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FIFTH CATALOGUE OF THE ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

BY

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Since the publication of the *Fourth Catalogue of Spectroscopic Binary Stars*¹ in 1936, the orbital elements of more than one hundred additional systems have been determined, and a number of the previous orbits have been revised. In order that this new material may be readily accessible for those interested in spectroscopic binaries the *Fifth Catalogue* has been prepared. Its aim is to present in brief and convenient form the pertinent data, relating to the orbits of these stars, published prior to January 1, 1948.

Unlike its predecessors, the present catalogue is concerned only with those stars whose observed variable radial velocities have been utilized for a determination of their orbital elements. It seems to us inadvisable to continue the practice of including a list of stars, now a very long one, whose radial velocities have been announced as variable. Such information contributes little to our knowledge of binaries and, moreover, may be obtained from a catalogue of stellar radial velocities. Likewise there appears to be no valid reason for listing here elements that have been determined for cepheids, cluster variables, etc., for which the observed variable velocities are known to be due to motion in the atmosphere of a single star. Stars known to belong to one of these groups have been excluded, except in the case of a few cepheids like α Ursae Minoris, S Sagittae, etc., for which the mean cepheid velocity is itself variable in a period of years. While it is possible that we are here observing the effect of orbital motion of the brighter (cepheid) component in a binary system, we have as yet obtained no evidence of the spectrum of the fainter component.

There were available to us, in publications prior to January 1, 1948, the orbital elements for 524 systems, of which 17 are visual binaries with elements derived from micrometric and spectroscopic observations, 147 are eclipsing variables, and 105 are non-eclipsing stars in which the spectra of both components have been observed. The binary character of the 269 stars may therefore be regarded as established. For the remaining 255, where the spectrum of only one star has been observed, the velocity-curves and elements are, with the exception of a few stars, such as to justify the conclusion that these systems also are real binaries.

In the preparation of the catalogue an endeavor has been made to give a brief but fairly complete view of the present status of the available orbital determinations of spectroscopic binaries. For this purpose the information that elements have been determined for a particular star will be of value to certain investigators, even if the results obtained are quite uncertain for one reason or another. Systems of uncertain nature obviously should not properly be included in the same list with those having reliable orbits. The separation of the data into two tables on the basis of reliability, however, encounters serious difficulties. While one may readily select the elements that are well determined, and those rendered very uncertain either by insufficient or poor observations, it is not possible in many cases to decide to which category the elements belong. Thus we have adopted the procedure of placing in Table I those elements which, after an examination of the original investigation, appeared to us to be reasonably reliable; in Table II we have included elements that were poorly

¹ *Lick Obs. Bull.*, 13, 1, 1936 (No. 483).

determined, or that were affected by causes other than orbital motion.

Table I lists the orbital elements of 480 spectroscopic binaries which, in our judgment, may be considered as fairly reliable on the basis of available evidence. In the case of about 25 per cent of these stars our judgment was perhaps too optimistic, and in our opinion several of these orbits, at least for the present, should be rejected in statistical studies. We would include among them the orbits for stars such as ι Orionis, B 1399 etc., for which the computer introduced a sine curve of the same period in order to satisfy the observations by elliptic motion. Criticisms of the elements for a particular star, or improved values by later computers, as well as references to earlier orbits and other pertinent information, are given in the notes immediately following Table I. The notes are indicated by an R in the last column of the table; they give data that will aid the student to judge whether the elements should be excluded from consideration in the particular problem under investigation. Orbits which the computer considered provisional are so indicated in the notes, and since many are for long-period binaries, they are necessarily based upon incomplete data. Although of value, such elements will doubtless be improved by future observations, which in some cases can be obtained only after a lapse of years.

In general the elements listed are those of the most recent determinations, or, in our opinion, the most reliable ones. For some, later orbits have been computed by other investigators, who used the same observations as the original observer. Where no material changes in the values of the elements were made, those obtained by the observer are quoted, since he is entitled to the credit because of his greater contribution.

Attention may be called in this connection to the very valuable investigation made by Luyten,² which related to the reliability of the elements derived for some of the earlier orbits of spectroscopic binaries. Using the original data, he recomputed many of these orbits, and, while in most cases his results were in fairly close agreement with those of the previous computer, he showed definitely that for many of the orbits with small eccentricity a circular orbit should have been adopted. In a few cases he found that periods related to the one originally used were not excluded by the observations. A similar investigation of the data of Table I would probably show that for some of the stars the computer has not been careful to exclude the possibility of periods other than the one adopted.

Table II lists the elements of 44 spectroscopic binaries whose orbits depend upon insufficient or poor observations, or where it has not been possible to distinguish between two related periods. In this table have also been

² *ApJ*, **84**, 85, 1936.

placed the elements of certain Wolf-Rayet stars, and eclipsing variables where we have definite evidence that the observed radial velocities are affected by the motion of gaseous shells, or of gaseous streams surrounding one or both stars. The evidence of such streams in the case of the eclipsing binaries β Lyrae, SX Cassiopeiae, RX Cassiopeiae, etc., has been extensively studied by Struve, who has shown that the motions of such streams introduce a distortion of the velocity-curve which leads to erroneous orbital elements. Orbital elements known to be so affected have been placed in Table II. In a few cases, although evidence of a gaseous ring-like structure has been obtained, the orbit of the primary appears to be normal and it has been retained in Table I. These elements, as well as those of a number of eclipsing and non-eclipsing stars of shorter periods for which the effect has not been observed, properly belong in Table II.

Struve³ has suggested that the dissymmetry in the distribution of ω for the orbits of spectroscopic binaries, first pointed out by J. Miller Barr and confirmed by other investigators, is caused by the distortion of the velocity-curve by the motions of gaseous streams referred to in the preceding paragraph. His recent investigation, based upon much the same material as that of the present catalogue, shows a marked statistical excess of orbits with values of ω between 0° and 90° and with eccentricities less than 0.10. A similar unpublished analysis of the data of Tables I and II by Messrs. V. M. Blanco and A. D. Williams, in which the quadrants for ω for stars of different spectral classes and different values of the period were tabulated, indicates quite clearly the presence of this effect. The investigation is being continued, but in advance of publication of the details, we quote with their permission certain of the preliminary results. For spectral classes earlier than F2 and with periods of less than 5 days, the concentration of ω in the first quadrant is quite marked; with periods between 5 and 10 days the effect is marked but less; with periods from 10 to 15 days it is present but still less; and for periods of over 15 days the distribution is practically normal. The effect does not appear to be present for spectral classes later than F2 for either short or long periods. These results seem to offer some support for Struve's suggested cause of the dissymmetry in the observed distribution of ω , since such phenomena would probably be more likely to occur among the binaries of shorter period—systems in which at least one component is of earlier spectral class.

In view of the evidence presented above we may conclude that a number of the orbits of the short-period spectroscopic binaries of earlier spectral classes should be removed from Table I, and that Table II is likely to grow considerably as our knowledge of the phenomena

³ *ASP*, **60**, 160, 1948.

and its effects are more extensively studied. Thus the data of Table II are largely for stars that are of astrophysical interest, rather than for stars having interesting orbital elements.

Columns seven to fourteen in Tables I and II list the orbital elements, while the last column gives the computer and reference to the published investigation. The elements of a spectroscopic binary are defined as follows:

P = apparent period of revolution in mean solar days, unless specified in mean solar years;

T = time of periastron passage expressed in Julian Days, except that (1) for variable star orbits T is usually given as the interval after maximum or minimum brightness, and (2) for circular orbits T has the significance given by the computer, as specified in the notes to the table;

ω = angular distance from the ascending node, measured in the direction of orbital motion;

e = eccentricity of the orbit;

K_1 and K_2 = the semi-amplitudes of the velocity-curves, respectively, of the primary and secondary members of the system, referred to the center of mass of the system;

a_1 and a_2 = semi-major axes of the orbits, respectively, of the primary and secondary, referred to the center of mass of the system;

m_1 and m_2 = masses, respectively, of the primary and secondary;

$\odot$ = mass of Sun;

γ = radial velocity of the center of mass of the system;

i = inclination of the orbital plane, i.e., the angle between the line of sight and the normal to the plane of the orbit.

Data for the masses and dimensions of the system are quoted from the values by the computer when given, otherwise they have been compiled from the following equations:

I. One stellar spectrum observed with comparison spectra,

$$a_1 \sin i = [4.13833] (1 - e^2)^{1/2} K_1 P, \quad (1)$$

$$f(m) = \frac{m_2^3 \sin^3 i}{(m_1 + m_2)^2} = [3.01642-10] (1 - e^2)^{3/2} K_1^3 P \odot. \quad (2)$$

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II. Two stellar spectra observed with comparison spectra,

$$a_1 \sin i = [4.13833] (1 - e^2)^{1/2} K_1 P, \quad (3)$$

$$a_2 \sin i = [4.13833] (1 - e^2)^{1/2} K_2 P, \quad (4)$$

$$m_1 \sin^3 i = [3.01642-10] (1 - e^2)^{3/2} (K_1 + K_2)^2 K_2 P \odot, \quad (5)$$

$$m_2 \sin^3 i = [3.01642-10] (1 - e^2)^{3/2} (K_1 + K_2)^2 K_1 P \odot, \quad (6)$$

$$\frac{m_1}{m_2} = \frac{K_2}{K_1}. \quad (7)$$

III. Two stellar spectra observed, without comparison spectra:

$$(a_1 + a_2) \sin i = [4.13833] (1 - e^2)^{1/2} (K_1 + K_2) P,$$

$$(m_1 + m_2) \sin^3 i = [3.01642-10] (1 - e^2)^{3/2} (K_1 + K_2)^3 P \odot.$$

The following symbols have been used in the tables:

R = note at end of table.

* = eclipsing variable.

† = ellipsoidal variable.

Abbreviations for references to publications are the following:

<i>AJ</i>	Astronomical Journal
<i>ApJ</i>	Astrophysical Journal
<i>AAS</i>	Publications of the American Astronomical Society
<i>AN</i>	Astronomische Nachrichten
<i>AO</i>	Publications of the Allegheny Observatory
<i>ASP</i>	Publications of the Astronomical Society of the Pacific
<i>Arcetri O</i>	Osservazioni e Memorie, Osservatorio Astrofisico di Arcetri
<i>CA</i>	Annals of the Cape Observatory
<i>CR</i>	Comptes Rendus Paris Academy
<i>DAO</i>	Publications of the Dominion Astrophysical Observatory, Victoria, B.C.
<i>DDO</i>	Publications of the David Dunlap Observatory
<i>DO</i>	Publications of the Dominion Observatory, Ottawa
<i>HCO</i>	Annals of Harvard College Observatory
<i>Laws OB</i>	Laws Observatory Bulletin
<i>LOB</i>	Lick Observatory Bulletin
<i>LO</i>	Publications of the Lick Observatory
<i>Low OB</i>	Bulletins of the Lowell Observatory
<i>Mem Soc Astr Ital</i>	Memorie della Societa degli Spectroscopisti Italiani
<i>MN</i>	Monthly Notices of the Royal Astronomical Society
<i>MO</i>	Publications of the University of Michigan Observatory
<i>O Ast Padova</i>	Pubblicazioni del R. Osservatorio Astronomico di Padova
<i>PA</i>	Popular Astronomy
<i>P Contr</i>	Contributions from the Perkins Observatory
<i>Ptm O</i>	Publikationen des Astrophysikalischen Observatoriums zu Potsdam
<i>Pub Min O</i>	Publications of Observatory of the University of Minnesota
<i>Pul O Cir</i>	Pulkowo Observatory Circular
<i>RASC</i>	Publications of the Royal Astronomical Society of Canada
<i>U O Cir</i>	Union Observatory Circular
<i>WO</i>	Publications of the Washburn Observatory
<i>YO</i>	Publications of the Yerkes Observatory

TABLE I
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

	Star	a 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ³	$f(m)$	$m \sin^3 i$	Authority
		h	m		Hvd.	Rev.										
1	B 1	00.2	- 6 16	4.68	K0	K0	72.93	22530.330	337.71	0.272	16.43	- 6.56	15.856	0.030	.....	Harper DAO 3, 341, 1926 R
2	B 9	03.1	+ 3 00	6.32	K0	K2	96.41	20006.84	222.1	0.124	23.88	+ 1.11	31.400	0.133	.....	Christie Ap γ 77, 310, 1933
3	α And	03.2	+28 32	2.15	A0p	A1n	96.697	22136.821	74.83	0.533	30.49	-11.69	34.310	0.172	.....	Pearce AAS 9, 16, 1937 R
4	+57 ²⁸	06.3	+57 39	7.08	B5	cB9sek	55.904	25634.780	313.3	0.033	85.5	-24.5	65.700	.....	113.2	Pearce MN 92, 877, 1932
5	Σ 12 A	09.8	+ 8 16	(6.1)	F0	B5n	0.84166	26974.194	119.55	0.027	87.96	+ 0.37	165.600	.....	44.9	Miss McCormack Ap γ 80, 120, 1934 R
6	* AO Cas	12.5	+50 53	(6.1-6.3)	B0	A0s	3.52341	24003.703	210.16	0.037	92.57	-29.34	10.578	.....	17.60	Pearce DAO 3, 283, 1926
7	* TV Cas	13.9	+58 35	(7.30-8.35)	B9	A0	1.812635	20117.742	.....	0.00	234.59	+ 0.54	11.360	.....	16.40	Plaskett DOA 2, 141, 1922 R
8	HD 1826	17.6	+28 55	6.89	A3	A0	3.28325	29191.218	151.63	0.056	54.49	+ 5.90	3.739	.....	0.94	Tidy DDO 1, 191, 1940
9	α Phe	21.3	-42 51	2.44	K0	A5	3849	16202	20	0.33	5.8	+75.2	290.000	0.066	.....	Lunt CA 10, Pt 7, 24 G, 1924 R
10	B 82	22.8	+43 50	5.16	A2	G5	3.95583	18841.590	233.2	0.152	41.7	+ 2.04	2.240	.....	.....	Udick AO 2, 191, 1912
11	13 Cet A	30.1	- 4 09	(5.6)	Go	F7	2.08189	18402.33	var	0.1	37	var	1.060	0.0108	.....	Luyten Ap γ 78, 225, 1933 R
12	13 Cet AB	30.1	- 4 09	5.24	B3	.....	6.91 yr	1995.94	73	0.73	.....	+11	77.585	.....	26.9	Luyten Ap γ 78, 225, 1933 R
13	π And	31.5	+33 10	4.44	B3	B3, B3	143.6065	27898.567	349.03	0.562	47.50	+ 8.35	191.760	.....	10.9	Pearce ASP 48, 215, 1936 R
14	π Cas	37.9	+46 29	5.02	A5	.....	1.96408	19970.035	45.1	0.010	117.32	+12.42	3.168	.....	1.35	Harper DO 4, 135, 1917 R
15	ρ Tuc	38.2	-66 01	5.46	F5	.....	4.820223	19299.106	269.01	0.02	118.97	+13.55	3.213	.....	1.34	Lunt CA 10, Pt 7, 38G, 1924 R
16	* YZ Cas	39.0	+74 26	(5.08-6.09)	A2	A3s	4.46718	23964.657	.....	0.00	25.7	+ 9.97	1.700	0.0085	.....	Plaskett DAO 3, 248, 1926 R
17	B 159	41.1	+74 18	5.39	B8	B9s	33.75	20577.41	269.71	0.405	71.46	+ 9.07	4.390	0.169	.....	Young DO 2, 181, 1915
18	$\dagger$ And	42.0	+43 43	(5.13-5.23)	K0	G8	17.7673	20037.675	80.60	0.017	16.32	-23.75	7.020	0.0121	.....	S Jones CA 10, Pt 8, 35, 1928 R
19	ν And	44.3	+40 32	4.42	B3	B5s	4.28284	18155.661	.....	0.00	75.63	-23.91	4.454	0.033	.....	Jordan AO 1, 191, 1910 R
20	η And	51.9	+22 52	4.62	G5	.....	115.71	30119.11	166.38	0.005	104	-10.33	6.125	.....	1.10	Miss Gordon Ap γ 103, 13, 1946
21	HD 5638	53.0	+46 31	6.75	A0	B5s	10.418	28013.922	20.90	0.132	17.89	-12.9	28.5	.....	0.34	Shajn Pul O Cir 21, 34, 1937
22	σ Psc	57.3	+31 16	5.46	B9	.....	81.12	31308.667	345.2	0.898	64.3	+10.40	31.5	0.2802	.....	Miss Pisani Ap γ 105, 229, 1947
23	ξ Phe	01 04.2	-55 47	4.13	B8	.....	1.66958	20709.85	90	0.14	125	+18	29.5	.....	0.51	Colacevich ASP 47, 84, 1935 R
24	ξ Psc B	08.5	+ 7 03	6.49	F8	F6	9.07504	39999.162	122.1	0.033	180	+10.35	4.093	.....	2.0	Christie Ap γ 77, 313, 1933 R
25	α UMi	22.6	+88 46	(2.54-2.71)	F8	cF7	29.6 yr	1899.5	332.0	0.63	51.07	-17.4	6.340	0.124	.....	Moore ASP 41, 254, 1929 R
26	γ Phe	24.0	-43 50	3.40	K5	M1	193.79	17945.0	267	0.005	4.05	+25.7	466.000	0.035	.....	Wilson LOB 9, 116, 1918
27	HD 9312	26.6	+16 28	6.81	G5	.....	36.588	28088.87	178.8	0.203	29.97	- 3.49	42.100	0.079	.....	Heard DDO 1, 194, 1940
28	Σ 145 A	35.7	+25 14	6.26	F5	F3	4.43474	21940.9865	295.58	0.108	81.5	+ 4.6	14.780	0.0964	.....	Sanford Ap γ 53, 203, 1921 R
29	ξ Cet	46.5	-10 50	3.92	K0	F3	1652	14377.6	85.0	0.586	88.6	+ 9.21	5.372	.....	1.06	S Jones CA 10, Pt 8, 40, 1928
30	α Tri	47.4	+29 06	3.58	F5	K0	1.73652	20793.821	135.56	0.121	3.30	-12.65	60.750	0.0033	.....	Harper DO 3, 113, 1915 R
31	ω Cas	48.2	+68 12	5.03	B8	F2	69.92	20426.02	49.97	0.30	12.10	-24.82	0.287	0.003	.....	Young DO 2, 89, 1915
32	β Ari	49.1	+20 19	2.72	A5	B8s	106.9973	28010.944	24.17	0.892	29.64	- 3.68	27.190	0.164	.....	Petrie DAO 7, 105, 1938 R
33	ϵ Ari	51.9	+17 20	5.16	G5	A3	1567.66	20961.1	94.04	0.356	10.78	- 4.86	217.000	0.0547	.....	Miss Gordon Ap γ 103, 16, 1946

34	*X Tri	(8.8-10.9)	A3	A3+G3	0.971535	0.27 P		0.00	110	- 5	1.47	0.134		Struve <i>Ap</i> 104, 253, 1946 R
35	* Ari	5.08	Ao	.....	15.2938	21844.1345	359.19	0.608	34.45	+11.48	5.752	.....	Miss Jones <i>LOB</i> 15, 117, 1931	
36	β Tri	3.08	A5	A6	31.4009	25191.160	293.9	0.456	26.1	+10.4	9.930	0.0397	Struve, Pogo <i>Ap</i> 67, 336, 1928	
37	Σ 227 A	(5.5)	Go	G4	14.732	22243.157	5.39	0.043	56.53	-19.09	11.441	.....	Harper <i>DAO</i> 2, 129, 1921 R	
38	Σ 227 B	(6.7)	.....	F2	2.2365	22246.698	3.68	0.010	95.43	-19.8	2.934	.....	Harper <i>DAO</i> 2, 129, 1921 R	
39	6 Per	5.40	Ko	G5	1650	25200	270	0.75	13.5	+27.3	3.107	.....	Christie <i>Ap</i> 83, 434, 1936 R	
40	δ Tri	5.07	Go	Go	9.92912	23309.427	21.50	0.059	8.82	- 6.4	1.200	0.0007	Pearce <i>LOB</i> 11, 131, 1923 R	
41	B 523	5.82	F8	F8	93.50	23389.995	100.95	0.445	19.43	+25.75	22.371	0.051	Harper <i>DAO</i> 6, 1, 1930	
42	Σ 5 A	6.57	F5	F5	9.851	21586.899	129.6	0.146	22.48	+14.42	3.013	0.0113	Adams, Joy <i>Ap</i> 48, 186, 1919 R	
43	B 610	4.99	Go	F9	331.0	15021.7	267.7	0.67	21.4	-22.5	72.100	.....	Colacevich <i>ASP</i> 47, 284, 1935	
44	B 613	5.84	A2	.....	2.53636	21895.898	0.93	0.014	24.8	+ 4.22	83.600	0.64	Harper <i>DAO</i> 4, 313, 1930 R	
45	* RZ Cas	(6.33-7.80)	Ao	.....	1.19525	19449.732	154.7	0.052	69.30	-38.32	1.137	0.041	Jordan <i>AO</i> 3, 137, 1914 R	
46	π Ari	5.30	B5	B8	3.854	20370.259	78.27	0.042	24.77	+ 7.81	1.312	0.0061	Young <i>DO</i> 4, 69, 1917 R	
47	+57°61	6.27	Ao	A1	8.2504	24854.892	212.74	0.227	12.88	- 5.80	1.423	0.0017	Harper <i>DAO</i> 4, 39, 1927 R	
48	τ Per	4.06	Go+A5	G1+A5	1515.6	15693.4	234.6	0.734	19.00	+ 2.15	268.900	0.337	Colacevich <i>ASP</i> 48, 32, 1936 R	
49	* ST Per	(9.2-11.4)	A	A3+G	2.6483615	0.25P	267.8	0.00	33	-50	0.94	0.008	Struve <i>Ap</i> 104, 253, 1946 R	
50	* β Per ab	(2.2-3.5)	B8	.....	2.8672965	1.424	140.4	0.033	43.96	+16.30	1.732	0.0253	McLaughlin <i>MO</i> 6, 3, 1934 R	
51	β Per abc	.....	B5	O8	2.8672965	0.400	140.4	0.043	44.34	+ 4.09	1.747	.....	McLaughlin <i>MO</i> 6, 3, 1934	
52	* CC Cas	(7.3-7.4)	B5	O8	1.873 yr	1903.38	93.0	0.26	9.70	+ 2.21	88.000	0.0583	Pearce <i>DAO</i> 4, 67, 1927	
53	+34°610	6.42	A2	.....	5.54348	23080.361	90.66	0.040	62.18	+24.24	4.732	0.138	Harper <i>DAO</i> 6, 79, 1932 R	
54	* RT Per	(10.6-12.0)	dF2	.....	0.84940756	0.25 P	.....	0.00	51	-12	0.60	0.012	Struve <i>Ap</i> 106, 92, 1947 R	
55	B 804	4.28	Ko	G7	960	14889.565	326.32	0.397	8.25	+14.18	99.955	0.0433	Harper <i>DAO</i> 3, 145, 1924 R	
56	B 809	5.80	Ao	A2	0.9171877	0.3137	.....	0.00	95.66	+ 2.72	1.206	0.0834	Harper <i>DAO</i> 6, 214, 1935 R	
57	HD 22124	6.76	Fo	F2	1.326390	29146.808	32.6	0.024	63.67	- 4.90	1.161	0.0355	Miss Northcott <i>DDO</i> 1, 197, 1940 R	
58	B 816	4.32	B8	B8n	6.2236	24446.55	313	0.20	107	+15.0	8.970	.....	Struve <i>Ap</i> 63, 368, 1926	
59	$\circ$ Per	3.94	B1	B2k	4.41916	18217.924	.....	0.00	103	+18.46	8.640	.....	Jordan <i>AO</i> 2, 63, 1910 R	
60	B 850	5.40	Ao	.....	15.5132	29186.817	107.41	0.221	160.0	+15.99	9.717	.....	Petrie <i>DAO</i> 7, 199, 1940	
61	β Ret	3.80	Ko	G9	1911.5	20086.1	13.8	0.210	24.69	+51.11	5.113	.....	S. Jones <i>MN</i> 88, 645, 1928	
62	B 900	5.47	F5p	F4	30.4338	23797.270	214.36	0.612	49.38	+25.66	16.343	0.0259	Harper <i>DAO</i> 4, 161, 1928	
63	* λ Tau ab	(3.77-4.14)	B3	B3	3.952941	21510.707	72.6	0.055	55.95	var	3.037	0.072	McLaughlin <i>MO</i> 6, 19, 1934 R	
64	λ Tau abc	55.1	B3	B3k	30.0	23764.58	169	0.05	8.60	+16.5	3.540	0.0020	McLaughlin <i>MO</i> 6, 19, 1934 R	
65	* AG Per	(6.33-6.63)	B3	B3k	2.02858	24039.335	30.103	0.051	164.97	+15.84	4.549	.....	Plaskett <i>DAO</i> 3, 184, 1925 R	
66	* YY Eri	(8.4-9.2)	G5	G5, G5	0.32	0.75P	.....	0.00	187.32	-20	5.165	.....	Struve <i>Ap</i> 106, 92, 1947 R	
67	μ Per	4.28	Go	cG2	283.272	30518.418	266.51	0.057	130	+ 7.74	80.4	0.25	Johnson-Neubauer <i>ASP</i> 58, 248, 1946 R	
68	+B 986	(4.85-4.91)	A2	.....	1.52738	18956.643	270.95	0.047	43.10	+19.83	0.904	0.0127	Heard <i>Ap</i> 87, 72, 1938 R	
69	+16°577	8.3	G5	G7	5.6100	23102.193	88.6	0.040	58.6	+38.2	4.517	0.1166	Sanford <i>Ap</i> 59, 356, 1924 R	

