant stars. The evidence which Eddington regarded as conclusive in disproving this hypothesis was provided by an analysis according to proper motion of the A-type stars for which velocities had been published. No increase of radial velocity with proper motion was indicated by the results. It has already been stated in this communication that such a conclusion is by no means tenable in the case of the K stars, for which Kapteyn has found from the Lick and Mount Wilson values an increase of velocity of from 10.9 km for stars having an average proper motion of about 0".020 to 26.7 km for stars with a proper motion exceeding 0".30. The following evidence derived entirely from the Mount Wilson observations for the other types of spectra will be of interest in this connection. The effect of stream motion has not been eliminated.[2]

TABLE XI

	No. Stars	μ	v'	No. Stars	μ	v'
B..........	61	0".016	8.2 km	52	0".041	9.6 km
A..........	55	0.019	10.0	104	0.067	10.7
F..........	20	0.011	10.1	45	0.53	24.6
G..........	63	0.013	10.6	69	0.67	24.9
M..........	27	0.015	12.6	12	0.17	17.6

The agreement of these results with those obtained from the K-type stars is surprisingly close, and suggests that the empirical law connecting proper motion and radial velocity derived by Kapteyn may be applied to the other types of spectra quite as well. Only a few A-type stars of very large proper motion have been observed at Mount Wilson. Of those for which μ exceeds 0".20, two have velocities exceeding 150 km; one has a velocity of 87 km; and the average for the other six is 20 km.

The main feature of interest resulting from this comparison of proper motion and radial velocity is the low average velocity found

[1] *Stellar Movements*, p. 161.

[2] Velocities exceeding 100 km have been omitted.

for the very distant stars of types F to M. The selection of stars on the basis of small proper motion means, of course, the selection not alone of distant stars but also of those which have small intrinsic velocities as well as those whose motion is mainly in the line of sight. These factors will affect the results to some extent, especially when comparatively small numbers of stars are used. On the other hand, the direct comparison of the average velocities of groups of stars of greatly different average proper motions means a comparison in part between stars of widely different distance, and in part between slowly moving stars of one type and rapidly moving stars of another. If the rate of change of velocity with spectral type is as gradual as seems probable from these results, a very accurate knowledge of the stream motions for the different types of stars will be essential for a determination of its true value.

No attempt is made here to discuss the well-known investigation by Kapteyn,[1] in the course of which he first analyzed the relationship of radial velocities and proper motions to spectral types; nor the work of Boss,[2] in which he deduced the linear cross-motions of the stars of his catalogue according to spectral type. There can, of course, be no doubt that among the stars selected on the basis of apparent brightness those of the solar type are moving more rapidly than those of types A and B. The question which is raised is whether there exists any such marked difference for the stars of the solar type with distances comparable to those of types A and B.

The small proper-motion stars of types F to M whose motions are considered here are on the average stars of very high absolute luminosity. The possible existence of a relationship between absolute brightness and velocity has been discussed in the communication by Kapteyn and Adams, to which reference has already been made. The observational material essential to an investigation of this question would necessarily be much more extensive than that given here, and should be selected with this purpose in view. It may, however, be noted in passing that the average radial velocity of the stars of very low absolute luminosity is extraordinarily great.

[1] *Mt. Wilson Contr.*, No. 45; *Astrophysical Journal*, **31**, 258, 1910.

[2] *Astronomical Journal*, **26**, 187, Nos. 623–624, 1911.

Of the stars in the Groningen list of parallaxes with absolute magnitudes of 8 or fainter (sun = 5.5) sixteen have been observed to some extent at Mount Wilson. The average velocity of these stars (corrected for the sun's motion) is 36 km; eight have velocities exceeding 40 km, although none have been included with values higher than 100 km. It is difficult to think of these stars as other than stars of small mass, and the results for their velocities would be in agreement with the hypothesis suggested by Halm[1] that the motions of stars are a function of their masses.

I am greatly indebted to several of my colleagues at the Observatory, and particularly to Dr. Kohlschütter, for much of the observational material upon which these results are based. Several of the members of the Computing Division have assisted in measuring and reducing the photographs.

MOUNT WILSON SOLAR OBSERVATORY
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[1] *Monthly Notices*, **71**, 634, 1911.