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THE RADIAL VELOCITIES OF 60 SOUTHERN STARS

BY JOSEPH LUNT

At the beginning of the year (1917) a new observing program was commenced, embracing all stars south of the equator of types F, G, K, and M, down to magnitude 5.5 in the *Harvard Revised Photometry* (50) for which radial velocities had not been published by Campbell¹ or Adams² in their lists of 915 and 500 stars, respectively, or previously observed here. Five stars from Campbell's *Second Catalogue of Spectroscopic Binary Stars*³ have been included, as well as 22 others subsequently announced in *Lick Observatory Bulletins* to be variable in velocity.

The 24-inch refractor, in conjunction with the four-prism star spectrograph, was employed, the short camera of 16-inch (40.6 cm) focus being used for the first time. The prisms are of light flint and give spectra of approximately the same linear scale as is given by the two dense prisms and short cameras used with the 60-inch reflector at Mount Wilson.

¹ The Radial Velocities of 915 Stars, *Lick Observatory Bulletin*, No. 229.

² The Radial Velocities of 500 Stars, *Mt. Wilson Contr.*, No. 105.

³ *Lick Observatory Bulletin*, No. 181.

TABLE I

H.R. No.	Star's Name	R.A. 1920	S. Decl. 1920	Mag.	Type	No. of Plates	Epoch 1917+	Radial Velocity	Solar Motion Correction	Corrected Radial Velocity	Range
3.....	Piscium†	0 ^h 8 ^m	6° 9'	4.68	K	3	.888	- 17.2	- 1.2	- 18.3	6.7
37.....	Cetus	0 8	18 23	5.47	K	2	.928	- 8.0	- 3.7	- 11.7	4.2
412.....	Ceti	1 22	15 1	5.19	K	3	.911	- 23.1	- 8.4	- 31.5	2.3
500.....	Cetus	1 39	4 5	5.27	K	2	.922	- 33.5	- 7.9	- 41.4	1.0
539.....	Ceti†	1 48	10 44	3.92	K	2	.495	- 8.2	- 9.5	- 1.4	1.7
994.....	Eridani	3 15	22 48	5.05	K	3	.068	+ 25.1	- 15.9	+ 9.3	2.4
1787.....	Orionis	5 20	0 58	5.15	K	3	.112	+ 21.6	- 17.2	+ 4.3	4.4
1836.....	Doradus	5 25	58 59	5.06	K8	2	.144	+ 10.5	- 17.4	- 6.9	3.2
2087.....	Columba†	5 53	37 8	5.02	K	2	.147	+ 56.9	- 19.8	+ 37.0	3.1
2140*.....	Lepus	6 0	26 17	5.18	G5	3	.123	+ 178.9	- 20.0	+ 158.9	3.0
2275*.....	Orion	6 16	2 54	5.18	Ma	3	.137	+ 47.4	- 17.8	+ 29.7	1.5
2469.....	Monoceros	6 38	9 5	5.32	Kp	3	.205	+ 3.9	- 18.5	- 14.6	3.4
2574*.....	Can. Maj.	6 50	11 56	4.25	K5	5	.159	+ 98.7	- 18.6	+ 80.1	2.7
2652.....	Carinae	6 59	51 18	5.02	Mb	2	.147	+ 3.8	- 18.3	- 14.5	2.0
2701.....	Monocerotis	7 6	4 7	5.02	G5	2	.202	+ 78.8	- 17.3	+ 61.6	1.0
2934*.....	Carinae	7 34	52 21	4.92	K5	3	.202	+ 62.2	- 17.6	+ 44.6	5.2
2959.....	Puppis	7 37	15 4	5.15	K	2	.250	+ 4.8	- 17.9	- 13.0	3.1
3123.....	Puppis	7 56	23 5	5.22	G5	2	.298	+ 11.7	- 17.9	- 6.2	2.8
3229.....	Puppis	8 10	15 32	5.05	K	2	.324	+ 18.1	- 16.8	+ 1.4	4.0
3484.....	D Hydra†	8 43	13 15	4.44	G5	2	.257	- 9.5	- 15.1	- 24.6	0.3
3681*.....	Hydrae	9 13	6 1	5.40	K5	3	.307	- 9.0	- 12.5	- 21.6	2.0
3765.....	Antlia†	9 26	35 35	4.64	K2	3	.307	+ 22.0	- 14.6	+ 7.4	3.8
4159.....	Carinae†	10 33	57 9	4.54	K5	2	.348	+ 8.4	- 11.9	- 3.5	2.7
4499.....	Centaurus†	11 37	61 39	4.88	G	2	.451	+ 15.5	- 9.6	+ 5.8	2.6
4523.....	Centaurus	11 43	40 4	5.04	G	2	.465	+ 17.3	- 7.4	+ 9.8	1.1
4682.....	Centauri†	12 15	54 42	4.98	Ma	2	.481	- 3.1	- 7.5	- 10.6	2.6
4699*.....	Corvus	12 17	13 7	5.36	K	3	.432	+ 16.2	- 1.1	+ 15.2	3.5
4955.....	Virginis	13 4	10 18	5.26	K	2	.440	- 7.4	+ 2.9	- 4.6	3.5
5905*.....	Virginis	13 28	5 51	4.83	Mb	3	.494	+ 17.9	+ 5.4	+ 23.3	4.3
5172.....	Centauri†	13 42	51 2	4.68	K	2	.465	+ 0.3	- 3.1	- 2.9	0.2
5301.....	Virgo	14 7	15 56	5.10	Ma	4	.522	+ 18.0	+ 6.0	+ 24.0	3.9