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

Star	α 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ⁶	f(m)	m sin ³ i	Authority
	h	m		Hvd.	Rev.										
70 B 1001	04	14.1	3.59	B9	.....	5.0105	17562.266	124.33	0.014	63.76	+17.6	4.393	.....	0.56	Paddock LOB 8, 168, 1915 R
71 O Σ 82 A	17.1	+14 49	(7.24)	Go	F9	4.00000	22274.812	12.74	0.060	64.85	.....	4.468	.....	0.55	Sanford <i>ApJ</i> 53, 206, 1921 R
72 B 1018	17.7	+16 33	5.68	A2	A7s	8.4178	19818.843	189.2	0.101	36.1	+37.4	1.980	0.0193	.....	Janzen, Harper, <i>DAO</i> 6, 217, 1935 R
73 +72 ²²⁷	21.9	+72 20	5.97	A5	.....	4.195	15950.989	18.90	0.043	31.81	+8.87	1.831	0.0140	.....	Harper <i>DAO</i> 4, 316, 1930 R
74 θ Tau	22.9	+15 39	3.62	Fo	A7s	140.751	28068.791	48.8	0.76	26.7	+38.5	33.585	0.0764	.....	Petrie <i>ASP</i> 52, 286, 1940 R
75 B 1074	29.7	+41 04	4.46	Ko+A3	cG2	6270	22892	201	0.45	12.9	+4.2	993.500	0.9665	.....	Sanford <i>ASP</i> 43, 268, 1931 R
76 B 1076	30.2	+9 57	4.38	A3	.....	3.57124	19734.996	.....	0.00	76.32	+28.4	3.748	0.164	.....	Wilson LOB 7, 104, 1913 R
77 β GC 2280 A	32.0	+52 53	5.31	Ko	G6	121	21137.55	285	0.019	28.19	-40.47	46.900	0.28	.....	Cannon DO 4, 175, 1918 R
78 +7 ⁶⁷⁶	32.5	+7 07	6.89	B5	B3k	2.2075	24807.936	2.38	0.076	124.9	+25.3	3.780	.....	7.0	Pearce <i>DAO</i> 6, 60, 1932
79 B 1107	36.2	+22 46	4.33	B5	B5n	1.5047	17892.500	242.88	0.087	235.8	+13.55	7.140	0.0135	3.7	Parker <i>Rep Chief Astr. Can</i> 1, 166, 1910
80 +32 ⁸⁴⁰	42.8	+32 25	5.94	A3	.....	7.0507	26327.626	289.66	0.033	57.81	+20.32	5.602	0.141	.....	Harper <i>DAO</i> 6, 82, 1932
81 B 1131	42.8	+18 33	6.79	G5	G1	45.454	23030.461	26.48	0.391	13.57	+34.66	7.810	0.0092	.....	Sanford <i>ApJ</i> 61, 321, 1925
82 π Ori	45.9	+5 26	3.78	B3	B2s	9.5191	18279.64	152.27	0.027	25.93	+23.27	3.393	0.0172	.....	Baker AO 1, 107, 1909 R
83 + π ^s Ori	49.0	+2 17	(3.60-3.65)	B3	B2sk	3.70045	17921.64	.....	0.00	57.88	+23.4	2.945	0.0745	.....	Lee <i>ApJ</i> 38, 175, 1913: 64, 1, 1926 R
84 β GC 2406 A	49.3	+53 35	(4.5)	A2	A2s	3.8846	18281.176	217.14	0.013	35.15	-8.93	1.877	0.018	.....	Harper <i>RASC</i> 5, 112, 1911 R
85 * ϵ Aur	54.8	+43 40	(3.08-3.79)	F5p	cF2	27.08 yr	1924.2	350	0.33	15.7	-2.5	2014.000	3.34	.....	Kuiper, Struve, Strömgren <i>ApJ</i> 86, 570, 1937 R
86 * ζ Aur	55.5	+40 56	(4.9-5.6)	Ko+B1	cK4+B	973	15122.471	330.13	0.411	23.78	+10.73	294.300	1.03	.....	Harper <i>DAO</i> 3, 151, 1924
87 B 1213	01.8	-4 47	5.19	B9	B9	5.52242	23087.575	335.9	0.074	97.0	+30.9	7.300	.....	2.5	Christie, O. C. Wilson <i>ApJ</i> 81, 426, 1935 R
88 B 1216	02.0	+24 08	5.50	B3	B3k	58.31	24221.266	273.88	0.189	111.0	+16.22	8.400	0.280	2.2	Frost, Struve <i>ApJ</i> 60, 313, 1924 R
89 * TT Aur	02.8	+39 28	(8.06-9.02)	B5	B3	1.332732	19005.9041	.....	0.00	196.8	+10.2	28.900	.....	6.7	Hill <i>ASP</i> 42, 246, 1930 R
90 * SX Aur	04.6	+42 02	(8.2-9.0)	B4	B3	1.210	.....	.....	0.00	246.1	+3	3.600	.....	5.3	Joy, Sitterly <i>ApJ</i> 73, 77, 1931 R
91 * ER Ori	06.5	-8 40	(9-9.6)	Go or G2	.....	0.423388	0.06 ph	.....	0.00	172	+3	4.500	.....	9.87	Popper <i>ApJ</i> 97, 394, 1943 R
92 Σ 653 A	08.8	+32 34	(5.3)	A2	A7s	3.789	20802.715	19.70	0.033	322	+35	2.863	.....	5.27	Struve <i>ASP</i> 56, 34, 1944 R
93 α Aur	09.3	+45 54	0.21	Go	G1	104.022	14899.5	117.3	0.0164	95	-10.74	5.355	.....	0.43	Harper DO 3, 221, 1916 R
94 β Ori BC	09.7	-8 17	6.67	B9	.....	9.860	29633.196	10	0.1	155	+30.17	0.901	0.0039	0.26	Reese LOB 1, 32, 1901 R
95 Σ 674 A	11.6	+20 01	(6.9)	F5	F2s	3.4347	24837.932	.....	0.00	11.123	-10.74	36.848	.....	1.19	Sanford <i>ApJ</i> 95, 421, 1942
96 16 Aur	11.6	+33 17	4.81	Ko	F2s	434.8	18690	40	0.1	32.6	-27.4	4.325	.....	1.40	Sanford <i>ApJ</i> 68, 42, 1928 R
97 * +3 ⁶ 1073	11.6	+36 31	7.56	B5	K3	4.0657	30734.445	51.1	0.051	101.3	-27.5	4.784	0.146	1.33	Christie <i>ApJ</i> 83, 434, 1936 R
					.....					226.9	-1.06	88.04	.....	19.75	Pearce <i>AAS</i> 10, 332, 1943
										227.5		12.67	.....	19.69	

98	* AR Aur	05 11.8	+33 39	(6.4-7.1)	Ao	B9	4.134581	28110.463	42.5	0.009	106.5	+25.6	6.055	.....	2.68	Harper DAO 6, 311, 1937 R	
99	+27°78 B 1275	14.7 14.9	+27 51 +29 29	6.30 5.72	B9 Ao	 Ain	5.43373 2.15165	28203.121 21138.241	74.6	0.076 0.00	120.9 113.27	+5.8 -19.70	6.873 3.351	..... .....	2.36	Stilwell DAO 7, 297, 1947 Harper DAO 3, 265, 1926 R	
101	* η Ori A ab	19.4	- 2 29	(3.7-3.9)	Bi	Bok	7.98922	15720.821	42.3	0.016	144.8	var	15.900	2.51	1.50	Adams, Sanford Apr 17, 68, 1903, 64, 173, 1926 R	
102	η Ori Aabc	19.4	- 2 29		.....	.....	9.2 yr	1900.0	270	0.1	17.5	+19.5	805.000	1.84	.....	Pogo Apr 68, 309, 1928	
103	ψ Ori A	21.6	+ 3 00	4.66	B2	B2	2.52588	17916.36	184.71	0.065	144.12	+12.02	4.995	0.780	.....	Plaskett Apr 28, 266, 1908 R	
104	x Aur	26.2	+32 07	4.88	Bi	cB3ss	655.16	20629.78	135.52	0.171	20.53	- 0.15	182.300	0.56	.....	Young DO 4, 1, 1916 R	
105	* EY Ori	26.4	- 5 47	(9.5-10.3)	F8	.....	16.789	0.39P	243	0.10	55	+28.0	12.6	0.29	.....	Struve Apr 102, 74, 1945 R	
106	* δ Ori A	26.9	- 0 22	(2.48-2.63)	Bo	Bok	5.732476	28382.26	38	0.079	101.0	+12.4	7.9	.....	20.5	Luyten, Struve, Morgan YO 7, 256, 1940 R	
107	* VV Ori ab	28.5	- 1 14	(5.30-5.65)	B2	B2nk	1.48540	19836.021	.....	0.00	132.37	+20.77	2.704	0.358	7.9	Daniel AO 3, 179, 1915 R	
108	VV Ori abc	28.5	- 1 14		.....	.....	120	19819	40	0.30	13.0		20.460	0.0238	.....	Daniel Ibid. R	
109	φ Ori	29.3	+ 9 25	4.53	Bo	Bessk	8.4 yr	1908.3	105	0.22	13.3	+33.2	54.000	0.6954	.....	Struve Apr 63, 60, 1925 R	
110	-o°1009	30.1	- 0 48	8.1	B3	.....	4.6239	26991.561	272.6	0.116	48.10	+ 0.93	3.04	0.05	.....	Neubauer LOB 17, 185, 1936	
111	HD 37000	30.3	- 6 00	8.4	B5	.....	30.278	28440.192	299.47	0.217	21.6	+18.8	8.78	0.03	.....	Neubauer ASP 49, 125, 1937	
112	θ Ori B	30.4	- 5 27	7.93	Oe5	B2	6.50	30787.86	194	0.14	81	+24.0	7.000	0.35	.....	Struve, Titus Apr 99, 84, 1944	
113	φ Ori A	30.5	- 5 29	5.17	Bi	Ogk	21.0315	30639.455	151.0	0.131	105.8	+34.5	30.0	2.52	.....	Münch Apr 98, 228, 1943 R	
114	ι Ori	30.5	- 5 59	2.87	Oe5	O8sk	29.136	17587.991	112.37	0.742	113.68	+21.53	30.560	1.3394	.....	Plaskett, Harper, Apr 30, 373, 1909 R	
115	B 1381	32.4	-64 18	5.30	G5	G8	180.8757	23108.42	333.0	0.51	22.4	+ 9.85	47.900	0.1344	.....	Lunt, CA 10 Pt 7, 19G, 1924	
116	B 1388	33.5	+25 50	5.00	B3	B3	27.864	20471.607	335	0.55	25.5	+14.8	8.160	0.0280	.....	Cannon DO 3, 409, 1916	
117	B 1399	35.8	- 1 11	5.00	B3	B3	27.160	17961.465	87.02	0.765	93.04	+26.12	22.380	0.6067	.....	Plaskett, Harper, Apr 30, 374, 1909 R	
118	* 31 Cam	46.0	+59 52	(5.3-5.5)	Ao	.....	2.93317	19793.791	359.25	0.030	76.02	- 3.86	3.065	0.1337	.....	Harper DAO 3, 159, 1924 R	
119	B 1457	47.0	+27 35	4.54	Ao	.....	5.969	19362.52	191.44	0.022	48.9	-17.1	4.011	.....	0.63	Cannon DO 2, 105, 1915 R	
120	B 1464	49.1	+19 44	5.89	B2	B3k	7.8271	24141.590	67.0	0.250	74.3	+ 7.2	5.826	.....	0.44	Pearce DAO 6, 65, 1932	
121	* β Aur	52.2	+44 56	(2.07-2.16)	Aop	B5	3.960027	17100.732	.....	0.00	194.0	-18.1	20.240	.....	3.9	Baker AO 1, 163, 1910 R	
122	B 1492	54.3	- 9 34	5.10	A5	Aop	9.3553	19673.815	35.41	0.208	111.04	+22.2	6.047	.....	2.17	Elvey Apr 60, 320, 1924	
123	* RW Gem	55.4	+23 08	(9.6-11.6)	B8+A3	B5+F5	2.87	0.25P	.....	0.00	65	+ 5	8.370	.....	0.79	Struve Apr 104, 253, 1946 R	
124	μ Ori A	56.9	+ 9 39	(4.3)	A2	A2s	4.44746	23862.224	.....	0.00	29.0	var	1.800	0.0113	.....	Bourgeois Apr 70, 256, 1929 R	
125	μ Ori AB	56.9	+ 9 39	4.19	.....	.....	17.5 yr	1911.75	43	0.76	14.9	+43.3	850.000	0.60	.....	Bourgeois Apr 70, 256, 1929 R	
126	B 1508	58.0	+23 16	4.30	G5	G5	9.590	21898.741	203.28	0.206	11.74	+19.71	1.510	0.0015	.....	Young DAO 1, 119, 1919	
127	B 1515	59.6	+38 29	5.31	A3	.....	28.28	20468.197	178.41	0.556	51.38	+16.91	16.550	.....	1.35	Young DO 4, 95, 1917	
128	ν Ori	06 01.9	+14 47	4.40	B2	B3s	131.26	17975.16	1.58	0.599	34.09	+22.10	20.140	.....	1.11	Harper RASC 5, 16, 1911	
129	η Gem	08.8	+22 32	(3.1-3.9)	Ma	M3	2983	26570	168	0.53	8.8	+17.6	306.000	0.2773	.....	McLaughlin, Miss van Dyke Apr 100, 63, 1944 R	
130	B 1593	13.6	+53 30	5.41	F5	F4	6.5013	23634.166	330.60	0.019	31.74	- 1.52	2.837	0.0216	.....	Harper DAO 3, 189, 1925 R	
131	ξ CMa	16.5	-30 01	3.70	B3	.....	675	16508.0	207	0.57	13.5	+32.2	104.000	0.098	.....	Colacevich, Arestri O 59, 1939-44	
132	* RR Lyn	18.0	+56 20	(5.60-5.98)	A3	A7s	9.944	19341.776	152.9	0.081	67.19	-13.74	9.127	0.3101	.....	Harper DO 2, 167, 1915 R	
133	-3°1413	18.0	- 3 14	6.58	B5	B5n	1.19033	24942.706	9.2	0.036	172.8	+ 8.3	2.827	.....	6.2	Pearce DAO 6, 70, 1932 R	
134	δ Col	18.4	-33 23	3.98	G5	G1	868.78	19915.02	117.08	0.695	10.61	- 2.56	91.120	0.0405		4.1	SJones CA 10, Pt 8, 45, 1928 R

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

	Star	a 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ⁶	f(m)	$m \sin^2 i$	Authority
		h	m		Hvd.	Rev.										
135	* WW Aur	06	26.0	+32 31	A0	A7	2.5250144	29781.692	.....	0.00	117.11	-9.39	4.066	.....	1.81	Miss Slocum LOB 19, 147, 1942 R
136	+61309	32.0	+6 13	6.06	Bop	A7	14.414	23031.870	181.95	0.035	121.51	+23.94	4.219	.....	1.75	Plaskett DAO 2, 147, 1922 R
137	α CMa	40.7	-16 35	-1.58	A0	A2s	50.04 yr	1894.133	145.69	0.594	2.36	-7.6	477.15	0.013	63.3	Aitken LOB 9, 184, 1918 R
138	* RX Gem	43.6	+33 21	8.6-10.7	A2	.....	12.209	.....	21.7	0.295	25.5	+33.5	4.070	0.018	.....	Gaposchkin Ap γ 104, 376, 1946 R
139	τ Pup	47.5	-50 30	2.83	K0	G8	1066.0	20992.8	64.0	0.088	4.14	+36.36	60.5	0.0078	.....	S Jones MN 88, 648, 1928 R
140	A Car	47.6	-53 30	4.38	G5	G3	195.32	21344.0	.....	0.00	24.8	+26.0	66.880	0.313	.....	Wilson, Huffer LOB 10, 17, 1918 R
141	* RU Mon	49.4	-7 28	(10.2-10.8)	A	.....	3.5847	0.94 P	42	0.28	44	+39	1.917	0.028	.....	Struve Ap γ 102, 74, 1945 R
142	* AO Mon	07 01.7	-4 28	(9.3-9.9)	A	B3	1.8847	0.75 P	.....	0.00	185	+15	4.8	.....	5.5	Struve Ap γ 102, 74, 1945 R
143	+25 ¹ 1594	03.5	+25 54	7.01	Go	G6	32.8092	23071.941	82.1	0.080	27.5	+19.7	12.383	0.0705	5.2	Sanford Ap γ 56, 447, 1922 R
144	* SW CMa	04.0	-22 17	(9.1-9.6)	A0	.....	10.092	0.84 P	180	0.50	90	+40	10.8	.....	2.0	Struve Ap γ 102, 74, 1945 R
145	HD 56310	11.1	-16 03	6.79	B3	.....	2.770354	28148.438	143.53	0.21	90	+24.4	10.8	.....	2.0	Neubauer, Miss Rosen-Raad LOB
146	* 29 CMa	14.5	-24 23	(4.5-4.8)	Oe	O7sfk	4.39351	29665.038	51.5	0.062	216.4	+9.3	13.046	4.597	.....	19, 95, 1940
147	τ CMa	14.5	-24 46	4.40	Oe5	O9sk	154.80	25201.22	102.5	0.36	52.1	+40.4	103.700	1.86	.....	Struve, Pogo Ap γ 68, 335, 1928, R
148	Σ 1062 A	14.7	+55 28	5.61	B8	.....	2.25960	19031.632	126.1	0.076	106.4	+4.2	3.296	.....	4.3	Pearce DAO 6, 56, 1932 R
149	* R CMa	14.9	-16 12	(5.38-5.98)	F0	A9	1.135939	.....	.....	0.013	24.0	-34.8	0.374	0.0016	2.3	Sitterly Ap γ 48, 190, 1940 R
150	* AR Mon	15.8	-5 05	(8.5-9.3)	K0	K0	21.207	26617.7	102	0.17	32.2	+14.1	9.300	0.07	.....	Sahade, Cesco Ap γ 100, 374, 1944 R
151	* RY Gem	21.7	+15 52	(8.4-10.5)	.....	A2+K2	9.30090	.....	.....	.....	30.0	+9.0	4.00	0.022	.....	Gaposchkin Ap γ 104, 383, 1946 R
152	B 1945	21.8	+21 39	5.27	F5	F4	1.93265	23430.048	104.84	0.002	94.56	+24.38	2.513	.....	1.05	Harper DAO 3, 226, 1925 R
153	γ CMi	22.8	+9 08	4.60	K0	K4	389.0	00388.53	107.4	0.31	18.57	+46.80	3.103	.....	0.85	Christie Ap γ 80, 181, 1934 R
154	HD 5943	25.3	-13 46	6.94	B5	.....	17.911	28141.544	214.77	0.52	45.6	+4.7	9.592	0.10	.....	Neubauer, Miss Rosen-Raad LOB
155	σ Pup	26.1	-43 06	3.27	K5	Mo	257.8	20418.6	349.3	0.17	18.55	+87.3	64.800	0.164	.....	19, 97, 1940
156	α^1 Gem	28.2	+32 06	2.85	A0	A8s	2.928318	27501.703	94.70	0.002	31.88	-1.16	1.284	0.0096	.....	Wilson LOB 9, 117, 1918 R
157	α^2 Gem	28.2	+32 06	1.99	A0	A3s	9.21280	27543.938	266.38	0.499	12.90	+5.21	1.417	0.0013	.....	Miss Vinter-Hansen LOB 19, 90, 1940 R
158	α Gem	28.2	+32 06	.....	.....	dMie	340 yr	1963	276.5	0.43	.....	+3.0	.....	.....	.....	Miss Vinter-Hansen LOB 19, 92, 1940 R
159	* YY Gem	28.2	+32 06	(9.0-9.6)	.....	dMie	0.814266	23746.524	.....	0.00	114.0	+4.3	1.276	.....	0.63	Luyten Ap γ 42, 179, 1933 R
160	α CMi	34.1	+5 29	0.48	F5	F3	40.23 yr	1886.50	65.7	0.310	1.32	-3.77	253.57	0.0030	0.57	Joy, Sanford Ap γ 64, 250, 1926 R
161	+34 ⁰ 1657	36.2	+34 14	6.00	F0	F3	31.50	23884.45	44.0	0.208	45.18	-12.11	19.142	.....	1.53	S Jones MN 88, 403, 1928 R
162	σ Gem	37.0	+29 07	4.26	K0	K1p	19.605	15824.019	330.25	0.022	52.43	+45.80	22.214	0.0812	1.32	Harper DAO 3, 269, 1926
163	* UZ Pup	37.1	-13 10	(9.7-10.6)	.....	(A5+A7)	0.795	0.75 P	.....	0.00	150	+25	1.6	.....	1.1	Harper DO 1, 265, 1911 R
											150		1.6	.....	1.1	Struve Ap γ 102, 74, 1945 R

164	B 2035	07 39.8 -28 43	4.10	A2p	cA2ep	137.767	30278.777	247.34	0.29	3.60	+25.43	6.24	0.0005	.....	Neubauer, Johnson ASP 58, 248, 1946 R
165	β GC 4310	47.1 -13 38	5.34	Go	G2	23.34 yr	1892.60	74.65	0.75	3.52	-17.8	272.000	0.0112	.....	Aitken LO 12, 51, 1914 R
166	* TU Mon	48.3 -2 47	(9.0-10.9)	B8	B5+A5	5.049011	0.210ph	115	0.2	55	+20	3.8	0.09	.....	Struve Apj 58, 141, 1923
167	B 2087	48.8 -40 19	3.76	G5	.....	2660	17165	190	0.4	11.8	+24.0	396.6	0.35	.....	Deutsch Apj 102, 433 1945 R
168	B 2112	54.5 +57 33	6.52	Go	.....	11.0764	22374.453	103.84	0.107	60.69	+24.80	9.19	.....	Christie Apj 83, 434, 1936 R	
169	* V Pup	55.4 -48 58	(4.14-4.78)	B1p	B1	1.4545	.....	.....	0.00	62.03	+20	9.39	.....	Harper DAO 7, 149, 1939	
170	B 2142	08 00.2 +43 34	6.24	Ao	.....	18.722	22015.449	208.1	0.174	199	+20	3.98	.....	Popper Apj 97, 400, 1943 R	
171	ϵ Vol	07.6 -68 19	4.46	B5	B8	14.16833	19453.562	.....	0.00	342	+8.3	16.38	.....	Harper DAO 6, 305, 1936	
172	* XZ Pup	10.1 -23 42	(7.4-10.8)	.....	Ao	2.19	0.50 P	200	0.10	64.6	+ 8.3	18.13	.....	Sanford LOB 8, 127, 1909 R	
173	B 2192	10.5 -40 02	4.43	Ko	.....	930	18060	140	0.4	75	+22	2.24	0.094	.....	Struve Apj 104, 253, 1946 R
174	B 2227	19.6 -3 26	5.67	F5	F2	1.562975	22650.082	123.92	0.051	10.8	+13.5	126.6	0.094	.....	Christie Apj 83, 434, 1936 R
175	β GC 4638 A	25.2 +75 04	(6.3)	A5	.....	4.285	24971.150	101.71	0.109	30.28	+71.3	0.650	0.0045	.....	Sanford Apj 55, 30, 1922 R
176	* VZ Hya	26.8 -5 59	(9.1-9.9)	F5	F5	2.9043	0.25 P	.....	0.00	63.53	-7.42	3.721	0.1123	.....	Harper DAO 4, 319, 1930 R
177	$\geq$ 1245 A	30.5 +6 58	6.04	F5	F5	14.296	21599.474	220.80	0.276	93	+ 1	3.7	.....	Struve Apj 102, 74, 1945 R	
178	* RU Cnc	31.6 +23 55	(9.9-11.5)	.....	dF9+G9	10.173	0.25 P	.....	0.00	105	+24.23	4.2	0.015	.....	Joy, Abetti Apj 50, 391, 1919 R
179	β GC 4705 C	34.2 +19 54	7.15	Ao	F1s	12.9117	25250.803	168.2	0.2	22.74	+24.23	4.300	0.042	.....	Struve Apj 102, 74, 1945 R
180	ϵ Hya AB	41.5 +6 47	3.48	F8	F8	5492	20839	86.75	0.61	64.0	+32.1	11.134	.....	Sanford Apj 74, 201, 1931 R	
181	ϵ Hya C	41.5 +6 47	(7.5)	.....	F7	9.9047	23800.007	117.6	0.62	65.6	+36.43	436.000	0.1099	.....	Miss Adams ASP 51, 118, 1939 R
182	+82134	46.8 +8 26	6.59	Go	dG1	10.2504	24891.018	314	0.1	7.29	+31.2	3.700	0.0206	.....	Sanford Apj 64, 179, 1926 R
183	H Vel	53.3 -52 20	4.77	B5	B5	0.91470	17967.119	44.33	0.131	35.0	+3.5	3.436	0.0154	.....	Sanford Apj 74, 205, 1931
184	B 2421	56.3 -40 52	4.42	F8	.....	74.1469	22728.629	90.0	0.05	24.5	+22.20	0.534	0.0081	.....	Neubauer LOB 15, 104, 1931 R
185	* RX Hya	09 00.8 -7 52	(9.0-11.7)	A2	A8	2.28	0.25 P	.....	0.00	46.31	-7.4	18.130	0.0433	.....	Lunt CA 10, Pt 7, 33G, 1924
186	κ Cnc	02.4 +11 04	5.14	B8	B9	6.39316	29012.081	161.04	0.139	17.8	0	1.25	0.015	.....	Struve Apj 104, 253, 1946 R
187	B 2447	02.9 +27 03	5.96	G5	G3	19.4589	22426.634	252.5	0.206	66.87	+25.33	5.821	0.1928	.....	Pearce, Miss Riddle ADS 10, 65, 1940 R
188	B 2463	06.4 +61 50	5.23	F8	F9	16.2382	23049.617	169.25	0.09	20.21	+12.3	5.296	0.0157	.....	Sanford Apj 55, 33, 1922
189	B 2473	08.4 -58 33	3.56	B3	B3s	6.744	16533.81	115.84	0.18	34.78	-14.99	7.730	0.07	.....	Young DAO 2, 205, 1923
190	B 2484	10.8 +47 14	5.70	Ao	A2	15.986	19408.027	355.2	0.504	21.5	+23.3	1.960	0.0066	.....	Curtis LOB 4, 153, 1907
191	B 2490	11.7 -5 56	5.40	Ko	K4	922	18549.21	92.27	0.293	63.34	-13.11	12.026	.....	Harper DO 8, 391, 1916 R	
192	κ Vel	19.0 -54 35	2.63	B3	B3	116.65	16459.00	96.23	0.19	73.64	-7.65	13.981	0.0832	.....	S Jones CA 10, Pt 8, 49, 1928
193	* S Ant	27.9 -28 11	(6.39-6.83)	Fo	A8	0.64833872	10741.5248	.....	0.00	9.98	+21.9	121.000	1.15	.....	Curtis LOB 4, 155, 1907
194	* Y Leo	31.1 +26 40	(9.7-13.0)	A	A3	1.686	0.25 P	.....	0.00	81	-5.0	73.200	.....	Joy Apj 64, 287, 1926 R	
195	o Leo	35.8 +10 21	3.76	F5+A3	cF5	14.4980	14656.477	.....	0.00	46.5	+27.07	10.775	0.52	.....	Struve Apj 102, 74, 1945 R
196	* W UMa	36.7 +56 25	(8.3-9.1)	Go	F8p	0.3336392	18075.8176	.....	0.00	148	-5	1.320	0.29	.....	Plummer LOB 5, 21, 1908 R
197	m Vel	47.8 -46 05	4.56	G5	F8p	329.30	16967.60	311.48	0.019	60	+10	0.038	.....	Adams, Joy Apj 49, 189, 1919 R	
198	B 2665	51.6 +41 32	5.19	F5	.....	9.283	23498.595	351.09	0.048	188	+11.02	0.860	0.48	.....	S Jones CA 10, Pt 8, 53, 1928 R
199	λ Hya	10 05.7 -11 52	3.83	Ko	G9	1585.8	18795.1	238.9	0.138	15.24	-10.78	1.943	0.0953	.....	Harper DAO 3, 194, 1925 R
200	B 2754	16.9 +66 04	4.92	Ao	.....	11.5832	18468.212	171.9	0.381	3.74	+19.39	80.800	0.0084	.....	S Jones MN 88, 652, 1928 R
										34.07	-0.10	5.020	0.0376	.....	Schlesinger AO 2, 139, 1912

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

	Star	a 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	a sin i 10 ³	(m)	m sin i	Authority
		h	m		Hvd.	Rev.										
201	* TX Leo	10 29.8	+ 9 10	(5.9-6.0)	A0	.....	2.445	27160.906	315.7	0.061	55.4	+14.9	1.860	0.043	.....	Mohler <i>ApJ</i> 45, 40, 1936
202	B 2824	32.2	+34 36	6.65	K0	.....	1510.0	27408.4	37.6	0.65	9.22	+12.62	145.000	0.054	.....	Christie <i>ApJ</i> 80, 181, 1934
203	* UV Leo	33.0	+14 47	(8.6-9.2)	.....	Go+G2	0.6000852	.....	.....	0.00	165	.....	1.36	.....	1.3	Gaposchkin <i>ApJ</i> 104, 370, 1946 R
204	p Vel	33.2	-47 42	4.06	F2+A3	Fop	10.210955	20259.381	184.62	0.541	42.34	+19.25	4.981	.....	0.28	Sanford <i>LOB</i> 9, 181, 1918 R
205	ϕ Hya	33.7	-16 22	5.11	K0	Ko	1200	20760	270	0.1	4.0	+16.2	6.107	.....	0.24	.....
206	* TX UMa	39.5	+46 05	(6.78-9.35)	B8	B8+F2	3.0633175	ph 2.250	356.4	0.029	51.8	-16.5	63.2	0.0075	.....	Christie <i>ApJ</i> 83, 434, 1936 R
207	HD 93075	39.8	+57 26	7.03	F0	A9	1.8052	30170.030	.....	0.00	49.19	-19.26	2.18	0.0442	.....	Hiltner <i>ApJ</i> 101, 108, 1945 R
208	ω UMa	48.2	+43 43	4.84	A0	.....	15.8401	17991.101	11.95	0.264	56.53	.....	1.403	.....	0.103	Miss Northcott <i>RASC</i> 37, 339, 1943 R
209	+82°325	11 02.2	+82 17	7.06	Go	dG3	18.8922	23154.071	332.97	0.282	20.64	-18.45	4.336	0.0130	.....	Parker <i>RASC</i> 5, 377, 1911 R
210	B 2951	02.3	+23 52	6.39	A2	.....	40.45	28294.094	330	0.10	40.1	-46.75	9.975	0.1111	.....	Sanford <i>ApJ</i> 59, 359, 1924
211	ξ UMa B	12.9	+32 06	4.87	Go	dGo	3.9805	25000.000	.....	0.00	18	+2.9	9.913	0.0024	.....	Heard <i>RASC</i> 31, 218, 1937
212	ξ UMa A	12.9	+32 06	4.41	Go	dGo	669.17	18582.0	320.0	0.531	5.04	var	0.276	0.0000	.....	Berman <i>LOB</i> 15, 109, 1930 R
213	ξ UMa m	12.9	+32 06	.....	.....	.....	59.863 yr	1935.03	127.18	0.413	.....	-15.7	.....	.....	.....	Van den Bos <i>MARS&L Denmark</i> 8, Ser 12, 2, 1928 R
214	B 2987	13.7	+38 44	4.78	A2	Aon	2.5	21412.762	173.4	0.11	38.5	-3	1.315	.....	0.12	Van den Bos <i>Ibid.</i> R
215	HD 99967	25.0	+47 12	6.49	K0	Ko	74.861	30852.014	218.70	0.029	28.77	+27.86	29.61	0.185	.....	Miss Northcott <i>DDO</i> 1, 371, 1947
216	Σ 1561 B	33.5	+45 40	(8.6)	.....	dK5	23.5415	24303.000	0.00	0.35	25.8	-13.8	7.866	0.0343	.....	Sanford <i>ApJ</i> 68, 46, 1928 R
217	+43°2135	33.7	+42 52	8.4	K2	K5	12.9167	23549.34	154.0	0.08	28.8	+15.3	5.090	0.0316	.....	Sanford <i>ApJ</i> 61, 325, 1924
218	* RW UMa	35.4	+52 33	(9.9-10.9)	.....	dF9+dG9	7.328	0.25 P	.....	0.00	72.5	-17.5	7.3	0.29	.....	Struve <i>ApJ</i> 102, 74, 1945 R
219	* Z Dra	39.8	+72 15	(10.5-12.7)	A5	A5	1.36	0.25 P	.....	0.00	49	-31	0.92	0.017	.....	Struve <i>ApJ</i> 106, 92, 1947 R
220	B 3098	42.8	+20 46	4.54	F8	F4	71.70	18088.405	270.81	0.008	26.54	+0.17	26.170	0.1392	.....	Cannon <i>RASC</i> 4, 452, 1910 R
221	+17°2402	44.1	+16 48	5.95	A2	A3	2.7818	23521.231	61.75	0.018	30.97	-24.21	1.184	0.009	.....	Petrie <i>DAO</i> 3, 331, 1926 R
222	B 3102	44.5	+35 29	5.76	F5	.....	32.864	22059.597	223.58	0.087	37.29	-8.28	16.787	0.1750	.....	Harper <i>RASC</i> 29, 411, 1935
223	o Leo	50.5	+16 12	5.49	A2	A4s	6.6254	24940.615	4.1	0.02	57.6	-20.4	5.250	.....	1.00	Struve, Morgan <i>ApJ</i> 66, 135, 1927 R
224	B 3138	55.7	-19 06	5.28	B3	B4n	2.96310	16378.385	68.8	0.057	120.5	+3	7.300	.....	0.72	Van Arnam <i>ApJ</i> 75, 348, 1932 R
225	* AG Vir	56.0	+13 34	(8.6-9.4)	A0	.....	0.64265	26418.979	90	0.10	225	-16	9.150	.....	4.40	Sanford <i>ApJ</i> 79, 89, 1934
226	θ Cru.	57.9	-62 45	4.48	A5	.....	24.4828	19453.347	358.87	0.609	46.07	-2.75	12.301	0.0345	0.74	Mrs. Moore <i>LOB</i> 15, 144, 1931 R
227	θ Cru	59.2	-62 36	4.98	B3	B3	3.4280	18747.367	.....	0.00	56.1	+16.3	14.978	.....	0.61	Mrs. Grattan <i>ASP</i> 38, 393, 1926 R
228	B 3180	12 06.7	+26 25	5.81	K0	K4	461	22360.79	235.29	0.169	51.34	+21.30	2.420	0.0482	.....	Harper <i>DAO</i> 4, 303, 1930 R
229	B 3182	07.5	+78 10	5.12	A5	.....	1.27100	20685.265	.....	0.00	14.25	+0.3	89.032	0.1326	.....	Lee <i>ApJ</i> 43, 320, 1916 R
230	B 3195	11.5	+33 37	5.08	K0	.....	1300	21750	300	0.3	6.8	-41.5	115.96	0.0368	.....	Christie <i>ApJ</i> 83, 434, 1936 R
231	η Vir	14.8	-0 07	4.00	A0	.....	71.9	17644.410	191.63	0.336	30.51	+5.33	28.410	.....	1.50	Harper <i>DAO</i> 6, 227, 1935 R
232	B 3224	17.5	+26 24	4.78	F5	.....	396.49	23885.847	101.29	0.602	43.72	+0.48	40.712	0.34	1.05	Miss Vinter-Hansen <i>LOB</i> 19, 101, 1940
233	+74°493	17.9	+73 48	8.2	G5	G6	5.41454	22853.120	.....	0.00	64.9	-97.4	4.833	.....	0.80	Sanford <i>ApJ</i> 56, 449, 1922 R
											74.0		5.510	.....	0.70	

234	+27°21'38 B 3284	12	23.7	+26 47	6.48	A3	.....	11.782	24585.282	198.50	0.060	41.27	+ 1.79	6.674	0.0855	.....	19481100B...20...1M Harper DAO 3, 315, 1926 R Petrie DAO 6, 365, 1937
235		30.1	+18 56	6.72	A3	.....	.....	7.3366	28423.039	287.6	0.213	66.27	+ 4.07	7.652	.....	.....	
236	Σ 1669 A	36.1	-12 28	5.98	F5	.....	.....	44.4137	20089.062	238.8	0.25	25.9	-11.6	15.33	0.0729	.....	Sanford, Karr Apf 96, 214, 1942
237	Σ 1669 B	36.1	-12 28	6.08	F2	.....	.....	1.46047	28707.080	86.8	0.088	88.2	-14.6	1.764	.....	.....	Sanford, Karr Apf 96, 214, 1942
238	+31°2397	36.2	+30 59	6.88	A2	.....	.....	2.7045	28285.101	10.10	0.051	40.7	- 8.6	2.001	.....	.....	Shajn Pul O Cir 21, 38, 1937
239	B 3323	40.6	+ 8 13	5.24	A5	.....	.....	38.3	20573.455	223.35	0.072	80	- 8.89	21.530	.....	.....	Cannon DO 2, 369, 1915 R
240	B 3354	48.3	+83 58	5.81	A0	.....	.....	3.28655	24226.669	211.05	0.041	108.34	- 0.05	5.426	.....	.....	Plaskett DAO 3, 255, 1926 R
241	δ Mus	55.4	-71 01	3.63	K2	.....	.....	847	21790	0.0	0.4	7.8	+36.5	83.269	.....	.....	Christie Apf 83, 434, 1936 R
242	*UY Vir	56.6	-19 15	(7.8-8.7)	A3	A7	.....	1.99447	ph 0.571 P	269.65	0.30	80.0	+ 4.0	2.09	0.092	.....	Herbig Apf 106, 119, 1947 R
243	ξ Cen	13	01.1	-49 22	B3	B3	.....	7.649652	18077.493	308.63	0.353	38.8	+14.3	3.680	0.038	.....	Neubauer LOB 15, 107, 1931 R
244	* RS CVn	06.0	+36 28	(8.12-10.03)	F8	F4n	.....	4.797944	23579.344	.....	0.00	91.6	- 8.9	6.040	.....	.....	Joy Apf 72, 41, 1930 R
245	* UW Vir	10.0	-16 57	(9.0-13.0)	A2	dG8	.....	1.81	0.25 P	.....	0.00	42	+22	1.05	0.014	.....	Struve Apf 106, 92, 1947 R
246	ξ UMa A	19.9	+55 27	2.40	A2p	A2s	.....	20.53860	31636.591	103.29	0.541	65.33	- 6.39	15.3	.....	.....	Cesco Apf 104, 287, 1946 R
247	* α Vir	19.9	-10 38	1.21	B2	B2	.....	4.014160	26041.26	40	0.10	126.8	+ 0.5	6.965	.....	.....	Struve, Ebbighausen Apf 80, 365, 1934 R
248	* BD Vir	21.3	-15 35	(9.9-11.3)	A2	A5	.....	2.5485	31111.06	123	0.17	42.0	+ 8.6	1.400	0.02	.....	Struve, Cesco, Sahade Apf 100, 181, 1944
249	B 3511	30.3	+37 42	4.96	F0	F2	.....	2.61314	17022.522	214.76	0.040	9.48	+ 6.43	0.340	0.0002	.....	Harper DAO 7, 141, 1938 R
250	* SX Hya	39.0	-26 16	(8.6-12.7)	A3	.....	.....	2.895697	10002.915	286	0.10	50.5	-42.1	2.00	0.038	.....	Sanford Apf 98, 153, 1937
251	B 3544	40.0	-32 33	4.36	F5	F0	.....	9.94480	22737.382	137.7	0.247	6.00	-23.91	0.795	0.0002	.....	S Jones CA 10, Pt 8, 57, 1928 R
252	M Cen	40.4	-50 56	4.68	K0	G5	.....	437.00	24162.96	58.6	0.134	12.29	- 5.55	73.200	0.0818	.....	S Jones CA 10, Pt 8, 61, 1928 R
253	+31°2540	41.7	+31 22	6.55	F5	.....	.....	39.28	28711.847	326.7	0.786	43.22	- 8.22	14.432	0.0778	.....	Shajn, Pul O Cir 25, 26, 1939
254	B 3555	42.1	+26 12	5.91	F5	F3	.....	36.04	22014.483	258.15	0.490	54.01	+ 6.50	23.333	.....	.....	Petrie DAO 3, 335, 1926
255	ν Cen	43.5	-41 11	3.53	B2	B2	.....	2.62516	20301.39	.....	0.00	65.82	+ 9.05	28.435	.....	.....	Wilson LOB 8, 130, 1914 R
256	h Cen	47.5	-31 26	4.76	B5	B7	.....	6.927	18733.25	147.23	0.23	21.4	+ 5.2	1.984	0.0065	.....	Paddock LOB 9, 42, 1916 R
257	ξ Cen	49.3	-46 48	3.06	B2p	B2	.....	8.02352	29798.46	290	0.5	110.7	+ 6.5	10.58	.....	.....	Popper Apf 97, 394, 1943 R
258	η Boo	49.9	+18 54	2.80	Go	F7	.....	495	18225	305	0.232	159.4	- 0.15	53.101	0.0242	.....	Bianchi Mem Soc Astr Ital 1, 31, 1920 R
259	B 3610	55.4	-45 07	4.39	F5	.....	.....	1025	23960	140	0.4	8.2	- 0.5	105.9	0.0452	.....	Christie Apf 83, 434, 1936 R
260	α Dra	14	01.7	+64 51	A0p	.....	.....	51.38	17403.284	19.07	0.384	46.25	-17.03	30.173	0.4156	.....	Harper RASC 4, 91, 1910 R
261	B 3635	05.8	+25 34	4.82	F5	F5	.....	9.6045	17679.523	273	0.169	68.40	+ 9.80	8.904	.....	.....	Harper DO 1, 303, 1911 R
262	B 3644	08.5	- 0 22	5.81	F5	F4	.....	2.6660	22744.103	.....	0.00	72.05	+17.60	9.380	.....	.....	Duncan Apf 64, 226, 1921 R
263	B 3649	09.2	+78 01	5.00	K0	K4	.....	575.24	23104.38	287.3	0.07	24.34	+ 9.49	91.300	0.11	.....	Young DAO 4, 27, 1927
264	+11°2662	13.7	+10 58	7.13	A3	.....	.....	7.369	26466.450	317.43	0.199	11.57	-28.99	3.344	0.029	.....	Harper DAO 6, 85, 1932 R
265	λ Vir	13.7	-12 55	4.60	A2	.....	.....	206.9	16263.0	92.2	0.25	24.3	-10.9	66.900	.....	.....	Colacevich Arcturi O No. 59, 28, 1941
266	B 3673	13.8	+35 58	4.83	K0	K1	.....	211.95	20561.18	223.42	0.54	38.3	-25.62	105.000	.....	.....	Young DO 3, 95, 1915
267	α Cen	32.8	-60 25	0.33	Go	G5	.....	80.089 yr	1875.759	52.132	0.321	3.90	-22.2	44.000	0.076	.....	Finsen UO Cir 68, 343, 1926 R
268	+22°2731abc	35.8	+22 24	6.17	F5	F1	.....	3320	25630.01	55.12	0.218	7.81	- 0.11	247.973	.....	.....	Harper, Blanchet DAO 7, 99, 1937
269	+22°2731bc	35.8	+22 24				.....	101.56	23491.829	186.82	0.042	19.22	var	26.818	.....	.....	Harper, Blanchet Ibid.