RADIAL VELOCITIES OF 60 STARS

5371.....	<i>Centaurus</i> †	14 17	58 5	4.89	G		2	.539	+ 10.0	- 3.4	+ 6.6	5.7
5444.....	<i>Lupus</i>	14 31	45 54	5.41	K ₂		3	.570	+ 55.6	+ 0.2	- 55.4	0.9
5535*.....	11 <i>Librae</i>	14 47	1 58	5.00	K		3	.520	+ 84.9	+ 11.2	+ 96.1	0.6
5777.....	37 <i>Librae</i>	15 30	9 47	4.83	K		3	.448	+ 48.2	+ 11.8	+ 60.1	2.5
5824.....	42 <i>Librae</i>	15 36	23 34	5.06	K		3	.610	- 18.5	+ 8.8	- 9.7	5.6
6017.....	<i>Scorpio</i>	16 6	29 12	5.16	G		3	.652	- 22.9	+ 8.4	- 16.5	1.0
6048*.....	<i>Scorpii</i>	16 9	11 38	5.50	G ₅		3	.599	- 22.2	+ 13.0	- 9.2	3.2
6128*.....	<i>Ophiuchus</i>	16 23	7 26	5.45	Ma		2	.641	+ 90.8	+ 14.4	+ 114.2	1.4
6166.....	H <i>Scorpii</i>	16 31	35 5	4.30	Ma		3	.580	- 1.3	+ 7.4	+ 6.1	5.5
6196.....	24 <i>Ophiuchi</i>	16 37	17 35	5.04	K		4	.615	- 23.1	+ 12.4	- 10.6	3.4
6424.....	o <i>Ophiuchi</i>	17 13	24 12	5.39	K		3	.666	- 27.4	+ 11.4	- 16.0	1.7
6516.....	<i>Ophiuchus</i>	17 26	0 59	5.34	G		2	.692	- 70.7	+ 17.0	- 53.8	1.4
6603.....	<i>Sagittarius</i>	17 54	30 14	5.27	K ₅		2	.662	- 17.8	+ 9.9	- 7.9	0.8
6761*.....	ι <i>Pavonis</i>	18 3	62 1	5.48	G		3	.702	+ 26.3	- 0.7	+ 25.6	1.3
6801.....	1 <i>Sagittarii</i>	18 7	23 43	5.13	K		3	.655	+ 4.9	+ 11.8	+ 16.7	2.2
6896.....	21 <i>Sagittarii</i> †	18 21	20 35	4.96	G ₅		2	.699	- 10.3	+ 12.6	+ 2.3	1.9
7050.....	μ <i>Coronae Aust.</i>	18 42	40 30	5.28	G		2	.680	- 20.2	+ 6.5	- 13.7	3.4
7116*.....	ν <i>Sagittarii</i>	18 47	22 51	4.96	G ₅		2	.747	- 12.0	+ 11.7	- 0.3	1.9
7127.....	ω <i>Pavonis</i>	18 52	60 19	5.14	K		2	.761	+ 177.0	- 0.3	+ 176.6	0.0
7304.....	d <i>Sagittarii</i>	19 13	19 6	5.03	K ₅		3	.696	+ 10.4	+ 12.3	+ 28.7	1.8
7315*.....	f <i>Sagittarii</i>	19 42	19 57	5.06	K		4	.712	+ 20.9	+ 11.3	+ 32.2	0.9
7597.....	ω <i>Sagittarii</i>	19 51	26 31	4.81	G ₅		2	.706	- 14.0	+ 9.3	- 4.7	1.8
7604.....	b <i>Sagittarii</i> †	19 52	27 23	4.62	K ₂		3	.688	- 17.6	+ 9.0	- 8.6	0.6
8283.....	42 <i>Capricorni</i>	21 37	14 24	5.28	K		17	.826	- 3.0†	+ 7.3	+ 4.3†	48.7
8311*.....	c <i>Capricorni</i>	21 41	9 27	5.28	K		2	.880	- 5.0	+ 8.1	+ 3.1	2.8
8644.....	ρ <i>Gruis</i>	22 39	41 50	4.89	K		3	.829	+ 20.0	- 2.2	- 26.8	5.1
8841*.....	ψ' <i>Aquarii</i>	23 12	9 32	4.46	K		3	.811	- 22.9	+ 1.9	- 21.0	1.1
8866.....	94 <i>Aquarii</i>	23 15	13 54	5.27	K		3	.881	+ 5.6	+ 0.9	+ 6.5	4.7
9103.....	3 <i>Ceti</i>	24 0	10 57	5.16	K		3	.912	- 40.5	- 1.9	- 42.4	3.5
Mean.....												2.6

* Check stars.
† Velocity of the center of mass of the system (see *Astrophysical Journal*, 47, 134, 1918).
‡ Previously announced as variable in velocity (*Lick Observatory Bulletin*).