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

Star	a 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ³	f(m)	$m \sin^3 i$	Authority
	h	m		Hvd.	Rev.										
270	Z 1890 B	14 46.3	+49 08	F5	F1	12.822	22379.490	97.05	0.394	58.31	-28.23	9.450	.....	1.27	Harper DAO 2, 167, 1922 R
271	* δ Lib	55.6	- 8 07	A0	.....	2.32735	23204.1439	300.2	0.012	72.19	-35.38	11.700	.....	1.03	McLaughlin MO 6, 28, 1934 R
272	B 3827	56.0	+66 20	Mb	M5	750	22065.0	.....	0.00	6.67	+ 6.85	68.800	0.023	.....	Young DAO 4, 32, 1927 R
273	* i Boo B	15 00.5	+48 03	.....	dG+dG2	0.2678094	.....	.....	0.00	115.4	+ 3.4	0.425	.....	0.77	Popper ApJ 97, 394, 1943
274	* SS Boo	09.8	+38 57	.....	dG5	7.60605	.....	0.0	0.05	69	-48	0.851	.....	0.39	Sanford ApJ 103, 114, 1946 R
275	* U CrB	14.1	+32 01	B8	B5	3.4522008	ph 2.687	5.8	0.13	74	- 8.7	7.7	0.05	1.11	Sahade, Struve ApJ 102, 480, 1945 R
276	+33 ² 574	15.4	+32 54	A2	A3	3.5753	23211.641	24.54	0.079	58.63	-25.85	2.865	0.0741	.....	Christie DAO 4, 55, 1927
277	e Lib	18.8	- 9 58	F0	F3	226.95	14785.116	339.52	0.68	14.00	- 9.66	32.037	0.0255	.....	Miss Jones LOB 16, 120, 1930
278	η CrB	19.1	+30 39	Go	F9	41.56 yr	1892.269	217.98	0.27	4.5	- 6.0	903.900	0.128	.....	Lohse PmoO 20, 119, 1908 R
279	β CrB	23.7	+29 27	Fop	.....	10.496 yr	28971.3	185.4	0.406	9.19	-18.03	442.000	0.24	.....	Chang ApJ 70, 185, 1929
280	+47 ² 227	25.6	+47 35	A0	A3	105.8	24346	30	0.1	11.2	-17.0	16.210	0.015	.....	Neubauer ApJ 99, 134, 1944 R
281	* α CrB	30.5	+27 03	A0	Ain	17.36	23175.835	304.22	0.377	34.83	+ 2.61	7.701	0.0605	.....	Christie ApJ 83, 184, 1936 R
282	* TW Dra	32.4	+64 14	A5	A6+K2	2.806689	28532.508	11.1	0.027	63.5	+ 2.6	2.447	0.0743	.....	McLaughlin MO 5, 91, 1933 R
283	* RW CrB	35.2	+29 56	F8	F0	0.7264171	25365.741	160	0.12	61	-11	0.600	0.0171	.....	Pearce AAS 9, 131, 1937 R
284	ζ CrB A	35.6	+36 58	B8	B8n	12.58485	23855.681	90	0.030	134.82	-29.61	23.310	.....	13.35	Sanford ApJ 79, 89, 1934 R
285	B 4008	40.9	- 1 29	B8	.....	38.95	19528.597	208.46	0.773	50.52	-11.63	17.170	0.133	.....	Plaskett DAO 3, 179, 1925 R
286	* SS Lib	43.4	-15 13	A5	.....	1.4380	0.25 P	.....	0.00	45	-45	0.89	0.014	.....	Jordan AO 3, 153, 1915
287	π Sco	52.8	-25 50	B2	B3	1.571	25047.023	90	0.05	138	- 3.0	2.977	.....	2.96	Struve ApJ 103, 76, 1946 R
288	ξ Sco	58.9	-11 06	F8	F4	44.70 yr	1905.39	343.6	0.75	180	-29.4	3.884	0.024	2.27	Struve, Elvey ApJ 66, 217, 1927 R
289	B 4088	59.6	+36 55	A2	dF9+AO	108.075	29765.532	.....	0.00	19.61	- 1.92	29.100	.....	0.48	Aitken LO 12, 102, 1912
290	β Sco	59.6	-19 32	B1	.....	6.828145	28286.484	35.0	0.262	23.16	- 3.8	10.32	.....	0.40	Chang ApJ 70, 182, 1929 R
291	θ Dra	16 00.0	+58 50	F8	F7	3.0708	15368.962	126.112	0.014	23.47	- 8.5	0.900	0.0041	.....	Petrie DAO 7, 273, 1942 R
292	+8 ³ 134	00.8	+ 8 22	A2	.....	8.855	22846.704	265.41	0.376	31.62	-21.54	3.568	0.023	.....	Luyten, Struve, Morgan YO 7, 264, 1940 R
293	+11 ² 2910	01.2	+10 57	G5	K0	4.28503	22418.052	82.49	0.089	38.1	-60.6	2.238	0.0244	.....	Curtis LOB 4, 156, 1907 R
294	B 4129	08.1	+36 41	K5	K4	2150	24290	340	0.6	16.0	-30.6	378.4	0.468	.....	J W Campbell DAO 1, 315, 1921
295	σ CrB A	10.9	+34 07	Go	F6	7.974	23216.694	90	0.081	60.12	-10.63	6.571	.....	0.94	Sanford ApJ 53, 210, 1921
296	ζ TrA	17.6	-69 52	Go	.....	12.9762	18103.642	274.54	0.060	68.77	+ 7.58	7.516	0.0005	0.82	Christie ApJ 83, 434, 1936 R
297	ι TrA	18.7	-63 50	F0	F3s	39.88796	23236.454	87.24	0.280	38.72	- 5.59	1.320	0.213	.....	Harper DAO 3, 231, 1925 R
298	B 4177	19.3	+ 7 10	A0	Ain	4.951	21773.086	355.92	0.511	16.28	-34.36	0.953	0.0014	.....	S Jones CA 10, Pt 8, 64, 1928 R
299	β Her	25.9	+21 42	K0	G5	410.575	15500.374	24.6	0.550	12.78	-25.52	60.280	0.0519	.....	S Jones CA 10, Pt 8, 68, 1928 R
300	β GC 7677 A	29.6	+30 43	F0	F0	3.39430	28006.493	355.23	0.025	68.18	-16.24	3.181	0.112	.....	Harper DAO 4, 179, 1928 R
301	+17 ² 3053	30.9	+17 15	A0	.....	10.56	22422.236	4.12	0.430	101.36	- 9.88	13.280	.....	2.19	Plummer LOB 5, 25, 1908 R
														1.35	McKellar DAO 6, 291, 1935 R
															Young DAO 1, 233, 1920 R

302	* W UMi	16 34.8	+86 26	(8.61-9.73)	Ao	A3	1.70116	ph 0.611	221.6	0.09	86.6	-17.9	2.0	0.11	Sahade <i>Apj</i> 102, 470, 1945 R
303	† Her	37.5	+31 47	3.00	Go	Go	34.417 yr	1898.755	113.80	0.440	3.81	-69.86	591.4	0.052	Berman <i>ASP</i> 53, 22, 1941 R
304	B 4247	37.6	+27 07	5.91	F2	F2	2.3076	23923.856	.....	0.00	97.4	-12.6	3.114	.....	Sanford <i>Apj</i> 64, 184, 1926 R
305	* WW Dra	37.7	+60 54	(9.3-10.0)	G5	G2+K2	4.629583	28020.369	.....	0.00	108.7	-28.5	3.426	0.99	Joy <i>Apj</i> 94, 407, 1941 R
306	* μ Sco	45.1	-37 53	3.09	B3p	B3nn	1.44627	12375.571	190	0.05	147.6	.....	9.396	2.3	Miss Maury <i>PA</i> 29, 22, 1921 R
307	* TT Her	49.9	+17 01	9.0-9.7	Ao	.....	0.912073	.....	.....	0.00	86.8	+21.8	1.09	0.062	Shajn, Melnikov <i>Pul O Cir</i> 19, 11, 1936 R
308	+13°3258	50.7	+13 47	6.16	F2	.....	11.857	26576.253	267.90	0.298	27.03	-5.05	4.207	0.021	Struve <i>Apj</i> 103, 76, 1945 R
309	* UU Oph	52.5	-25 40	(10.0-12.5)	Ao	Ao	4.40	0.25 P	.....	0.00	30	+50	1.82	0.012	Harper <i>DAO</i> 6, 236, 1935
310	B 4322	55.5	+65 17	4.82	F5	F6	52.11	14816.015	351.05	0.149	17.14	-28.7	12.144	0.0263	Plaskett <i>RASC</i> 4, 460, 1910
311	e UMi	56.2	+82 12	4.40	G5	G1	39.482	18005.75	359.46	0.011	31.95	-11.40	17.346	0.1337	Baker <i>AO</i> 2, 17, 1910 R
312	e Her	56.5	+31 04	3.92	Ao	.....	4.0235	18086.253	180	0.023	70.39	-24.03	3.890	.....	Sanford <i>Apj</i> 86, 153, 1937
313	* WZ Oph	17 01.8	+7 55	9.3-10.0	Go	Go+Go	4.183496	22897.863	128.0	0.10	92.5	-16.8	5.29	0.326	Christie <i>DAO</i> 3, 307, 1925 R
314	B 4351	02.1	+48 57	6.32	Ko	.....	786	26275	0.00	0.3	10.0	+12.8	103.1	0.0709	Harper <i>DAO</i> 1, 197, 1920 R
315	+12°3161	06.1	+12 35	6.46	Ao	.....	23.245	21780.200	129.85	0.427	27.67	+3.51	7.997	0.038	Sanford <i>Apj</i> 79, 89, 1934 R
316	* AK Her	09.5	+16 29	(8.29-8.90)	F8	.....	0.4212207	22977.254	27.89	0.00	78	-13	0.452	0.0208	Sanford <i>Apj</i> 53, 212, 1921 R
317	α Her B	10.1	+14 30	5.39	B8	F8	51.590	22468.581	27.89	0.028	29.64	-37.2	2.103	0.1395	Plaskett <i>DAO</i> 1, 138, 1919 R
318	* U Oph	11.4	+1 19	(5.67-6.36)	B8	Bgnk	1.6773476	18026.703	.....	0.00	179.8	-11.5	4.147	.....	Smith <i>Apj</i> 102, 500, 1945 R
319	* u Her	13.6	+33 12	(4.60-5.28)	B3	B3nk	2.05102	.....	194	0.053	204.6	-20.9	4.718	4.63	Baker <i>Laws OB</i> No. 31, 1, 1921 R
320	* TX Her	15.4	+42 00	(8.33-9.03)	A5	B3	2.059801	22504.085	.....	0.00	121.0	-6.4	3.427	.....	Parker <i>DO</i> 2, 331, 1915
321	B 4423	21.3	-5 00	4.61	Fo	A2	26.2742	18411.524	14.48	0.491	47.49	+0.44	14.947	0.88	Christie <i>DAO</i> 3, 307, 1925 R
322	+34°2971	23.2	+34 47	5.91	B9	A2	5.9182	23585.527	35.74	0.031	25.09	-22.73	2.041	0.0097	J W Campbell <i>DAO</i> 2, 159, 1922
323	+12°3241	27.6	+12 00	6.18	B9	.....	6.7984	22878.154	116.26	0.069	50.18	-12.79	4.680	0.0886	Trumpler <i>ASP</i> 42, 342, 1930 R
324	B 4444	28.1	-32 31	5.71	Oe5	.....	3.36657	26461.928	.....	0.00	215	-4	9.952	.....	Young <i>LOB</i> 6, 160, 1911 R
325	ξ Ser	31.9	-15 20	3.64	A5	.....	2.292285	19209.618	.....	0.00	19.35	-42.77	0.610	0.0017	Turner <i>LOB</i> 4, 163, 1907 R
326	ω Dra	37.5	+68 48	4.87	F5	F4	5.27968	17415.493	333.76	0.011	36.26	-14.0	2.632	0.0261	Petrie <i>DAO</i> 4, 81, 1928 R
327	+14°3329	39.8	+14 27	6.13	A3p	.....	3.894	24701.985	74.29	0.04	96.56	-32.29	5.148	.....	Harper <i>DAO</i> 1, 125, 1919 R
328	B 4507	44.4	+47 39	6.34	Ao	A2	2.82424	22106.713	30	0.017	60.15	-27.30	2.336	0.06	Sanford <i>Apj</i> 86, 153, 1937
329	* UX Her	49.7	+16 57	9.0-9.7	Ao	.....	1.5488545	19876.845	177.0	0.08	50.5	-58.6	1.07	0.020	Struve <i>Apj</i> 99, 210, 1944 R
330	* V 453 Sco	49.7	-32 27	6.62	Oe5	Boje	12.004211	28433.83	23.7	0.10	192.6	-39.8	31.62	8.771	Adams, Joy <i>Apj</i> 49, 192, 1919 R
331	* Z Her	53.6	+15 09	(7.10-7.90)	F5p	F2p	3.992775	.....	.....	0.00	88.2	-46.5	4.800	1.5	Berman <i>LOB</i> 16, 24, 1932 R
332	70 Oph A	18 00.4	+2 31	(4.28)	.....	F2p	18.101 yr	1900.643	97.51	0.279	1.37	var	119.6	0.0016	Pavel <i>AN</i> 212, 347, 1921 R
333	70 Oph AB	00.4	+2 31	4.07	Ko	dKo	87.710 yr	1895.965	193.352	0.499	.....	-7.25	6.341	.....	Boothroyd <i>DAO</i> 1, 245, 1920 R
334	B 4602	07.5	+79 59	6.18	F5	F5	10.5217	21764.648	256.76	0.314	46.16	+2.93	7.074	0.46	Kohl <i>AN</i> 219, 213, 1923 R
335	* μ Sgr	07.8	-21 05	4.01	B8p	cB8ea	108.2	17495.64	79.13	0.447	66.82	-8.23	148.110	4.0	Colacovich <i>Arcturi</i> O No. 59, 33,
336	* RS Sgr	11.0	-34 08	6.1-6.8	B5	.....	2.415702	15023.0847	261	0.091	70	+14	2.320	0.085	1941 R
337	B 4622	12.9	+56 33	6.41	Fo	F1	2.0476	22147.630	195.10	0.039	105.09	-8.51	2.957	.....	Harper <i>DAO</i> 1, 307, 1921 R

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

No.	Star	α 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ³	f(m)	$m \sin^3 i$	Authority
		h	m		Hvd.	Rev.										
338	ξ Pav	18 14.0	-61 32	4.25	K2	M1	2214	18076.27	187.2	0.264	17.92	+12.40	526	1.188	.....	S Jones CA 10, Pt 8, 72, 1928 R
339	B 4629	15.1	+24 24	5.49	K5	K4	478	23540.65	234.47	0.398	16.07	-14.36	96.904	0.16	.....	Harper DAO 3, 198, 1925 R
340	B 4643	17.1	+29 48	5.54	A2	A4s	5.51460	19551.742	.....	0.00	70.1	-20.2	5.320	.....	1.72	Daniel, Miss Jenkins AO 3, 147, 1914 R
341	* W Sct	18.9	-13 42	9.5-10.2	.....	B3+B0	10.27	0.75 P	.....	0.00	101.7	-16	7.710	.....	1.18	Struve Apj 103, 76, 1946 R
342	* RZ Sct	21.1	-9 15	7.5-8.9	B2	.....	15.19016	19643.07	138	0.05	76	-28.3	10.5	0.458	.....	Neubauer, Struve Apj 101, 240, 1945 R
343	* RZ Dra	21.6	+58 50	10.0-10.8	.....	A5	0.55	0.25 P	.....	0.00	104	-16	0.79	0.081	.....	Struve Apj 103, 76, 1946 R
344	d Ser abc	22.1	+0 08	5.33	A0	Go+	386	221	277	0.47	28	-23.3	131.000	1.16	.....	Miss Tilley Apj 98, 347, 1943 R
345	d Ser bc	22.1	+0 08	5.33	.....	(A2+A0)	1.8505205	0.219	.....	0.00	90	0.0	2.270	.....	0.694	Miss Tilley Ibid R
346	B 4669	22.1	+29 46	5.71	A2	A4s	9.6120	22048.711	326.43	0.468	28.49	+7.54	3.330	0.016	.....	Young DAO 1, 131, 1919
347	x Dra	22.9	+72 41	3.69	F8	F5	280.531	22440.160	122.56	0.452	17.96	+32.53	61.8	0.12	.....	Miss Vinter-Hansen LOB 19, 141, 1942 R
348	B 4678	24.5	-2 03	5.44	K0	G8	3.1558	20000.146	.....	0.00	3.55	+28.03	0.154	0.0000	.....	Christie ASP 45, 190, 1933 R
349	* RX Her	26.0	+12 30	(7.20-7.88)	A0	A0	1.7785740	19638.5882	.....	0.00	130.6	-24.9	3.194	.....	2.08	Sanford Apj 68, 51, 1928 R
350	+65°1276	31.0	+65 22	6.31	A3	.....	14.3450	24710.897	295.93	0.210	68.29	-10.34	13.173	.....	1.85	Petrie DAO 4, 85, 1928
351	B 4745	40.7	+55 26	5.08	A0	.....	9.810	27945.341	155.5	0.022	72.01	-30.97	13.885	.....	1.87	Petrie RASC 29, 411, 1935
352	ζ Lyr A	41.3	+37 30	4.29	A3	Aps	4.29991	18109.722	.....	0.00	51.24	-25.97	3.030	0.0601	.....	Jordan AO 1, 115, 1909 R
353	β Scu	41.9	-4 51	4.47	Go	cG7	834	22480.9	33.9	0.35	16.65	-21.9	178.000	0.33	.....	Young DAO 4, 35, 1927
354	* KO Aql	42.4	+10 40	8.2-9.3	A0	.....	2.863844	ph 0.372	130.9	0.02	37.8	-2.7	1.5	0.016	.....	Sahade Apj 102, 470, 1945 R
355	β GC 8849 A	45.0	+49 19	(7.3)	F5	F1	3.76468	22159.769	.....	0.00	97.7	-18.8	5.058	.....	1.48	Sanford Apj 53, 215, 1921 R
356	* β Lyr	46.4	+33 15	(3.36-4.33)	B8p	B8+B2e	12.92529	26758.137	310.7	0.024	98.3	-21.24	5.089	.....	1.47	Sherman Apj 94, 368, 1941 R
357	* SV5923 Her	46.8	+24 36	8.15-8.63	B8	.....	1.637416	28772.76	37	0.05	183.48	-16.0	32.602	8.282	.....	Cesco, Sahade Apj 101, 114, 1945
358	B 4779	48.0	+21 18	5.33	B9	Aos	6.3624	24589.683	195.53	0.116	82.6	-19.8	1.537	0.0036	.....	Meyer LOB 13, 49, 1927 R
359	B 4788	49.6	+75 19	5.37	A0	.....	4.1175	20293.519	107.6	0.012	79.12	-8.79	4.480	.....	0.95	Harper RASC 13, 236, 1919 R
360	Σ 2420 A	49.7	+59 16	4.78	K0	G5	138.420	19258.16	274.31	0.114	23.46	-19.52	4.751	.....	0.90	Young DAO 1, 263, 1920 R
361	δ Lyr	50.2	+36 51	5.51	B3	B3	88.112	19220.727	204.55	0.28	33.68	-25.85	39.220	0.309	.....	Jordan AO 3, 119, 1914
362	β GC 8908 A	50.5	+22 31	4.56	Go+A3	Go	245.3	19805.0	169.5	0.12	16.0	-23.8	53.580	0.102	.....	Wilson LOB 7, 106, 1913 R
363	+20°4022	57.0	+20 42	6.55	B3	B2	15.9526	24698.747	262.24	0.159	55.08	-10.29	11.930	0.266	.....	Millman DAO 4, 97, 1928
364	-10°4926	57.1	-10 52	6.68	B5	B8	1.849084	25074.648	156.16	0.033	150.58	-12.86	3.826	.....	7.10	Pearce DAO 4, 75, 1927 R
365	B 4864	19 02.3	+10 55	5.10	B8	.....	1.30226	18157.502	.....	0.00	27.59	-18.65	6.129	.....	4.43	Jordan AO 3, 77, 1914 R
366	B 4870	03.1	+41 16	6.15	B3	B3sk	1.03088	21735.647	20.02	0.015	12.12	-21.19	0.172	0.0002	.....	Boothroyd DAO 2, 173, 1922 R
367	+16°3752	03.5	+16 43	5.99	G5	G4	21.998	26206.422	92.70	0.205	12.77	+14.44	3.952	0.0045	.....	Albicky Pul O Cir 7, 1, 1933
368	+16°3758	04.2	+16 42	6.46	F5	F2	4.812	23630.622	59.16	0.073	86.03	+8.80	5.677	.....	1.26	Harper DAO 3, 236, 1925 R
369	Σ 2469 A	04.4	+38 46	(7.8)	A3	.....	1.54039	22128.084	14.26	0.008	88.69	-29.79	1.878	0.112	.....	Harper DAO 6, 7, 1930 R

370	HD 179094 * RS Vul	19 06.1 13.4	+52 16 +22 16	5.93 (6.90-7.63)	Ko B8	 B8 B9	28.59 4.477325	31048.179 19654.866	330.1 236.26	0.041 0.053	40.31 54.98 (175.9)	+5.18 -22.04	15.800 (3.388) (10.842)	0.194 (1.35)	Young RASC 38, 366, 1944 Plaskett DAO 1, 141, 1919 R
371	HD 181144 * U Sge	14.2 14.4	+16 19 +19 26	6.92 (6.52-9.40)	F5 B9	F7 B9n G2	5.3803 3.38056	31638.518 24721.497	348.74 260	0.018 0.035	38.18 67.9 224.0	-4.44 -15.1	2.824 3.155 10.411	0.0311 2.03	Miss Northcott DDO 1, 374, 1947 Joy Apf 71, 336, 1930 R
372	+37° 3413	15.5	+37 16	6.19	Ao	.....	10.3932	23570.622	198.68	0.520	60.26 84.0	-14.86	7.356 10.254	 0.84	Harper DAO 4, 183, 1928 R
373	v Sgr * Z Vul	16.0 17.5	-16 08 +25 23	4.58 (6.97-8.60)	B8p,F2p B3	B3+A2 B3n B3n	137.939 2.45492	19648.72 19679.911	28.6	0.087 0.00	48.15 96.35 213.74	+11.9 -15.08	91.010 3.252 7.215	1.582 5.24	Wilson LOB 8, 132, 1914 R Plaskett DAO 1, 251, 1920 R
374	B 4947	19.8	+16 45	6.03	Ao	A3s	7.390	20943.233	332.6	0.05	52.95 73.8	+11.0	5.370 7.490	 0.65	Young DO 4, 55, 1917 R
375	+55° 2215 * σ Aql	29.2 34.3	+55 32 + 5 10	6.52 (4.99-5.17)	K2+A3 B3	cG6 B3 B3	108.5707 1.950272	23375.760 28201.103	87.0	0.054 0.00	22.1 164.2 208	-5.2 -4.5	33.040 4.403 5.493	0.1222 4.61	Sanford Apf 61, 326, 1925 Luyten, Struve, Morgan YO 7, 275, 1940 R
376	B 5026	36.4	+54 44	5.86	F5	F4	7.6383	22201.398	46.74	0.527	89.81 91.12	-15.59	8.017 8.134	 1.83	Harper DAO 1, 157, 1919 R
377	δ Sge	42.9	+18 17	3.78	Ma	Ma-Ao	3988	22500	270	0.75	13.0	+1.4	2660	.....	Christie Apf 83, 433, 1936 R
378	* B 5070	47.2	+40 21	(5.6-5.8)	B2	B2k	12.4255	19636.432	115.75	0.222	94.01	-3.87	15.590	.....	Harper DAO 6, 244, 1935 R
379	S Sge	51.5	+16 22	(5.8-6.8)	Gop	F8-G7	682	20279.0	195.4	0.165	14.6	-12.3	136.400	.....	Aldrich MO 4, 75, 1932 R
380	φ Aql	51.5	+11 09	5.29	A2	.....	3.32068	23324.045	55.87	0.026	37.12	-28.24	1.694	.....	Harper DAO 6, 245, 1935 R
381	θ Sgr	53.2	-35 33	4.39	B3	B5	2.10514	11140.645	.....	0.00	15.9	+0.9	0.460	.....	Wilson, Huffer PA 29, 85, 1921
382	Σ 2613 A	56.6	+10 28	(7.5)	F2	F4	4.4696	23802.192	294.5	0.10	41.3	-43.0	2.526	.....	Sanford Apf 61, 330, 1925 R
383	* WW Cyg	20 00.6	+41 18	(9.7-13.4)	A2	B8+G	3.32	0.30 P	.....	0.00	68	+8	3.10	.....	Struve Apf 104, 253, 1946 R
384	* HD 227696	02.8	+35 27	8.3	B2	B2	3.87972	30231.084	175.2	0.070	181.8	-15.0	13.9	.....	Pearce AAS 10, 233, 1941
385	O Σ 398 A	03.6	+35 26	(7.7)	Bo	Bok	8.33425	24039.940	0.50	0.264	237.4	-5.44	17.351 18.626	 12.90	Plaskett DAO 3, 258, 1926 R
386	* SW Cyg	03.8	+46 00	4.57	A2	A2+Ko	4.57	0.85 P	20	0.30	43	-1	2.58	.....	Struve Apf 104, 253, 1946 R
387	* QY Aql	04.9	+15 00	(11.0-13)	Fo	.....	7.23	0.25 P	180	0.06	36	+34	3.57	.....	Struve Apf 103, 76, 1946 R
388	B 5170	05.7	+36 33	4.82	B2p	B3nne	226.0	22379.5	258.39	0.746	12.20	-13.60	25.249	.....	Losh MO 4, 199, 1932 R
389	θ Aql	06.1	-1 07	3.37	Ao	B9s	17.12426	31636.344	34.45	0.607	51.01 63.68	-27.94	9.5 11.9	 0.60	Cesco, Struve Apf 104, 282, 1946 R
390	B 5173	06.4	+26 36	5.46	A2	A1np	9.316	20304.628	103.15	0.012	78.49 86.31	-13.04	10.054 11.055	 2.06	Harper DO 4, 199, 1918 R
391	31 Cyg	10.5	+46 26	4.0	Ko	Ko+B8	3802.84	22064.7	209.65	0.131	13.78 17	-6.87	720.000 1224.000	 7.0	Miss Vinter-Hansen Apf 100, 8, 1944 R
392	B 5192	11.2	+23 12	5.38	G5	cG4	251.0	23415.850	121.0	0.042	26.99	-23.75	93.072	.....	Harper DAO 3, 201, 1924 R
393	B 5200	12.3	+47 24	4.16	Ko+A3	cK5	1170 (390)	20700.39 20515.821	281.05	0.182 0	16.64 5.86	-14.35	263.250	.....	Cannon DO 4, 151, 1918 R
394	β Cap a	15.4	-15 06	3.25	Go+Ao	Go	1374.126	21521.26	119.12	0.417	21.93	-18.94	395.050	.....	Sanford Apf 89, 333, 1939 R
395	β Cap bc	15.4	-15 06	.....	B+dG5	B+dG5	.....	.....	20.00	.....	20.00	.....	360.300	.....	Sanford Ibid
396	β Cap b	15.4	-15 06	6.28	B1	B8	8.6780	28383.898	343.24	0.36	37.9	0.0	4.226	.....	Sanford Ibid
397	+45° 3139	15.6	+46 00	.....	B3	B2k	2.98474	23951.678	103.17	0.098	115.54 142.61	-8.93	4.719 5.825	 2.35	Plaskett DAO 4, 103, 1928 R
400	* HD 228911	15.8	+40 33	8.7	B3	B2	1.8742	31740.1097	112.7	0.056	192.6	-8.6	4.956	.....	Pearce ASP 58, 247, 1946
402	* HD 193576	15.8	+38 25	8.0	Ob	WN5, O6	4.21238	30569.092	14	0.026	219.5 172.6 306.7	+38.4	5.648 9.994 17.719	 30.79 17.33	Keeping ASP 58, 245, 1946 R

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

	Star	α 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	$\frac{K}{\text{(km/sec)}}$	γ (km/sec)	$a \sin i$ 10 ⁶	f(m)	$m \sin^3 i$	Authority
		h m	s °		Hvd.	Rev.										
404	α Pav	20 17.7	-57 03	2.12	B3	B3s	11.753	16379.90	224.80	0.01	7.25	+ 2.0	1.170	0.0005	.....	Curtis LOB 4, 154, 1907 R
405	HD 194495	20.8	+21 10	7.09	B9	.....	4.9052	28693.640	54.5	0.133	82.2	+11.1	5.495	0.275	.....	Shajn Pul O Cir No. 26, 74, 1939
406	HD 195986	29.4	+42 51	6.41	B3	B6s	5.38275	28775.557	57.1	0.069	31.68	-16.88	2.339	0.0176	.....	McKellar DAO 7, 115, 1938
407	+25°4299	31.8	+25 34	6.29	A2	.....	11.088	26492.609	59.11	0.284	58.7	-18.8	8.581	0.205	.....	Shajn Pul O Cir 8, 16, 1933
408	β Del	32.9	+14 15	3.72	F5	F3	26.79 yr	1883.04	351.20	0.35	6.8	-21.0	857.000	0.263	.....	Aitken LO 12, 150, 1912
409	ϵ Del	33.0	+11 02	5.43	A2	A2s	11.039	22139.862	61.8	0.227	26.02	- 4.92	3.846	0.019	.....	Chang Apf 68, 323, 1928 R
410	* W Del	33.1	+17 56	(9.9-12.1)	A	A3+G5	4.81	0.78 P	0.0	0.20	30	+19	1.94	0.013	.....	Harper DAO 6, 247, 1935
411	B 5294	33.2	- 1 27	4.51	K0	G5	205.0	22311.55	321.43	0.128	9.78	- 6.09	27.347	0.0194	.....	Struve Apf 104, 253, 1946 R
412	* GO Cyg	33.5	+35 05	(8.23-8.77)	A0	B9n	0.717767	26953.0425	.....	0.00	133.2	+ 3.2	1.315	.....	0.98	Harper DAO 3, 345, 1926 R
						Aon			.....		156.2		1.542	.....	0.83	Pearce RASC 27, 62, 1933 R
413	* V 367 Cyg	44.2	+38 55	(6.98-7.58)	F5+A3	cAryse	12.3 yr	1932.5	110	0.2	17.5	- 2.0	1000.000	2.3	.....	Christie Apf 78, 200, 1933 R
414	B 5359	44.9	+ 7 30	6.23	A0	A2	10.883	26526.412	162.1	0.386	31.4	-30.2	4.335	0.0275	.....	Shajn Pul O Cir 7, 1933
415	* Y Cyg	48.1	+34 17	(6.95-7.55)	B2	Ognnk	2.996332	2.407	4.8	0.136	244.8	-51.8	9.96	.....	17.2	Redman DAO 4, 341, 1931 R
						Ognnk	2.996332	0.005	86.3	0.133	245.0	-61.8	9.86	.....	17.4	(Redman <i>Ibid</i>)
416	57 Cyg	49.7	+44 00	4.68	B3	B3k	2.854833	28055.351	97.5	0.138	117	-24	4.549	.....	2.14	Luyten, Struve, Morgan YO 7, 281, 1940 R
417	+44°3639	53.1	+44 33	6.01	Oe5	O6k	48.608	22892.226	66.75	0.099	42.22	- 5.78	28.076	0.374	.....	Plaskett DAO 2, 183, 1922
418	δ Equ	21 09.6	+ 9 36	4.61	F5	F3	5.70 yr	1929.85	164.5	0.39	.....	-15.4	.....	.....	.....	Aitken LO 12, 158, 1914 R
419	+57°2309 ab	14.6	+58 10	6.41	B3	B3ek	5.41364	23635.140	58.5	0.114	40.0	var	2.960	0.0353	.....	Sanford Apf 64, 186, 1926 R
420	+57°2309abc	14.6	+58 10	6.41	B3	.....	225.44	23803.98	16.6	0.226	21.9	-17.2	65.989	0.3956	.....	Sanford Apf 64, 186, 1926 R
421	+32°4134	17.1	+32 11	6.03	A0	.....	20.30	24363.558	219.67	0.441	45.71	- 3.98	10.278	.....	1.87	Harper DAO 3, 319, 1926 R
									78.95				17.753	.....	1.08	
422	+39°4529	17.2	+39 55	6.46	F8	.....	3.24343	21801.549	357.55	0.022	62.23	+ 0.16	2.773	0.0810	.....	Plaskett DAO 1, 113, 1919
423	HD 203858	19.7	+24 54	6.22	A0	A1	6.9463	30006.249	.....	0.00	71.44	-19.46	6.820	.....	1.37	Patten, McKellar DAO 7, 287, 1942 R
424	+18°4794	21.8	+18 58	6.06	A3	.....	21.724	23302.555	.....	0.00	41.45	-12.42	7.780	.....	1.20	Harper DAO 4, 167, 1927 R
425	B 5536	28.9	+75 58	7.67	F0	A6n	8.4455	17978.327	12.2	0.039	79.71	- 4.69	9.250	0.1607	.....	Harper RASC 29, 411, 1935 R
									80.28				9.316	.....	1.78	
426	ν Oct	30.4	-77 50	3.74	K0	.....	1037	17506	90	0.25	8.0	+34.7	110.400	0.050	.....	Colacevich ASP 47, 87, 1935 R
427	+27°4107	30.9	+27 46	6.35	F0	F3	12.21	23710.068	46.79	0.318	51.95	-43.17	8.270	.....	0.97	Harper DAO 3, 241, 1925 R
									65.24				10.385	.....	0.77	
428	* AQ Peg	32.5	+13 01	(10.0-12.7)	A2	A2+G5	5.55	0.85 P	15	0.24	35	- 8	2.59	0.023	.....	Struve Apf 103, 76, 1946 R
429	β GC 11160A	35.8	+57 02	(5.9)	Oe5	O6nk	3.708611	22889.592	58.79	0.111	75.86	- 7.65	3.761	0.165	.....	Rufus MO 6, 45, 1934 R
430	42 Cap	36.1	-14 30	5.28	G5	G1	13.173584	22069.255	175.42	0.158	23.0	- 1.8	4.103	0.0159	.....	Sanford Apf 95, 425, 1942 R
431	B 5575	37.8	-20 04	6.17	A3	A6n	6.3702	25486.567	.....	0.00	82.1	-25.5	7.191	.....	1.62	Sanford Apf 74, 205, 1931 R
						A6n			86.3				7.559	.....	1.54	
432	B 5579	38.4	+40 38	5.48	A0	.....	1.72897	21774.161	256.0	0.033	109.70	-25.47	2.607	.....	0.96	Harper DAO 3, 324, 1926 R
									110.35				2.622	.....	0.95	
433	B 5591	39.9	+28 19	6.90	A5	A9	3.74860	22175.1577	262.66	0.189	92.1	+ 4.2	4.662	.....	1.19	Sanford Apf 53, 218, 1921 R
						A9			93.2				4.728	.....	1.17	
434	κ Peg A	40.1	+25 11	(4.8)	.....	F2	5.97152	19954.957	148	0.031	41.7	var	3.430	0.045	.....	Luyten Apf 79, 449, 1934

435	κ Peg AB	21	40.1	+25 11	4.27	F5	F2	11.53 yr	1909.86	131	0.30	.....	- 8.1	.....	.....	.....	.....	.....	Luyten <i>Apj</i> 79, 449, 1934 R
436	δ Cap	41.5	-16 35	2.98	2.98	A5	A7s	1.02275	21451.86	149.06	0.019	65.67	- 5.82	0.926	0.0301	.....	.....	.....	Crump <i>Apj</i> 54, 127, 1921 R
437	π^2 Cyg	43.1	+48 51	4.3	4.3	B3	B3k	72.0162	28410.6	238.1	0.034	7.8	-12.3	7.720	0.0035	.....	.....	.....	Taffara <i>O Ast Padova</i> No. 65, 1939 R
438	HD 207650	45.4	+29 43	5.00	5.00	A0	.....	5.30465	29117.474	302.7	0.528	37.01	-23.89	2.293	.....	0.082	.....	.....	Petrie <i>DAO</i> 7, 245, 1940
439	B 5620	46.8	+66 20	6.51	6.51	F2	.....	2.72574	28396.623	146.9	0.025	40.35	-15.25	2.500	.....	0.075	.....	.....	McKellar, Patten <i>DAO</i> 7, 243, 1940 R
440	B 5629	48.8	+55 20	5.54	5.54	B3	B7 B9	17.3263	24415.682	269.9	0.224	108.3	- 6.5	25.170	.....	20.8	.....	.....	Pearce <i>DAO</i> 6 73, 1932 R
441	* VV Cep	53.8	+63 09	(4.9-5.7)	(4.9-5.7)	Map	M2+B9	7450	26970.075	339	0.25	165.8	-20.6	38.530	6.05	.....	.....	.....	Gaposchkin <i>AAS</i> 9, 39, 1937 R
442	* MR Cyg	55.0	+47 30	(8.50-9.30)	(8.50-9.30)	A0	.....	1.676970	.....	103.2	0.122	147.0	-26.0	2030.000	.....	3.01	.....	.....	Pearce <i>RASC</i> 29, 411, 1935
443	* CM Lac	56.1	+44 04	(8.21-9.34)	(8.21-9.34)	A2	.....	1.60469	25922.284	.....	0.00	172.9	-17.5	3.957	.....	2.56	.....	.....	Sanford <i>Apj</i> 79, 95, 1934 R
444	* RT Lac	57.5	+43 24	(9.06-10.12)	(9.06-10.12)	G5	G9 K1	5.073921	18204.444	.....	0.00	117.5	-47.0	3.509	.....	1.5	.....	.....	Joy <i>Apj</i> 74, 101, 1931 R
445	B 5671	59.6	- 1 23	5.23	5.23	A3	A8s	7.8327	21806.644	.....	0.00	116.0	-20.45	4.360	.....	1.0	.....	.....	Miss Farnsworth, Miss Jones <i>LOB</i> 16, 46, 1932 R
446	HD 209813	22	01.0	+46 45	6.52	K0	K0	24.431	31660.819	60.38	0.027	33.14	-22.21	11.13	0.0922	.....	.....	.....	Miss Northcott <i>DDO</i> 1, 376, 1947
447	Σ 2873 B	01.9	+82 23	7.37	7.37	F5	G5	1.1522143	23213.363	.....	0.00	105.6	-17.0	1.673	.....	0.65	.....	.....	Sanford <i>Apj</i> 65, 295, 1927 R
448	+47°3692	02.0	+47 45	6.16	6.16	B3	B3k	2.1721	22138.172	.....	0.00	112.4	-17.76	1.781	.....	0.61	.....	.....	Young <i>DAO</i> 1, 193, 1920 R
449	ϵ Peg	02.4	+24 51	3.96	3.96	F5	F3	10.21312	14820.966	251.81	0.008	47.99	- 4.12	3.810	0.47	.....	.....	.....	Curtis <i>LOB</i> 2, 169, 1904 R
450	* AR Lac	04.6	+45 15	(6.96-7.78)	(6.96-7.78)	G5	K0	1.983244	26625.732	334.82	0.041	120.02	-36.25	6.740	0.117	.....	.....	.....	Harper <i>RASC</i> 27, 146, 1933
451	α Tuc	11.7	-60 45	2.91	2.91	K2	K5	4197.7	18666.4	48.5	0.385	119.19	+42.24	3.247	.....	1.40	.....	.....	S Jones <i>MNV</i> 88, 657, 1928 R
452	B 5764	16.9	+46 02	4.66	4.66	B5	B5	2.616394	27700.07	.....	0.00	74.8	-10	385.100	0.1295	.....	.....	.....	Luyten, Struve, Morgan <i>YO</i> 7, 285, 1940 R
453	HD 213389	25.9	+48 51	6.52	6.52	K0	K1	17.755	31656.953	103.34	0.023	96	+ 5.36	3.453	.....	0.59	.....	.....	Miss Northcott <i>DDO</i> 1, 379, 1947
454	+28°4389	27.0	+29 02	6.32	6.32	A5	.....	2.3409	24715.985	30.11	0.016	79.18	+ 1.73	9.806	0.119	.....	.....	.....	Harper <i>DAO</i> 6, 203, 1933 R
455	B 5834	31.7	+49 33	6.20	6.20	B3	B3k	10.9114	24340.542	67.54	0.253	83.27	-15.28	2.548	0.121	.....	.....	.....	Hill <i>DAO</i> 3, 358, 1926
456	HD 214652	34.6	+36 51	6.67	6.67	B3	B3k	1.254535	28253.055	307	0.022	129.44	-12.61	18.789	.....	3.87	.....	.....	McKellar <i>DAO</i> 6, 369, 1937
457	B 5846	34.8	- 9 53	6.74	6.74	Go	F6	21.6997	25172.797	213.1	0.38	63.78	-39.3	15.599	0.034	.....	.....	.....	Sanford <i>Apj</i> 74, 209, 1931
458	η Peg	38.3	+29 42	3.10	3.10	Go	G2	818.0	15288.7	5.60	0.155	14.20	+ 4.31	157.800	0.234	.....	.....	.....	Crawford <i>LOB</i> 1, 27, 1901 R
459	* ZZ Cep	41.7	+67 36	(9.0-10.1)	(9.0-10.1)	A2	B7+Fo	2.141800	0.699 P	340	0.03	95.0	-17.4	2.80	.....	4.10	.....	.....	Herbig <i>Apj</i> 106, 115, 1947 R
460	* AH Cep	44.2	+64 32	(6.63-6.85)	(6.63-6.85)	B3	B0nk B0nk	1.77476	24076.621	106.3	0.034	205.0	-20.6	6.03	.....	1.90	.....	.....	Pearce <i>RASC</i> 29, 411, 1935 R
461	B 5900	48.2	+16 19	5.72	5.72	K0	K1	24.65	22240.992	.....	0.00	225.3	-12.84	6.371	.....	11.4	.....	.....	Harper <i>DAO</i> 1, 203, 1920 R
462	B 5913	51.8	+41 04	5.54	5.54	B3	B3sk	12.3106	24063.894	7.8	0.10	261.2	- 6.9	11.254	0.094	.....	.....	.....	Struve, Bobrovnikoff <i>Apj</i> 62, 139, 1925 R
463	* HD 218066	23	00.0	+62 51	7.8	B5	B3	2.72916	30386.277	57.1	0.058	202.1	- 9.9	7.570	.....	9.72	.....	.....	Petrie <i>DAO</i> 7, 305, 1947
464	+45°4147	02.7	+45 33	6.56	6.56	B5	B3k	3.3372	22151.272	125.67	0.233	206.5	-15.13	7.740	.....	9.51	.....	.....	Young <i>DAO</i> 1, 239, 1920
465	+58°2546	03.0	+59 13	6.28	6.28	B3	B3sk B5	7.25105	21825.038	71.6	0.376	87.9	- 4.6	8.121	0.215	.....	.....	.....	Pearce <i>DAO</i> 6, 53, 1932
466	π Cep A	04.7	+74 51	(4.7)	(4.7)	G5	G1	556.2	14126.33	5.70	0.281	146.7	-19.63	13.554	.....	2.9	.....	.....	Harper <i>DAO</i> 3, 204, 1925 R

TABLE I—(Continued)
ORBITAL ELEMENTS OF SPECTROSCOPIC BINARY STARS

	Star	α 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ³	$f(m)$	$m \sin^3 i$	Authority
		^h 23	^m 04.7 06.7	^s -45 47 +52 29	Hvd.	Rev.										
467	* Gru			4.10 (8.9-9.9)	K0	G5	409.614	16115.569	240.76	0.656	13.62	-4.17	57.900	0.0462	.....	S Jones <i>CA</i> 10, Pt 8, 89, 1928
468	* RT And				K2	dGo + dK1	0.62893249	31441.536	282.50	0.089	132.5	+20	1.141	.....	1.507	Mrs. Gaposchkin <i>ApJ</i> 103, 291, 1946 R
469	* AN And			(5.9-6.1)	A3	A9s	3.2195	21059.912	40.57	0.036	73.56	-4.87	3.240	0.133	.....	Young <i>DO</i> 4, 83, 1917
470	* AR Cas			(4.9-5.0)	B3	B3k	6.06638	27881.842	45	0.27	60.0	-17.0	4.819	0.121	.....	Luyten, Struve, Morgan <i>YO</i> 7, 289, 1940 R
471	* Y Psc			9.2	A2	A3 + K0	3.77	0.03 P	103	0.12	37	+6	1.90	0.019	.....	Struve <i>ApJ</i> 104, 253, 1946 R
472	B 6070			6.18	A0	.....	11.2298	21916.942	236.38	0.037	26.70	-27.38	4.120	0.022	.....	S Smith <i>DAO</i> 8, 163, 1925 R
473	λ And			4.00	K0	G7	20.5212	29202.389	313.6	0.040	6.64	+6.84	1.872	0.0006	.....	Pearce, Walker <i>RASC</i> 38, 249, 1944 R
474	* XX Cep			(8.7-9.5)	A	A8	2.34	0.00 P	76	0.14	28	-29	0.88	0.005	.....	Struve <i>ApJ</i> 103, 76, 1946 R
475	* UU Cas			(9.7-10.0)	K2	B1	8.520676	23450.42	.....	0.00	161	-56	18.863	3.693	.....	Sanford <i>ApJ</i> 79, 84, 1934 R
476	B 6129			6.55	K2	dK5	7.75310	20001.264	.....	0.00	39.88	+1.68	4.250	.....	0.32	Christie <i>ApJ</i> 80, 181, 1934 R
477	* XY Cep			(10.0-10.8)	.....	B8 + A0	2.77	0.25 P	.....	0.00	49.70	-14	5.300	.....	0.26	Struve <i>ApJ</i> 103, 76, 1946 R
478	+27° 4642			7.30	K0	G8p	6.7217	22220.740	18.6	0.059	54	-19.8	2.06	0.045	.....	Sanford <i>ApJ</i> 83, 221, 1921
479	B 6142			6.05	B0	B0k	13.4187	20801.379	0.0	0.1	117.5	-24.3	21.600	.....	13.5	Sanford <i>ApJ</i> 83, 121, 1936 R
480	B 6148			5.69	F5	F3	12.155	22162.601	213.45	0.278	144	+11.98	26.400	.....	11.0	Harper <i>DAO</i> 2, 263, 1923 R
											72.97		11.716	.....	1.67	