§ The solar apex assumed as 18°, +30°, and velocity 20 km per second.

|| Difference between extremes of separate plates.

The linear scale of the spectra from the following iron lines toward the red was:

λ	$\text{\AA}$ per mm
4247.6	17.2
4340.6 (H γ)	19.3
4376.1	20.1
4528.8	24.1

The measures were made with the Hartmann spectrocomparator in the region between the foregoing lines, with use of the 45 mm objectives, without extension tubes, and the low-power eyepiece. The magnification employed is 20 diameters, and the elevation scale-reading (W) is 13.

TABLE II
COMPARISON OF RESULTS* FOR 16 STARS

H.R. No.	MAG.	TYPE	NO. OF PLATES	RADIAL VELOCITIES			DIFFERENCES	
				Lunt (Cape) (1)	Campbell (Lick) (2)	Adams (Mt. Wilson) (3)	(1)-(2)	(1)-(3)
				Km	Km	Km	Km	Km
994.....	5.05	K	3	+ 25.1	+ 26.3	.....	-1.2	.....
2140.....	5.18	G ₅	3	+178.9	+183	.....	-4.1	.....
2275.....	5.18	Ma	3	+ 47.4	.....	+48.3	.....	-0.9
2574.....	4.25	K ₅	5	+ 98.7	+ 96.7	.....	+2.0	.....
2934.....	4.92	K ₅	3	+ 62.2	+ 61.1	.....	+1.1	.....
3681.....	5.40	K ₅	3	- 9.0	.....	- 7.3	.....	-1.7
4699.....	5.36	K	3	+ 16.2	.....	+12.5	.....	+3.7
5095.....	4.83	Mb	3	+ 17.9	+ 19.2	-19.1†	-1.3	-1.2
5535.....	5.00	K	3	+ 84.9	+ 83.2	.....	+1.7	.....
6048.....	5.50	G ₅	3	- 22.2	.....	-26.3	.....	+4.1
6128.....	5.45	Ma	2	+ 99.8	.....	+97.1	.....	+2.7
6761.....	5.48	G	3	+ 26.3	+ 31	.....	-4.7	.....
7116.....	4.96	G ₅	2	- 12.0	- 12.0	.....	0.0	.....
7515.....	5.06	K	4	+ 20.9	+ 23‡	+16.5‡	-2.1	+4.4
8311.....	5.28	K	2	- 5.0	.....	- 6.5	.....	+1.5
8841.....	4.46	K	3	- 22.9	- 26.9	-28.4	+4.0	+5.5
Mean							-0.5	+2.0
Excluding 8841, possibly variable.....							-0.9	+1.6

* Adams has compared results for 26 stars with Lick values and obtains, for Lick - Mt. Wilson,

F and G types, 14 stars, +1.6 }
K and M types, 12 stars, +0.4 } *Mt. Wilson Contr.*, No. 105, p. 14.

† Sign of velocity taken as plus.

‡ Difference suspected as due to variability by Adams.

Under these conditions the same mirror strips between the prisms can be used as were employed with the spectra obtained

with the long camera. The micrometer screw is of half-millimeter pitch and one division on the head (0.01 rev.), approximately $1/5000$ of an inch, is equivalent to a radial velocity shift of 6.6 km per second in the mean of the 12 settings. The mean range, difference between highest and lowest value of velocity given by separate plates, is 2.6 km per second. Plate 4903 of α Tauri was used as standard plate throughout, the shift being taken as $+82.34$ km per second. As a check on the results a number of stars for which radial velocities have been published by Campbell or Adams or both were included, and 16 of these have been observed. Table II shows a comparison of the results obtained. The Cape results appear to lie between those of Lick and Mount Wilson.

Table I gives the provisional velocities of 60 stars for which two or more spectra have been measured. Only one of these stars shows distinct evidence of variable radial velocity during the period of observation, viz., 42 Capricorni, and for this a preliminary orbit has been computed (*Astrophysical Journal*, 47, 134, 1918).

Other stars may prove to be variable in velocity when the period of observation is extended, and it is noteworthy that 12 of these stars, marked ‡, are variables previously announced. All the computations were made to the second decimal place in kilometers per second and rounded off to a tenth in the tables.

In addition to those stars already known to have high radial velocities the following may be noted:

H.R. No.	Star's Name	Magnitude	Type	Radial Velocity	Solar Motion Correction	Corrected Radial Velocity
				Km	Km	Km
7127.....	ω Pavonis	5.14	K	+177.0	- 0.3	+176.6
2701.....	20 Monocerotis	5.02	G5	+ 78.8	-17.3	+ 61.6
6516.....	<i>Ophiuchus</i>	5.34	G	- 70.7	+17.0	- 53.8

These stars have small proper motions.

Messrs. Woodgate and Baines took part in exposing the plates. The measures were made by the writer.

ROYAL OBSERVATORY, CAPE OF GOOD HOPE
December 31, 1917