NOTES TO TABLE I

1. B 1. Recent observations at Victoria indicate no correction to the elements are needed. *DAO* 6, 208, 1935.
3. α And. ADS 94, 2.9-11.4, $d = 75''$. Earlier orbit by Baker (*AO* 1, 17, 1908). Present elements are based on Allegheny observations (1907-08) and Victoria observations (1935-36). Orbit by Luyten, Struve, and Morgan (*YO* 7, 251, 1940) based on 40 Yerkes observations (1930-35). Also one by Kohl (*AN* 262, 469, 1937) derived from Babelsberg observations. The elements agree fairly well except Yerkes obtains $K = 34.0$ km/sec, and Kohl finds $e = 0.479$. From the four sets of observations the Yerkes observers obtain $P = 96^d 688^s$.
5. Σ 12 A. ADS 191, 6.2-7.8, $d = 12''$.
7. TV Cas. Luyten's orbit (*ApJ* 84, 85, 1936) based on the Victoria observations gave $e = 0.024$ with other elements similar to Plaskett's. Sahade and Struve (*ApJ* 102, 480, 1945) found that their 1945 observations fit Plaskett's orbit but show an appreciable rotational disturbance.
9. α Phe. Alden (*AAS* 9, 31, 1937) has derived the following apparent orbit of the primary from Yale plates: $a = 0''.072$, $i = 110^\circ.4$, $\Omega = 221^\circ$, $\omega = 3^\circ$, $a \sin i = 0''.068$, from which with spectroscopic element $p = +0''.036 \pm 0''.005$.
11. 13 Ceti A. Earlier orbits by Fox (*ApJ* 27, 375, 1908), Paraskévopoulos (*ApJ* 52, 110, 1920) and Pogo (*ApJ* 68, 116, 1928). Bauer from 108 Yerkes spectrograms found from variation in γ , $m_A = 1.8\odot$, $m_B = 0.6\odot$ and $P = 2^d 081877$.
12. 13 Ceti A B. ADS 490, 5.6-6.4, $d = 0''.3$. Luyten finds evidence of a rotation of line of apsides of short period system, but observations are not sufficient to establish this with certainty. The value of ω is given by $\omega = 180^\circ + 0''.016 (t - T)$. Additional data from spectroscopic and micrometric observations yield $i = +52^\circ$; $a = 0.244$; $\Omega = 24^\circ$. For $p = 0''.050$, $a = 4.9$ ast. units, $m_A = 1.27\odot$ and $m_B = 1.05\odot$.
13. π And. ADS 513, 4.5-9.0, $d = 36''$. Earlier orbit by Jordan (*AO* 2, 49, 1910) and by Luyten, Struve, and Morgan (*YO* 7, 254, 1940) based on their 1934 observations. From the Allegheny and Yerkes data they find $P = 143^d 621 \pm 0^d 007$.
14. π Cas. Revised elements by Victoria (*DAO* 6, 208, 1935) give $P = 1^d 96418$, $T = 2421295.789$. Luyten (*lc*, Note 7) from same material adopts $e = 0$.
15. ρ Tuc. Neubauer (*ASP* 41, 371, 1929) found his 21 observations of 1924 are represented by Lunt's elements.
16. YZ Cas. ADS 624, 6-9.7, $d = 36''$. Epoch is time of nearest approach of primary to observer. Huffer (*WO* 15, 103, 1928) from spectroscopic and photometric elements obtained the following absolute dimensions: $m_1 = 3.4\odot$; $m_2 = 1.6\odot$; $r_1 = 3.10\odot$; $r_2 = 1.50\odot$; $\rho_1 = 0.120\odot$; $\rho_2 = 0.510\odot$; $a = 13,795,000$ km. Kron (*ApJ* 96 173, 1942) has determined the coefficient of limb darkening for each component in blue and in red light.
18. ζ And. Earlier orbit by Cannon (*DO* 2, 143, 1915). Luyten (*lc*, Note 7) from a discussion of Ottawa and Cape observations finds $P = 17^d 7678$, and $e = 0$.
19. ν And. Epoch is time of maximum positive velocity.
23. ξ Phe. SDS, 4.2-7.8, $d = 6''$. Elements provisional.
24. ζ Psc B. ADS 996, 4.2-5.3, $d = 23''$.
25. α UMi. ADS 1477, 2.0-9.0, $d = 18''$. Short period variation in velocity ($P = 3^d 9683$). $K = 2.74$ km/sec, is Cepheid variable.
28. Σ 145 A. ADS 1326, 6.0-10.6, $d = 11''$.
30. α Tri. Revised elements by Victoria give $P = 1^d 73631$; $T = 2420500.349$ (*DAO* 6, 211, 1935). Luyten (*lc*, Note 7) points out that a period of $2^d 3413$ will also represent the observations fairly well.
32. β Ari. Earlier orbit by Ludendorff (*ApJ* 25, 320, 1907).
34. X Tri. T is phase of minimum velocity. Rotational disturbance, $V_{rot} = 50$ km/sec.
- 37 and 38. Σ 227 A, Σ 227 B. ADS 1697, 5.0-6.4, $d = 4''$. Recent observations at Victoria give no corrections to elements of Σ 227 A, but yield revised elements for Σ 227 B, $P = 2^d 23655$; $T = 2422635.849$; (*DAO* 6, 212, 1935). Luyten (*lc*, Note 7) for Σ 227 B regards orbit as circular.
39. 6 Per. Elements provisional.
40. δ Tri. ADS 1739, 5.2-13.7, $d = 64''$. Luyten (*lc*, Note 7) from same data finds $e = 0.046 \pm 0.017$; $\omega = 13^\circ.5 \pm 23^\circ$ and states that Pearce's value of ω should read 11° .
42. Σ 5 A. ADS 1982, 6.1-7.1, $d = 38''$.
44. B 613. See Note 1. Luyten (*lc*, Note 7) adopts circular orbit.
45. RZ Cas. Later orbits based on same material by Luyten (*lc*, Note 7) and Ellsworth (*Lyon* O, ser 1, 2, 72, 1937). From photometric observations e should be less than 0.01. Luyten finds $e = 0.044 \pm 0.031$ and $\omega = 195^\circ \pm 38^\circ$. Ellsworth finds $e = 0.018$; $\omega = 125^\circ$. Pearce (*ASP* 49, 223, 1937) from comparison of Allegheny elements and those given by the 1936 Victoria observations announced a rotation of the line of apsides in a period of 18.3 years. Luyten (*ASP* 49, 329, 1937) showed that the orbital eccentricity is too small to permit of detecting apsidal motion from values of ω determined spectroscopically.
46. π Ari. ADS 2151, 4.9-8.4, $d = 3''$. From same data Luyten (*lc*, Note 7) finds $e = 0.080 \pm 0.048$; $\omega = 102^\circ \pm 36^\circ$.
47. $57^d 651$. See Note 1.
48. τ Per. Orbit based on 30 Lick (1898-1935) 3 Bonn and 2 Victoria observations.
49. ST Per. T is phase of minimum velocity. There is evidence in the velocity-curve of a negative rotational disturbance, no observations being secured where a positive one would have been expected. One half of curve was not well observed, but the orbital elements are probably substantially correct.
50. β Per a b. ADS 2362, var -12, $d = 58$. Epochs for the short period orbits refer to the light minimum J.D. 2422619.7908, with added corrections for equation of light in the long period orbit, and to the respective dates 1923.65 and 1924.65.
53. $34^d 610$. ADS 2433, 6.5-12.0, $d = 30''$. See Note 1.
54. RT Per. T phase of minimum velocity. There is evidence that the observations deviate systematically from the published velocity-curve, and the orbit should be considered of preliminary character.
55. B 804. See Note 1.
56. B 809. Epoch is time when primary is nearest observer.
57. HD 22124. "Circular orbit fits observations fairly well."
59. $\circ$ Per. ADS 2726, 4.0-8.5, $d = 0''.8$. Earlier orbit by Vogel (*ApJ* 17, 212, 1903) and a later discussion by Ludendorff (*AN* 188, 211, 1911), who concluded that the velocity of the system is variable.
63. λ Tau a b. Earlier orbit by Schlesinger (*AO* 3, 23, 1913; 167, 1914). McLaughlin's elements were derived from the Allegheny observations after excluding those affected by rotation of the star, and differ very little from those of Schlesinger. He also finds evidence on Ann Arbor plates of secondary spectrum from measures of which, together with Stebbins' light elements (*ApJ* 51, 217, 1920) he derives for the mass ratio 3:1, $r_1 = 5.35\odot$; $r_2 = 4.00\odot$; $m_1 = 3.71\odot$; $m_2 = 1.24\odot$; $\rho_1 = 0.0240\odot$; $\rho_2 = 0.019\odot$.
64. λ Tau a b c. The elements quoted seem to satisfy Ann Arbor observations better than those of Schlesinger with $P = 34^d 60$. A definite effect of rotation is shown with the improved elements. Both the long period orbit and rotational effect require further study.
65. AG Per. ADS 2990, 7.0-9.0, $d = 1''$.
66. YY Eri. T is phase of minimum velocity. More massive component is apparently in front of less massive component during the principal eclipse.

67. μ Per. ADS 3071, 4.5-12.0, $d = 15''$. Earlier orbit by Cannon *DO* 2, 353, 1915.
68. B 986. Earlier orbit by Cannon (*DO* 1, 285, 1911) included measures of secondary. Harper (*DAO* 4, 309, 1930) derived an orbit from Victoria observations, and was unable to find evidence of secondary spectrum. He concluded that the velocity of system was probably variable.
69. $+16^\circ 577$. Member of Taurus stream.
70. B 1001. SDS, 4.0-5.0, $d = 0''.5 \pm$.
71. Σ 82 A. ADS 3169, 7.0-9.0, $d = 1''$.
72. B 1018. Elements are revision of Jantzen's orbit (*AN* 196, 117, 1913). Member of Taurus stream.
73. $+72^\circ 227$. ADS 3267, 6-13, $d = 40''$. Luyten (*lc*, Note 7) finds $e = 0.051 \pm 0.045$; $\omega = 273^\circ$ and adopts a circular orbit. He says Harper's value for T probably should read 2425950.989 instead of the one quoted.
74. θ^2 Tau. Member of Taurus stream. Earlier orbit by Plaskett (*DO* 2, 63, 1915).
75. B 1074. Spectrum composite; spectrum of primary veiled by that of secondary.
76. B 1076. ADS 3317, 4.5-8.5, $d = 70''$. Revised elements at Victoria give $P = 3^d 57^m 10.4s$; $T = 2419643.013$ (*DAO* 6, 218, 1935). Epoch is time when secondary is nearest to observer. Orbit by Harper (*DO* 1, 125, 1913) gives $m_2/m_1 = 0.47$; $m_1 \sin^3 i = 2.7\odot$. Later orbit by Daniel (*AO* 3, 96, 1914) is in close agreement with Wilson's. Spectrum of secondary is not visible on Victoria, Allegheny or Lick spectrograms.
77. β GC 2280 A. ADS 3359, 5-12, $d = 4''$. Since the mean error of e is more than three times the value of e , Luyten (*lc*, Note 7) points out that a circular orbit should be adopted.
82. π^4 Ori. From same data Luyten (*lc*, Note 7) finds $e = 0.038 \pm .023$, $\omega = 167^\circ \pm 33^\circ$.
83. π^5 Ori. Epoch is time of maximum positive velocity.
84. β GC 2406 A. ADS 3536, 4.6-7.9, $d = 1''$. Revised elements by Victoria give $P = 3^d 88^m 45s$; $T = 2418692.944$. *DAO* 6, 218, 1935.
85. ϵ Aur. Earlier orbit by Ludendorff (*Sitz. Ber. Acad.* 49, 1924). The present elements are based upon Potsdam and Yerkes radial velocities. The spectrum is formed by the smaller F2 star. The larger component has a temperature of about 1200° to 1400° and gives no light in the region of the spectroscopic observations. Spectroscopic and photometric observations during the eclipse show that the infrared star is semi-transparent, and that its non-selective opacity for visual and photographic light is concentrated in an outer shell. From photometric and spectrographic elements, with $i = 70^\circ$ the ratio of the radii and mass ratio are determined.
86. ζ Aur. Christie and O. C. Wilson, from Mount Wilson spectrograms taken during the 1934 eclipse, have observed the B-component, and the value of K_2 quoted for it is given below Harper's value for K_1 , whose elements for the primary were used by them. They found a systematic difference of 4 km between their observations and those of Harper, which is indicated by the value of γ in (). Their mass ratio of 1.85 is the mean of Mount Wilson values and that by Tremblot (*CR* 198, 1977, 1934). From photometric and spectroscopic elements they find $m_A = 15.3\odot$; $m_B = 8.3\odot$; $r_A = 192\odot$; $r_B = 8.5\odot$; $\rho_A = 2.16 \times 10^{-6}\odot$; $\rho_B = 0.013\odot$.
87. B 1213. ADS 3698, 6.0-9.2, $d = 53''$. On Lick spectrograms a faint line is visible between the other two lines but does not partake of their change in position (*ASP*, 30, 351, 1918.)
88. B 1216. ADS 3709, 6.0-12.5, $d = 14''$.
89. TT Aur. Epoch is H. G. M. T. of minimum light.
90. SX Aur. From photometric and spectroscopic elements with $i = 81^\circ$, $m_1 = 10.80\odot$; $m_2 = 5.66\odot$; $r_1 = 5.18\odot$; $r_2 = 4.32\odot$; $(a_1 + a_2) = 12.0 R\odot$.
91. ER Ori. T is epoch of superior conjunction.
92. Σ 653 A. ADS 3824, AC, 5.0-7.2; $d = 15''$; AB, 5.0-11.0, $d = 12''$. Revised elements by Victoria (*DAO* 6, 219, 1935) give $P = 3^d 78^m 73s$.
93. α Aur. ADS 3841, 1.0-16.0, $d = 46''$. From a comparison of Mount Wilson (1921-22) and Lick (1900) observations Sanford concluded that Reese's period cannot be in error by .01 day, and that velocity of the system may have changed about 1 km/sec. Merrill's orbit (*ApJ* 56, 40, 1922) from interferometer measures gives $T = 2422596.79$, $\omega = 114^\circ 30'$; $i = 41^\circ 08'$; $\Omega = 38^\circ 70'$; $e = 0.0086$; $a = 0''.05360$. With these and spectrographic elements, he derived $a_1 + a_2 = 126,630,000$ km. $p = 0''.0632$; $m_1 = 4.2\odot$; $m_2 = 3.3\odot$. Merrill suggests a rotation of line of apsides.
95. Σ 674 A. ADS 3866, 6.5-9.5, $d = 10''$. Epoch is time of maximum positive velocity of primary.
96. 16 Aur. Elements provisional.
98. AR Aur. Earlier orbit by Wyse (*ASP* 48, 24, 1936), who assumed $e = 0$, which is in close agreement with Harper's elements, whose small value of e is not significant.
100. B 1275. Epoch is time of closest approach of primary to the sun.
101. η Ori A a b. ADS 4002, 4.0-5.0, $d = 1''$. Baker (*AO* 1, 136, 145, 1910) from observations of secondary found $m_2/m_1 = 0.95$.
103. ψ Ori A. ADS 4039, 5.5-11.1, $d = 2''.5$. Harper (*DO* 4, 343, 1919) measured the lines of secondary and derived $m_2/m_1 = 0.63$.
104. χ Aur. H and K blend of stellar and interstellar lines.
105. EY Ori. T is phase 0.39 P after mid-eclipse.
106. δ Ori A. ADS 4134, 2.0-13.5, $d = 33''$. T is nodal passage of primary. Orbits by Hartmann (*ApJ* 19, 278, 1904), Jordan (*AO* 3, 131, 1914), Curtiss (*ApJ* 42, 135, 1915), and Hnatek (*AN* 213, 17, 1920). From Potsdam, Allegheny, Michigan and Yerkes observations, the present authors find evidence of a forward rotation of the apse in a period of the order of 280 years.
- Measures of a second component of $\lambda 4471$ on six plates gave $K_2/K_1 = 2.6$. From photometric and spectroscopic elements they obtained $a = 31 \times 10^8$ km; $m_1 = 26\odot$; $m_2 = 10\odot$; $r_1 = 17\odot$; $r_2 = 10\odot$; $\rho_1 = 0.005\odot$; $\rho_2 = 0.010\odot$.
107. VV Ori a b. Epoch is time when radial component of orbital velocity is zero and changing from negative to positive.
108. VV Ori a b c. Elements provisional.
109. ϕ^1 Ori. Orbit provisional.
113. θ^2 Ori A. ADS 4188, 4.8-6.1, $d = 52''$. Earlier orbit by Struve (*ApJ* 60, 159, 1924).
114. ϵ Ori. The orbit was derived after introducing a secondary oscillation of same period whose elements are given in the second line. The system should receive further study.
117. B 1399. See Note 114.
118. γ^1 Cam. See Note 1. Luyten (*lc*, Note 7) from same material finds $e = 0.045 \pm .022$; $\omega = 39^\circ \pm 26^\circ$.
119. B 1457. ADS 4474, 6.0-12.0, $d = 15''$. Elements for secondary based on four Lick observations. Luyten (*lc*, Note 7) from same observations finds $e = 0.005 \pm .030$ and adopts a circular orbit.
121. β Aur. ADS 4556, 2.0-10.5, $d = 15''$. Baker finds period variable and given by $P = 3^d 96^m 00.27s + 0^d 00^m 00.10s$ ($t - 1906$); epoch is time of passage through ascending node. Orbits by Rambaut, Vogel, Ludendorff, Belopolsky, and Baker. Present one is based upon all reliable data up to 1910, and is for epoch 1905.78. Tikhoff (*Pul Mit* 10, 205, 1925) derived orbits based on different lines.
123. RW Gem. T is phase of minimum velocity. Velocity-curve shows rotational effect.
124. μ Ori A. Orbits by Frost and Struve (*ApJ* 60, 192, 1924), (*YO* 7, 28, 1929) from which velocity of system was found to be variable in a period of about 18 years. Epoch here quoted refers to time of minimum velocity.
125. μ Ori A B. ADS 4617, 4.3-6.6, $d = 0''.3$. Orbit based upon observations at nine epochs between 1906 and 1929 and is provisional.

129. η Gem. Irregular velocity variations superimposed upon that due to orbital motion are probably associated with light changes.
130. B 1593. Luyten (*lc*, Note 7) finds $e = 0.024 \pm .031$ and adopts a circular orbit.
132. RR Lyn. Revised elements at Victoria (*DAO* 6, 221, 1935) give $P = 9^d 94.50$, $T = 2420375.952$.
133. $-3^h 14.13$. Luyten (*lc*, Note 7) from same data obtains a difference of 17 km between the values of γ given by the two components, and regards the elements as only approximate.
134. δ Col. Earlier orbit by Wilson and Huffer (*LOB* 10, 15, 1918). Jones' elements are based on Cape and Lick (Chile) observations.
135. WW Aur. T is epoch of primary minimum. From photometric and spectrographic elements ($i = 86^\circ 7'$) $a_1 = 4.073 \times 10^6$ km; $a_2 = 4.226 \times 10^6$ km; $r_1 = 2.47\odot$; $r_2 = 2.22\odot$; $m_1 = 1.82\odot$; $m_2 = 1.75\odot$; $p_1 = 0.121\odot$; $p_2 = 0.160\odot$.
136. $+6^h 13.09$. From same data Luyten (*lc*, Note 7) found $e = 0.035 \pm .013$; $\omega = 187^\circ \pm 22^\circ$.
137. α C Ma. ADS 5423, $-1.6-8.4$, $d = 8''$. The velocity of the system was derived from 151 radial velocity observations of brighter star, on the basis of Aitken's elements and Boss' mass ratio $m_2/m_1 = 0.29$. Aitken finds $i = 43^\circ 31'$; $\Omega = 42^\circ 71'$; $a = 7''.570$. For $p = 0''.376$, $m_1 = 2.53\odot$; $m_2 = 0.73\odot$; $a = 3009 \times 10^6$ km. Various shorter periods have been suspected by several investigators, but the evidence is not convincing.
138. RX Gem. Observations show large scatter, and elements are only provisional.
139. τ Pup. Based upon 26 Lick (Chile) and 31 Cape observations.
140. A Car. Epoch is time of nearest approach of primary to the sun. Elements are provisional.
141. RU Mon. T is phase after mid eclipse. Observations show large scatter. Elements provisional.
142. AO Mon. T is phase of minimum velocity of B3 component. Elements from He I lines.
143. $+25^h 15.94$. ADS 5827, $7.0-13.0$, $d = 20''$.
144. SW C Ma. T is phase 0.84 P. Elements are provisional.
146. 29 C Ma. Velocity of system found by Harper (*DO* 4, 123, 1917) was -12.1 , by Pearce (*DAO* 6, 49, 1932), -10.6 , by Luyten and Ebbighausen (*ApJ* 82, 246, 1935), -9.0 , and in orbit quoted, $+9.3$. The observed difference may be due to a third body. Struve and Sherman tentatively attribute the large red shift, shown by emission lines, to self-absorption in an expanding and rotating shell.
147. τ C Ma. ADS 5977, $5.0-10.5$, $d = 8''$.
148. Σ 1062 A. ADS 6012, $5.3-6.6$, $d = 15''$. Based on Harper's orbit for the brighter component (*DO* 4, 235, 1918) and ten later observations. See Note 1. Luyten (*lc*, Note 7) finds from same data $e = 0.042 \pm .020$; $\omega = 146^\circ \pm 28^\circ$.
149. R C Ma. T_s (primary minimum of velocity curve) $- T_p$ (primary minimum photometric) $= -0.013$ d. $e = 0.013 \pm .062$ and a circular orbit should be adopted.
150. AR Mon. Ko star is in front at primary eclipse. The radial velocities derived from the central emission lines H and K agree well with those of primary star. This suggests that the Ko star is surrounded by an envelope of calcium gas which is probably excited by the secondary star.
151. RY Gem. Elements are for K2 star (secondary). The value of K is for K_2 .
152. B 1945. ADS 6089, $5.3-9.5$, $d = 43''$. Harper gives $e = 0.002 \pm .025$. Circular orbit should be adopted.
153. γ C Mi. ADS 6100, $4.3-13.0$, $d = 32''$.
155. σ Pup. SDS, $3.3-8.4$, $d = 22''$. Earlier orbit by Lunt (*ApJ* 44, 261, 1916). Wilson's elements are based upon Cape and Lick (Chile) observations.
156. α^1 Gem. Earlier orbits by Belopolsky (*ApJ* 5, 1, 1897), Curtis (*LOB* 4, 55, 1906), Lehmann-Balanovskaya (*Pul OB* 9, 365, 1922), Barlow (*DO* 9, 149, 1929), Luyten (*Pub Min O* 2, 3, 1934). Guthnick and Prager (*VBB* 1, 56, 1914) observed slight variation in light of a Geminorum having the period of the velocity variation of α^1 .
157. α^2 Gem. Earlier orbits by Curtis (*LOB* 4, 55, 1906), Rossowskaya (*Pul OB* 10, 102, 1924), Barlow (*DO* 9, 140, 1929), and Luyten (*Pub Min O* 2, 5, 1934).
158. α Gem. ADS 6175, $2.7-3.7$, $d = 6''$. From his elements of visual pair and the relative radial velocities of α^1 and α^2 Luyten computes $p = 0''.068$ (Miss Vinter-Hansen finds $p = 0''.070$). The mass of the system is then found to be $5.5\odot$, and with Rabe's value of the mass ratio, $0.42/0.58$, the mass of $\alpha_2 = 3.2\odot$, and of $\alpha_1 = 2.3\odot$.
159. VY Gem. Epoch is time when primary is farthest from sun.
160. α CMi. ADS 6251, $1.0-13.5$, $d = 5''$. Orbit (of brighter star about center of mass of system) was derived from micrometric, meridian, and radial velocity observations. Jones finds $i = +30^\circ 6'$, $\Omega = 307^\circ 8'$, $a = 1''.020$, and for $p = 0''.308$, $m_1 = 1.24\odot$, $m_2 = 0.39\odot$, $a = 495 \times 10^6$ km.
162. σ Gem. Revised elements at Victoria (*DAO* 6, 224, 1935) give $P = 19^d 60.3$, $T = 2419117.659$. Luyten (*lc*, Note 7) calls attention to the fact that Harper's values of $e \sin \omega = 0.38 \pm 0.77$, $e \cos \omega = 0.65 \pm 0.77$ justify the adoption of a circular orbit.
163. UZ Pup. T is epoch of maximum velocity. The spectrum shows two components of very different intensities but approximately same spectral type.
164. B 2035. Provisional elements by Neubauer (*ASP* 44, 254, 1932).
165. β GC 4310. ADS 6420, $5.6-6.7$, $d = 0''.4$. Struve from visual orbit and radial velocities obtains $m_2/m_1 = 0.6$, $a = 900 \times 10^6$ km.
166. TU Mon. T is phase after primary minimum. Orbit based on measures of He I lines. On the assumption that K line of Ca II is due to A5 star $K_2 = 125$ km/sec, $m_1 \sin^3 i = 2.3\odot$, $m_2 \sin^3 i = 1.0\odot$. Elements depend upon five groups of observations and are only provisional.
167. B 2087. Provisional Elements.
169. V Pup. SDS, var -10.0 , $d = 6''$. Relative orbit by Miss Maury (*PA* 29, 22, 1921). For $i = 77^\circ$, $m_1 = 16.5\odot$, $m_2 = 9.7\odot$; $r_1 = 6.1\odot$, $r_2 = 5.3\odot$, $(a_1 + a_2) = 16.0 R\odot$.
171. ϵ Vol. SDS, $4.5-6.0$, $d = 6''$. Epoch is time when primary is nearest sun.
172. XZ Pup. T is phase of periastron.
173. B 2192. Elements Provisional.
175. β GC 4368 A. ADS 6872, $6.5-10.0$, $d = 1''.7$.
176. VZ Hya. T is phase of minimum velocity of brighter component.
177. Σ 1245 A. ADS 6886, $6.0-7.0$, $d = 10''$.
178. RU Cnc. T is phase of minimum velocity of brighter component. Large scatter in observations, and elements are only provisional.
179. β GC 4705 C. ADS 6915 AC, $7.0-8.0$, $d = 45''$. Member of Praesepe cluster.
180. ϵ Hya A B. ADS 6993, $4.0-5.5$, $d = 0''.2$. Miss Adams' elements of visual orbit are: $P = 15.04$ yr, $T = 1915.93$, $\omega = 266^\circ 75'$; $e = 0.61$; $\Omega = 104^\circ 9'$; $a = 0''.21$; $i = 39^\circ 1'$.
181. ϵ Hya C. ADS 6993 C, -7.8 , $d = 3''.2$.
183. H Vel. SDS, $4.9-7.7$, $d = 3''$.
185. RX Hya. T is phase of minimum velocity.
186. κ Cnc. Earlier orbit by Ichinohe (*ApJ* 25, 315, 1907) and a later one by Struve (*ApJ* 99, 216, 1944). The three sets of elements are in fairly good agreement except Struve finds $\omega = 174^\circ 6'$, and $\gamma = +21.1$. He is unable to explain this difference as being due to systematic errors, and thinks the velocity of system may be variable.
190. B 2484. Revised elements at Victoria (*DAO* 6, 225, 1935) give $P = 15^d 99.0$, $T = 2420750.851$.
193. S Ant. Epoch is time of primary minimum.
194. Y Leo. T is phase of minimum velocity. Velocity-curve shows pronounced rotational disturbance.

195. α Leo. ADS 7480, 4.0-10.0, $d = 84''$. Epoch is time when primary is nearest sun. Earlier orbit by Zurhellen (*AN* 173, 353, 1907).
196. W UMa. ADS 7494, var -13.1, $d = 7''$. The period is twice that given by Shapley and Vanderbilt (*ApJ* 46, 281, 1917), and T is epoch given by them for light minimum.
197. m Vel. Luyten (*lc*, Note 7) shows that a circular orbit should be adopted.
198. B 2665. See Note 1. Luyten (*lc*, Note 7) finds $e = 0.043 \pm 0.033$, $\omega = 96^\circ \pm 44^\circ$ and adopts a circular orbit.
199. λ Hya. ADS 7671, 4-13.5, $d = 55''$.
203. UV Leo. The photometric elements give $i = 90^\circ$, and with spectrographic; $r_1 = 1.12\odot$; $r_2 = 1.17\odot$; $m_1 = 1.34\odot$; $m_2 = 1.22\odot$.
204. p Vel. SDS, 4.5-5.0, $d = 0.7''$.
205. ϕ Hya. Elements provisional.
206. TX UMa. T is phase from primary minimum. Pearce (*ASP* 52, 287, 1940) from observations of 1924, 32, 34, and 40 found evidence of rotation of apse in period of 35.6 years and elements $e = 0.162$, $\gamma = -10.9$, $K = 54.3$, $\omega = 295.8 + 10.1 (T - 1900)$. In an earlier orbit (*AASt* 8, 251, 1936) he gave a value of $K_2 = 181$ and $m_1 \sin^3 i = 3.0\odot$, $m_2 \sin^3 i = 0.9\odot$. Hiltner observed rotational effect for primary and also for the secondary if the Ca II K line observed at primary minimum is due to secondary.
207. HD 93075. T is time when primary is nearest sun.
208. ω UMa. Victoria revised elements (*DAO* 6, 226, 1935) give $P = 15^d 8300$, $T = 2418577.185$. Parker measured lines of secondary on three spectrograms, from which $m_2/m_1 = 0.17$. Harper, however, was unable to find secondary spectrum on Victoria plates.
211. ξ U Ma B. Epoch is arbitrarily fixed.
212. ξ U Ma A. Elements derived by Van den Bos from photographic observations; $a = 0.0514$, $i = +95.5^\circ$, $\Omega = 399.2^\circ$.
213. ξ U Ma m. ADS 8119, 4.0-4.9, $d = 1.7''$. Elements are from Van den Bos' visual orbit for which $a = 2.5355$, $i = +122.801^\circ$, $\Omega = 101.400^\circ$. From visual and spectroscopic elements Berman finds total mass of system = $2.27\odot$ and $p = 0.136$.
214. B 2987. Approximate orbit. On basis of Jordan's measures of earlier Allegheny plates, Hertzsprung (unpublished) finds $P = 2^d 53664 \pm 0.00016$ (m.e.); mean error of single epoch = ± 0.0165 .
216. Σ 1561 B. ADS 8250, 5.9-8.0, $d = 10''$.
218. RW UMa. T is phase of minimum velocity of brighter component. From Ca II emission, $K = 72$ km/sec.
219. Z Dra. T is phase of minimum velocity. A portion of velocity-curve is not well observed, and in other portions the observations show considerable scatter. The elements are only approximate.
220. B 3098. Cannon published a second orbit based upon micrometer measures of same plates.
221. +17°2402. Since the value of $e = 0.018 \pm 0.027$ makes ω indeterminate, Luyten (*lc*, Note 7) adopts a circular orbit.
223. α Leo. Through an error this orbit was omitted from the *Fourth Catalogue*.
224. B 3138. Earlier orbit by Cannon (*DO* 4, 125, 1917) was based on erroneous period. Luyten (*lc*) has derived separate elements from the Ottawa and Yerkes observations, for which the respective values of ω were $212^\circ \pm 27^\circ$ and $280^\circ \pm 40^\circ$. He feels that the star merits further attention.
226. θ^1 Cru. SDS, 4.5-13.8, $d = 4.5''$. Earlier orbit of brighter component by Lunt (*CA* 10, Pt 7, 17, G, 1924). Spectrum of secondary resembles that of primary.
227. θ^2 Cru. Epoch is time when primary is nearest to the sun.
228. B 3180. Victoria's revised elements (*DAO* 6, 227, 1935) give $P = 462.48$, $T = 2424665.790$.
229. B 3182. Epoch is time of maximum velocity of recession. Voikevitch-Oculitch (*Pul OB* 10, 26, 1925) derived elements from Pulkovo observations, in which he found $e = 0.07$. Luyten (*lc*, Note 7) concluded that a circular orbit is all that is justified. From Yerkes and Pulkovo data he found $P = 1^d 271022 \pm 0.000020$.
230. B 3195. Provisional elements.
231. η Vir. Earlier orbits by Ichinohe (*ApJ* 26, 282, 1907) and Harper (*ApJ* 27, 100, 1908). The present elements are based upon 3-prism observations.
233. +74°493. T is epoch of maximum velocity of recession of primary.
234. +27°2138. Victoria's revised elements (*DAO* 6, 230, 1935) give $P = 11^d 788$, $T = 2424632.410$.
239. B 3323. Revised elements at Victoria (*DAO* 6, 230, 1935) give $P = 38^d 321$. Cannon from observations of secondary finds $m_2/m_1 = 0.51$. Harper has reexamined Ottawa plates and nine additional Victoria plates, and concludes doubling of lines is occasionally present. He found a mass ratio of 0.6.
240. B 3354. ADS 8682, 4.9-5.4, $d = 22''$.
241. δ Mus. Elements provisional.
242. UY Vir. $T = 1^d 139$ after primary minimum.
243. ξ^2 Cen. SDS, 4.4-9.5, $d = 25''$. Member of Scorpio-Centaurus cluster.
244. RS CVn. Epoch and period are those of Schneller for light variation. Epoch is that of light minimum in H. G. M. T.
245. UW Vir. T is phase of minimum velocity. Velocity-curve shows a rotational disturbance.
246. ζ U Ma A. ADS 8891, 2.1-4.2, $d = 14''$. Orbits by Vogel (*ApJ* 13, 328, 1901), Ludendorff (*AN* 180, 276, 1909), Hnatek (*AN* 209, 49, 1919) and Hadley (*MO* 2, 76, 1915). The present orbit, which agrees well with previous determinations, was determined from 11 Coudé spectrograms (3.8 A/mm at $\lambda 4405$). The period was derived from the Potsdam, Michigan and McDonald observations.
247. α Vir. Earlier orbits by Vogel (*Ptm O* 7, 1936, 1892), Baker (*AO* 1, 72, 1909). Luyten and Ebbighausen (*ApJ* 81, 305, 1935) find rotation of line of apsides in a period of 114 years.
249. B 3511. Present orbit is based on 142 Victoria observations (1920-37), which showed that the period of $1^d 611$ used by Harper (*DO* 4, 223, 1918) was in error.
251. B 3544. Lines of spectrum are diffuse, and the probable error of single observation is large, so that elements are somewhat doubtful.
252. M Cen. SDS, 4.7-10.0, $d = 32''$.
255. ν Cen. Epoch is time of perihelion.
256. h Cen. SDS, 4.8-8.0, $d = 14''$.
257. ζ Cen. Popper assumed Miss Maury's values (*PA* 29, 636, 1921) of e and P .
258. η Boo. Elements based upon Harper's orbit (*RASC* 4, 191, 1910) and were derived from observations at Ottawa, Bonn, Cape, and Lick. Revised elements at Victoria (*DAO* 6, 231, 1935) give $P = 492.45$.
259. B 3610. Elements provisional.
260. α Dra. Several orbits by Plaskett and Harper (*Rep. Chief Astr. Can. App.* 3, 146, 1907) (*RASC* 1, 244, 1907) Victoria's revised elements (*DAO* 6, 232, 1935) give $P = 51^d 41$, $T = 2417711.564$.
261. B 3635. Revised elements (*DAO* 6, 232, 1935) give $P = 9^d 607$, $T = 2419081.780$.
262. B 3644. Epoch is time of maximum positive velocity.
264. +11°2662. Revised elements (*DAO* 6, 233, 1935) give $P = 7^d 3683$, $T = 2426503.295$.
267. α Cen. SDS, 0.3-1.7, $d = 2''-22''$. Finsen finds $i = +79.233^\circ$, $\Omega_b = 25.445^\circ$, $\Omega_a = 17.665^\circ$. The velocity of the system is the mean of the values derived by Wright (*LO* 9, 238, 1909) and Jones (*CA* 10, Pt 8, 206, 1928), the former on the basis of Lick (Chile) radial velocities and Roberts' elements, the latter from Cape observations and Lohse's elements. K_1 and K_2 are quoted from Jones, from which $m_2/m_1 = 0.65$. The value given by Boss is 0.85 and undoubtedly is entitled to greater weight. With this mass ratio and $p = 0.756$, we find $m_1 = 1.08\odot$, $m_2 = 0.88\odot$, $a = 3493 \times 10^6$ km.

270. Σ 1890 B. ADS 9406, 5.8-6.5, $d = 3''.5$. Revised elements (DAO 6, 234, 1935) give $P = 12^d 8244$, $T = 2423187.276$.
271. δ Lib. The present elements are based on the Ann Arbor observations of 1924, from which McLaughlin obtained a rotation effect in the velocity-curve. Earlier orbit by Schlesinger (AO 1, 126, 1910) gave $e = 0.05$, $\omega = 29^\circ 2$, $K = 76.5$, $\gamma = -45.0$. The difference of nearly 10 km/sec in γ for the two orbits probably indicates that the velocity of the system is variable.
272. B 3827. Epoch is time of perihelion.
274. SS Boo. T is 1915 Aug 3.770 UT. Struve's orbit (ApJ 102, 118, 1945) gives approximately the same elements, except he finds $K_1 = 47$ km/sec, $\gamma = -43$ km/sec.
275. U CrB. T is reckoned from 0 phase, 1945, June 3.19 U.T. Earlier orbits by Plaskett (DAO 1, 187, 1920) and by Pearce (AAS 8, 219, 1936) gave values for K_2 of 182 and 212 respectively. Sahade and Struve were unable to observe lines of fainter component at maximum and minimum radial velocities.
278. η CrB. ADS 9617, 5.2-5.7, $d = 0''.5$.
279. β CrB. Neubauer suspects shorter period variation with $P = 320^d 13$; $T = 26475$; $\omega = 102^\circ$; $e = 0.7$; $K = 1.4$ km/sec; $a \sin i = 4.4 \times 10^6$ km.
280. $+47^\circ 2227$. Earlier orbit by Christie (DAO 3, 310, 1926) with erroneous period.
281. α CrB. Earlier orbits by Jordan (AO 1, 85, 1909) and by Cannon (RASC 3, 152 and 421, 1909) are in satisfactory agreement with one quoted.
282. TW Dra. ADS 9706, var -9.5, $d = 3''.5$. Earlier orbit by Plaskett (DAO 1, 147, 1919) gave $e = 0.05$, $\omega = 90^\circ$ —values which are checked by Luyten (*lc*, Note 7). The smaller value of e obtained by Pearce lends weight to Luyten's suspicion that the orbit in reality is circular.
284. ζ CrB A. ADS 9737, 4.1-5.0, $d = 6''$. Luyten (*lc*, Note 7) from same data finds ω of primary 148° , and p.e. of $e = \pm 0.03$. In view of these uncertainties he is probably correct in regarding the orbit as circular.
286. SS Lib. T is phase of minimum velocity. Velocity-curve shows conspicuous rotational disturbance. Direction of rotation is in same sense as that of orbital motion.
287. π Sco. ADS 9862, 6.0-12.0, $d = 50''$. Luyten (*lc*, Note 7) calls attention to large p.e. of e and ω . Struve (ApJ 85, 41, 1937) suspected variation in intensity of absorption lines.
288. ξ Sco. ADS 9909, 4.9-5.2, $d = 1''$.
289. B 4088. T is epoch of ascending nodal passage.
290. β Sco. ADS 9913, 2.0-9.7, $d = 1''$. Earlier orbits by Daniel, Schlesinger (AO 2, 127, 1912) and by Duncan (Low O B 2, 21, 1912) give closely concordant values of the element with $e = 0.27$, $\omega = 20^\circ$. Larger values of ω given by Yerkes observations (1934-36) offers definite evidence of a forward rotation of line of apsides. Struve (ApJ 85, 41, 1937) finds fairly pronounced variation in intensity of absorption lines with the orbital period.
291. θ Dra. Luyten (*lc*, Note 7) calls attention to the fact that since Curtis' value of $e = 0.0141 \pm 0.0166$, ω is indeterminate and the orbit is plainly circular.
294. B 4129. Elements provisional.
295. σ CrB A. ADS 9979, 5.0-6.1, $d = 5''$. Victoria's revised elements (DAO 6, 234, 1935) give $P = 7.975$, $T = 2423814.744$. Luyten (*lc*, Note 7) presents evidence for the adoption of a circular orbit.
297. ι Tr A. SDS, 5.3-9.7, $d = 21''$.
298. B 4177. Revised elements at Victoria (DAO 6, 235, 1935) give $P = 5^d 0193$, $T = 2425417.022$.
300. β GC 7677 A. ADS 10116, 6.3-13.5, $d = 3''$.
302. W UMa. Eccentricity is inconsistent with photometric elements. Velocity of rotation of A3 star is of the order of 40 km/sec. Joy and Dustheimer (ApJ 81, 479, 1935) assumed $e = 0$ and found $\gamma = -7.7$ km/sec; $K = 105.5$ km/sec.
303. ξ Her. ADS 10157, 3.0-6.5, $d = 1''$.
304. B 4247. Epoch is time of maximum positive velocity.
305. WW Dra. ADS 10152 A, 7.7-8.8, $d = 8''$. T is epoch of primary minimum. The lines of secondary are faint and "the velocities derived from them should be accepted with caution." K_2 is therefore not well determined. The strongly exposed spectrograms show fairly narrow single emission H and K lines. These emission lines are displaced in the same direction as the absorption lines of the secondary component. They can be represented by a velocity-curve for which $K_3 = 86$ km/sec. As a possible explanation Joy suggests that the secondary star is surrounded by an envelope of calcium, which is greatly extended in the direction of the primary star. It would describe a smaller orbit than the secondary star, and therefore have a lower velocity. Phenomena of this nature have since been observed in several eclipsing binaries.
306. μ Sco. Relative orbit. $K_1 + K_2 = 480$ km/sec, $(a_1 + a_2) \sin i = 9.534 \times 10^6$ km, $(m_1 + m_2) \sin^3 i = 16.5 \odot$. New light-curve by Rudinick and Elvey (ApJ 87, 553, 1938).
307. TT Her. β Lyrae type.
308. $+13^\circ 3258$. Based on Simeis and Victoria data.
309. UU Oph. T is phase of minimum velocity. The observations show a large rotational disturbance. The star has a faint visual companion.
312. ϵ Her. Earlier orbit by Harper (RASC 4, 302, 1910) derived from blend of two components. The probable errors of e and ω are large, and although Luyten (*lc*, Note 7) retains the elliptical solution he is not convinced of its reality.
314. B 4351. Elements provisional.
315. $+12^\circ 3161$. Revised elements at Victoria (DAO 6, 238, 1935) give $P = 23^d 253$, $T = 2422454.395$.
316. AK Her. ADS 10408, 8.0-12.0, $d = 4''$. Epoch is time of light minimum. Epoch and period by Jordan (AO 7, 142, 1929).
317. α Her B. ADS 10418, 3.0-6.1, $d = 4''$.
318. U Oph. ADS 10428, var -13.0, $d = 20''$. Epoch is time of primary minimum.
319. u Her. ADS 10449, 4.8-10.2, $d = 4''$. On 27 plates Baker measured the lines of secondary and found $K_2 = 253$ km/sec. Earlier orbit by Baker (AO 1, 77, 1909). A later orbit by Luyten, Struve, Morgan (YO 7, 268, 1940) was based on Yerkes (1935) plates. On 12 plates they measured the lines of the secondary, finding K_2 to be of the order of 253 km/sec. Smith's orbit is based on 154 Yerkes 1944 plates. He measured the lines of the secondary on 123 spectrograms, but he does not quote a value of K_2 .
320. TX Her. T is epoch of principal conjunction. Elements are revision of Plaskett's (DAO 1, 207, 1920).
322. $+34^\circ 2971$. Luyten (*lc*, Note 7) finds from same data $e = 0.017 \pm .024$, and remarks that if we retain an elliptic orbit ω must be very uncertain.
324. B 4444. SDS, 5.7-10.5, $d = 5''$. Epoch is time of zero velocity. Elements are provisional and depend upon unpublished data.
325. ξ Ser. Epoch is time of perihelion.
326. ω Dra. Luyten (*lc*, Note 7) considers that nothing more than a circular orbit has been established.
327. $+14^\circ 3329$. ADS 10749, 6.7-9.8, $d = 38''$. Luyten (*lc*, Note 7) considers reality of elliptic orbit doubtful.
328. B 4507. A circular solution by Luyten (*lc*, Note 7) with $\gamma = -27.1$, $K = 60.2$ km/sec, apparently gives smaller residuals than Harper's elements. Revised period and epoch at Victoria give $P = 2^d 82374$, $T = 2422129.307$.
330. *V453 Sco. Emission lines emitted by nebulosity associated with secondary. Velocity-curve of primary shows a conspicuous rotational effect. Earlier orbit by Humason, Nicholson (ApJ 67, 341, 1928) gave quite similar elements.
331. Z Her. Epoch of primary minimum is $2413086.365 + 3.992795 E$ (Nyland, Contr. Prin O 15, 23, 1934).

332. 70 Oph A. The orbit is provisional and was derived from 30 3-prism observations 1897 to 1931. Reul and Holmberg (*ApJ* **97**, 41, 1943) found from photographic observations evidence of a period of about 17 years.
333. 70 Oph AB. ADS 11046, 4.1-6.1, $d = 2$. Pavel finds $i = -58^\circ 743$; $a = 4''.495$; $\Omega = 122^\circ 184$. Adopting $p = 0''.20$ and Pavel's elements and mass ratio $m_B/m_A = 0.36$, we find $m_A = 1.09\odot$, $m_B = 0.38\odot$, $a = 3359 \times 10^6$ km.
334. B 4602. ADS 11061, 5.4-6.1, $d = 20''$.
335. μ Sgr. ADS 11169, 4.0-11.0, $d = 17''$. Earlier orbit by Ichinohe (*ApJ* **26**, 161, 1907). Kohl's elements were derived from measurements of same plates used by Ichinohe. Elvey and Morgan (*ApJ* **88**, 110, 1938) found the star to be eclipsing variable.
336. RS Sgr. T is time of primary minimum.
337. B 4622. ADS 11213, 6.4-9.8, $d = 95''$. Victoria's revised elements give $P = 2^d 04765$, $T = 2422557.150$. Luyten (*lc*, Note 7) finds $e = 0.031 \pm .013$, $\omega = 211^\circ \pm 22^\circ$.
338. ξ Pav. SDS, 4.3-8.1, $d = 3''$.
339. B 4629. Revised elements at Victoria, $P = 485^d$, $T = 2423540.650$.
340. B 4643. Epoch is time of maximum positive velocity of primary. Earlier approximate orbit by Ludendorff (*AN* **197**, 218, 1913).
341. W Sct. T is phase of minimum velocity. Orbit derived from hydrogen lines, which show a large scatter, and elements are provisional.
342. RZ Sct. Large rotational disturbance in partial phases of eclipse. He I lines have range of 250 km/sec; H lines a range of 100 km/sec. Hydrogen forms a slowly rotating reversing layer.
343. RZ Dra. T is phase of minimum velocity. Curve suggests a small rotational disturbance. The star has a faint visual component.
344. d Ser abc. Triple system. Orbit of G star and pair of A-type stars about center of mass of triple system.
345. d Ser bc. Orbit of pair of A-type stars about their center of mass.
347. χ Dra. Three orbits have been derived at the Lick Observatory; Wright's (*ApJ* **11**, 133, 1900) based upon observations in 1898-99; Crawford's (*LOB* **13**, 176, 1928) upon earlier ones and those of 1922-28, and the present one based upon former observations and those of 1933-41. The last investigation has shown definitely that no changes in the orbital elements have occurred during the 43 years in which the star has been observed. Alden (*AJ* **45**, 113, 1936) derived a telescopic orbit giving $i = 60^\circ$, $a_1 = 0''.056$. With this value of a_1 together with that of the present investigation, the following parallax was derived: $p = 0''.117$.
348. B 4678. Elements provisional.
349. RX Her. Epoch is time of primary minimum.
352. ζ Lyr A. ADS 11639 AD, 4.2-5.5, $d = 44''$. Epoch is time of maximum positive velocity. Revised period at Victoria gives $P = 4^d 30002$.
354. KO Aql. T is phase in days from primary minimum.
355. β GC 8849 A. ADS 11698, 6.5-8.5, $d = 0''.4$. Epoch is time of maximum positive velocity.
356. β Lyr. ADS 11745, 3.0-6.7, $d = 45''$. The more massive but fainter star has a spectrum of Class B2e. Its lines are nearly stationary, and across them the lines of the brighter B8 star periodically oscillate. Earlier orbits by Belopolsky and others. Curtiss (*AO* **2**, 73, 1911) made an extensive study of its spectrum. He suspected a variation of the velocity of the system, but Rossiter (*MO* **5**, 67, 1933) showed this to be constant within the errors of observation. Rossiter isolated and measured the rotational effect of the component star. His orbital elements show no striking difference from those of Sherman. An intensive study of the complex spectrum has been made by Struve (*ApJ* **93**, 104, 1941), who interpreted it as an expanding ring of gas surrounding the system and as a gaseous stream from the B8 star. The dynamics of this model have been developed by Kuiper (*Ibid.*, p. 133).
358. B 4779. Luyten (*lc*, Note 7) finds from the same data $e = 0.096 \pm .024$, $\omega = 200^\circ \pm 15^\circ$.
359. B 4788. Luyten (*lc*, Note 7) regards the adoption of a circular orbit as better.
360. Σ 2420 A. ADS 11779, 4.6-7.6, $d = 32''$.
362. β GC 8908 A. ADS 11820, 6.0-12.5, $d = 35''$. Luyten (*lc*, Note 7) from same data finds $e = 0.116 \pm .011$, $\omega = 172^\circ 8 \pm 6^\circ$.
364. $-10^\circ 4926$. Similar elements from same data were derived by Luyten (*lc*, Note 7).
365. B 4864. Epoch is time of maximum positive velocity.
366. B 4870. Luyten (*lc*, Note 7) adopts a circular orbit.
368. $+16^\circ 3758$. Luyten (*lc*, Note 7), from same data, finds $e = 0.050 \pm .020$, $\omega = 57^\circ \pm 25^\circ$. Revision of period and epoch at Victoria gives $P = 4^d 8126$, $T = 2424126.258$.
369. Σ 2469 A. ADS 12075, 7.6-8.7, $d = 1' 3$. In view of the fact that $e = .008 \pm .027$, a circular orbit, as Luyten (*lc*, Note 7) points out, should be adopted.
371. RS Vul. Luyten's (*lc*, Note 7) computation from Plaskett's data gives $e = 0.018 \pm .020$, and he therefore adopted a circular orbit. Struve's (*ApJ* **102**, 480, 1945) observations of the primary fit Plaskett's elements fairly well, after a slight change in the origin of phase due to the use of Dugan's period, $4^d 4777666$. From the metallic lines of the secondary visible at mid-eclipse, Struve estimates its spectrum as A2. Like Pearce, he was unable to observe the secondary outside of eclipse. Plaskett's values of K_2 and of $m_1 \sin^3 i$ and $m_2 \sin^3 i$ are therefore placed in () to call attention to their very doubtful character. A recent orbit by Stillwell (*AAS* **10**, 318, 1943) gives $e = 0.154$, $\omega = 58^\circ 04$.
373. U Sge. Radial velocity of secondary was observed during primary minimum, and from slope of velocity-curve, $m_1/m_2 = 3.3$. Earlier orbit by Miss Fowler (*AO* **3**, 14, 1912) gave $e = 0.035 \pm .018$, $\omega = 44^\circ 14 \pm 45^\circ$. Luyten (*lc*, Note 7) from Allegheny data finds $e = 0.031 \pm .028$, $\omega = 50^\circ \pm 50^\circ$, and from Mount Wilson observations $e = 0.062 \pm .054$, $\omega = 285^\circ \pm 50^\circ$, with $K_1 = 66.7$ km/sec in both cases. He adopts a circular orbit.
374. $+37^\circ 3413$. Revised period and epoch at Victoria give $P = 10^d 3932$, $T = 2425295.893$.
375. ν Sgr. Plaskett finds spectrum to consist of enhanced metallic lines, and of helium lines. The velocities derived from both sets of lines are in close agreement. He also finds hydrogen lines consist of several components, one in the normal position corresponding to displacements of metallic and helium lines, the other displaced to the violet. It was this effect that led to Harvard's announcement of double hydrogen lines, from which Ludendorff computed masses of the two components. Plaskett's observations of 1924-25-26 are well represented by Wilson's elements.
376. Z Vul. ADS 12352, var -12.0 , $d = 13''$. Miss Slonim (*Tashkent Bul* **6**, 187), using Baker's and Jordan's light data, obtained $a = 15.08\odot$, $r_1 = 5.02\odot$, $r_2 = 4.80\odot$, $m_1 = 2.38\odot$, $m_2 = 5.27\odot$.
377. B 4947. Revised elements at Victoria give $P = 7^d 3919$, $T = 2421083.643$. Luyten (*lc*, Note 7) from same data finds $e = 0.020 \pm .020$ and adopts circular elements. He also finds $K_2 = 1.47 K_1$.
379. σ Aql. ADS 12737, 5.5-12.4, $d = 47''$. T is epoch of primary minimum. With Hyllie's photometric elements (*ApJ* **56**, 232, 1922) and spectroscopic elements, $a = 15.1 \text{ r}\odot$, $m_1 = 6.8\odot$, $m_2 = 5.4\odot$, $r_1 = r_2 = 3.66\odot$, $p_1 = 0.14\odot$, $p_2 = 0.11\odot$.
380. B 5026. Revised elements at Victoria give $P = 7^d 6408$, $T = 2422201.398$.
381. δ Sge. Approximate elements.
382. B 5070. Kron (*ApJ* **82**, 232, 1936) from photometric observations gives $P = 12^d 4262$, $i = 72^\circ 16$. He derives $m_1 = 9.7\odot$, $m_2 = 7.3\odot$, $r_1 = 9.6\odot$, $r_2 = 3.4\odot$, $p_1 = 0.011\odot$, $p_2 = 0.178\odot$, $a = 38.2 \times 10^6$ km, $p = 0''.0029$.
383. S Sge. The orbital elements were derived from the variable systemic velocity of this Cepheid. An extensive series of observations made with the Mills 3-prism spectrograph at the Lick Observatory in the years 1921-24-26-27-38-39-40-47, and 48 (unpublished) give a period of approximately 676 days, with the

- other elements similar to those given by Aldrich. The value of $\gamma = -1.8$ given by Aldrich is obviously in error, and should be -12.3 .
384. ϕ Aql. From the same data Luyten (*lc*, Note 7) obtains $e = 0.035 \pm .034$, and adopts a circular orbit.
386. $\Sigma 2613$ A. ADS 13256, 7.0-7.2, $d = 4''$.
387. WW Cyg. T is phase of minimum velocity. Large scatter of observations. Elements provisional.
389. $\Omega 398$ A. ADS 13405, 7.3-9.8, $d = 0''9$.
390. SW Cyg. T is phase of periastron, velocity-curve shows large rotational disturbance.
391. QY Aql. T is phase of periastron.
392. B 5170. Variation in radial velocity cannot be fully explained by orbital motion. Miss Losh finds evidence of two oscillations with periods $45^d.33$ and $1^d.51775$ superimposed upon long-period variation. This star should receive further study and the elements quoted should be regarded as provisional.
393. θ Aql. Earlier orbits by Baker (*AO* 2, 43, 1910) and by Harper (*RASC* 6, 265, 1912). The present orbit is based upon 12 Coude spectrograms in 1945 on which the blending of lines was not appreciable.
394. B 5173. Victoria's revised elements give $P = 9^d.314$, $T = 2421143.068$. On the basis of the same data Luyten (*lc*, Note 7) adopts similar elements with $e = 0$.
395. 31 Cyg. The spectrum of the B star was obtained in the violet with a 1-prism spectrograph on 7 spectrograms which, with the elements of the primary, gave values of K_2 .
396. B 5192. Revised elements at Victoria gave $P = 248^d.9$, $T = 2423666.850$. From the same data Luyten (*lc*, Note 7) obtained $e = 0.058 \pm 0.02$, $\omega = 145^\circ \pm 21^\circ$.
397. B 5200. Set of elements in () represents residuals from elliptic motion. The star should receive further study.
- 398-400. β Cap. Elements for b and c derived from measures of Si II and Ca II lines. Minimum masses are $a = 4.4\odot$, $b = 3.9\odot$, $c = 0.9\odot$. With the absolute magnitudes given by the mass luminosity law it would appear that a is a G0 giant, b a normal B8 and c a main sequence star of about G5.
401. $+45^\circ 3139$. Luyten (*lc*, Note 7) finds from same data $e = 0.076 \pm .030$, $\omega = 113^\circ \pm 23^\circ$.
403. HD 193576. Earlier orbit by O. C. Wilson (*ApJ* 91, 379, 1940) in which a difference of 90 km/sec between the values of γ was found for the two components. Kron and Miss Gordon's photoelectric observations give evidence of a gaseous envelope surrounding one or both stars.
404. α Pav. From same data Luyten (*lc*, Note 7) obtains similar elements with $e = 0$.
408. β Del. ADS 14073, 4.0-5.0, $d = 0''4$.
410. W Del. T is phase of periastron. Velocity-curve shows pronounced rotational disturbance.
411. B 5294. ADS 14081, 6.0-12.5, $d = 32''$. Revised elements at Victoria give $P = 205^d.2$, $T = 2423541.550$.
412. GO Cyg. Epoch is time of primary minimum.
413. V 367 Cyg. ADS 14314, 6.7-13.7, $d = 2''3$. Christie found the star to be a light variable with two unequal minima and a period of $18^d.60$ of the β Lyrae type. The velocity is variable in the same period and the times of the systemic velocity of the system correspond to those of the two light minima. The systemic velocity of the short period system is variable, in a period of 12.3 years, and also the amplitude of its velocity-curve varies in the same long period. Christie presents several difficulties with the interpretation of the short period variation as due to orbital motion. The elements quoted for the long period system are provisional; from the evidence available, they appear to represent the orbital motion of the variable star with respect to the center of mass in a binary system.
415. Y Cyg. The first orbit depends upon 28 plates in 1919-21, mean epoch is 2422555.5 ; the second upon 36 observations in 1928-9, mean epoch 2425644.5 . T for each orbit refers to epoch of primary minimum, which was derived from the formula $J D 2418073.866 + 2^d.996332 E - 0^d.143 \sin (0^o.0667 E) - 0^d.008 \sin 2 (0^o.0667 E)$. Redman finds evidence of a third body and that there is a slow precession of the line of apsides in a period of about 46 years.
416. 57 Cyg. Pearce (*AAS* 9, 268, 1939) from a comparison of Allegheny and Victoria observations announced a rotation of the apse-line in a period of 25.4 years. The present authors, from a careful investigation of the Allegheny, Victoria, and Yerkes data, conclude that "while the observations suggest a forward motion, the period of the apsidal rotation is still unknown."
418. δ Equ. ADS 14773, 5.3-5.4, $d = 0''3$. Aitken's visual orbit gives $i = \pm 81^\circ$, $a = 0''27$, $\Omega = 21^\circ 0$. The spectra of both components are visible and are separated near the time of periastron passage. From Aitken's orbit, and from the observed relative velocity of the two components, the parallax is found to be $p = 0''048$. The velocity of the system is assumed to be the measured radial velocity when the lines are single. Luyten and Ebbighausen (*Pub Min O* 2, 25, 1934) have derived a later orbit, which is in close agreement with the one quoted. They find the total mass of system = $4.9\odot$, and from the relative velocities at periastron, $m_1/m_2 = 1.03$.
- 419-420. $+57^\circ 2309$ abc. ADS 14832, 6.7-12.3, $d = 4''$.
421. $+32^\circ 4134$. Revised elements at Victoria give $P = 20^d.342$, $T = 2424566.558$.
423. HD 203858. T is T_0 . Elliptic elements are also given, for which $e = 0.022 \pm .0027$.
424. $+18^\circ 4794$. Epoch is time of perihelion. Revised elements at Victoria give $P = 21^d.720$, $T = 2424953.579$.
425. B 5536. Elements are approximate.
426. ν Oct. Elements are provisional. Christie (*ApJ* 83, 434, 1936) finds from same material $P = 1020^d$, $\omega 80^\circ$, $e = 0.4$, also provisional. Alden (*AJ* 48, 83, 1940) from 38 Yale plates (1926-38) obtained elements $a = 0''052$, $i = +65^\circ$, $\omega = 37^\circ$, $\Omega = 118^\circ$, $p = +0''048$. He estimates mass of primary of the order of $2.7\odot$ and of secondary $1.1\odot$.
427. $+27^\circ 4107$. Revised elements by Victoria give $P = 12^d.216$, $T = 2424051.948$.
428. AQ Peg. T is phase of periastron. Velocity-curve shows strong rotational effect. Possesses a ring-like gaseous structure, and should therefore be placed in Table II, although the velocity-curve appears normal.
429. β GC 11160 A. ADS 15184, A B, 6.0-14, $d = 1''6$, A C, 6.0-7.9, $d = 12''$, A D 6.0-8.0, $d = 19''$. Brightest component of visual quadruple; earlier orbit by Plaskett (*DAO* 4, 108, 1928). Present elements are based on hydrogen lines alone. Rufus finds assumption of binary system with an enveloping atmosphere gives fairly satisfactory interpretation of complicated observed spectral changes.
430. 42 Cap. Earlier orbits by Lunt (*ApJ* 47, 134, 1918; *CA* 10, Pt 6, 3 F, 1921) and S. Jones (*CA* 10, Pt 8, 81, 1928). Jones' discussion was based upon 54 observations 1917-1923 sufficient for an independent determination of orbits for each of the years 1917, 1920, and 1923. He concluded that the systemic velocity is variable but found no certain changes in the other elements such as were suspected by Lunt. Luyten (*Pub Min O* 2, 17, 1934) rediscussed the orbit on the basis of Lunt's data and concluded that they do not prove that even γ was variable. Sanford's elements are derived from the Cape observations, 5 Lick (1920-21), 10 Mount Wilson (1917-22) and 14 Mount Wilson (1935-41). They are in good agreement with those of Jones except that the eccentricity is somewhat smaller. Sanford is of the opinion that Jones' conclusion of a variable systemic velocity is probably correct.
431. B 5575. Epoch is time of maximum negative velocity for primary.
432. B 5579. Luyten (*lc*, Note 7) showed that a circular orbit is preferable.

433. B 5591. ADS 15275, 7.6-14.0, $d = 14''$.
435. κ Peg A B. ADS 15281, 4.8-5.3, $d = 0''.2$. The orbit of the visual pair A B is based upon all available micrometric observations. Luyten also finds $i = +109^\circ$, $a = 0''.21$, $\Omega = 111^\circ$, $p = 0''.0247$. $M_{A+B} = 3.3\odot$, $M_B = 1.9\odot$, and he estimates $M_A = 2.1\odot$, $M_a = 1.2\odot$; all are values which appear reasonable.
436. δ Cap. ADS 15314, 3.0-16, $d = 69''$. Luyten (*lc*, Note 7) points out that the large probable errors of e and ω indicate a circular orbit.
437. π^2 Cyg. The orbit is provisional and is based upon Babelsberg, Yerkes, and Lick observations.
439. B 5620. The star is brighter component of Σ 2836; ADS 15366.
440. B 5629. ADS 15405, 6.0-7.0, $d = 19''$.
441. VV Cep. Earlier orbit by Harper (*RASC* 28, 173, 1934), who used a period of 7400^d.
443. CM Lac. Epoch is time of primary minimum; second spectrum doubtful. Photometric and spectroscopic elements by Wachmann (*AN* 259, 323, 1936), in which $e = 0.040 \pm .026$.
444. RT Lac. Epoch is time of primary minimum; epoch and period are those of Nijland's photometric elements. Krat Nekrasova (*Acta Ast Serc* 2, 130, 1936) with $i = 84^\circ 1'$, derives $m_1 = 1.9\odot$, $m_2 = 1.0\odot$, $p_1 = 0.017\odot$, $p_2 = 0.026\odot$.
445. B 5671. Epoch is time of perihelion.
447. Σ 2873 B. ADS 15571, 6.2-7.0, $d = 14''$. Epoch is time when primary has maximum positive velocity.
448. +47°3692. Epoch is time of perihelion passage.
449. ϵ Peg. Zurhellen (*AN* 177, 333, 1908) found Bonn observations 1905-7 well satisfied by these elements. Luyten (*lc*, Note 7) points out that the orbit is circular.
451. α Tuc. Based upon Cape and Lick (Chile) observations. From telescopic orbit Alden (*AJ* 47, 187, 1939) derives $a = 0''.049$, $i = +113^\circ$, $\omega = 76^\circ$, $\Omega = 262^\circ$.
452. B 5764. T is $T\Omega$. The agreement with Baker's elements (*AO* 1, 93, 1909) is as close as could be expected in view of the character of the spectrum.
454. +28°4389. Albitzky (*Pul O Cir* 8, 10, 1933) from 52 Simeis observations (1929-32) derived the following elements: $P = 2^d 34095$, $T = 2425940.381$, $\omega = 49^\circ 36'$, $e = 0.031$, $K = 84.76$ km/sec, $\gamma = -0.54$. Harper's elements were based upon 28 Victoria spectrograms (1926-33). Luyten (*lc*, Note 7) finds for Simeis $e = 0.028 \pm .014$, $\omega = 22^\circ \pm 30^\circ$, and for Victoria $e = 0.022 \pm .012$, $\omega = 30^\circ \pm 30^\circ$ with practically the same values of K found by Albitzky and Harper. The difference between the K s in the two sets of elements is puzzling. Luyten finds $P = 2^d 34092 \pm .00007$.
458. η Peg. ADS 16211, 3.0-10.1, $d = 90''$.
459. ZZ Cep. T is phase from primary minimum.
460. AH Cep. Earlier orbit by Pearce based on erroneous period (*DAO* 3, 176, 1925). Zverev (*VFP A* 4, 177, 1933) from photometric observations found period to be 1.77454 days and derived new elements on the basis of Pearce's data. Period quoted is from photometric observations by Huffer.
461. B 5900. Epoch is time of perihelion. Victoria's revised elements give $P = 24^d 649$, $T = 2422378.892$.
462. B 5913. ADS 16381, 6.0-12.0, $d = 27''$.
466. π Cep A. ADS 16538, 5.2-7.5, $d = 0''.8$. Victoria's revision gives $P = 556^d 0$, $T = 2423581.730$.
468. RT And. From photometric elements $i = 82^\circ 7'$. Then $m_1 = 2.70\odot$, $m_2 = 0.35\odot$.
470. AR Cas. By comparison of Baker's elements (*AO* 2, 25, 1910) with their own, they conclude that "in spite of several difficulties that remain to be cleared up it is difficult to escape the conclusion that the apsidal rotation is forward, and that its period is of the order of $U = 4/3 \times 10^4 P''$."
471. Y Psc. T is phase of periastron.
472. B 6070. Luyten (*lc*, Note 7) finds $e = 0.050 \pm .019$, $\omega = 264^\circ \pm 20^\circ$.
473. λ And. Earlier orbits by Burns (*LOB* 4, 87, 1906), for observations (1897-1900) made with original Mills spectrograph and those (1904-06) taken with the remounted instrument, appeared to give slightly different elements. A rediscussion of this material by Luyten (*Publ Min O* 2, No. 1, 19, 1934) showed that both sets of observations could be satisfactorily represented by the same orbital elements, with a period of $20^d 5214$.
474. XX Cep. T is phase of periastron.
475. UU Cas. Epoch is time of maximum positive velocity. The radial velocity and light observations appear to indicate definitely that the star is of the β Lyrae type.
476. B 6129. ADS 17062, 6.8-11.7, $d = 5''.5$.
477. XY Cep. T is phase of minimum velocity.
479. B 6142. Earlier orbit by Young (*DO* 3, 373, 1916).
480. B 6148. Revised elements at Victoria give $P = 12^d 1565$, $T = 2423232.241$.

TABLE II

Star	α 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ⁶	$f(m)$	$m \sin^3 i$	Authority
	h	m		Hvd.	Rev.										
1 * SX Cas	00 05.5	+54 20	9.8-11.0	.....	A6+G6	36.567	ph 32.0	10	0.50	50.0	-9.7	22.000	0.31	.....	Struve <i>Apj</i> 99, 93, 1944 R
2 * ZZ Cas	27.8	+61 58	10.6-11.2	.....	B3	1.24	0.70 P	330	0.2	93	-45	1.55	0.097	.....	Struve <i>Apj</i> 106, 92, 1947 R
3 * U Cep	53.4	+81 20	6.85-9.19	Ao	B8	2.493	ph 2.16	40	0.20	120	-5	4.0	0.42	.....	Struve <i>Apj</i> 99, 222, 1944 R
4 * AQ Cas	01 12.6	+61 51	10.0-10.9	.....	G2	11.72	0.25 P	.....	0.00	160	-20	25.8	4.985	.....	Struve <i>Apj</i> 104, 253, 1946 R
5 ϕ Per	37.4	+50 11	4.19	Bop	Bone	126.626	24473.500	270.9	0.10	40	+4	69.000	.....	15	Hynek <i>P Contr</i> 2, 1, 1940 R
6 * +55 ⁶ 16	02 18.9	+55 38	.....	B9	B5	2.7278	31440.660	112	0.09	80	-25.3	140.000	0.0150	7.5	H lines. Deutsch <i>Apj</i> 102, 496, 1945 R
7 * RY Per	39.0	+47 44	8.5-10.5	B6	B4+F5	2.7278 6.863571	31441.152	182	0.11	65.6	-39.6	2.48	0.0795	.....	He I lines H lines. Hiltner <i>Apj</i> 104, 396, 1946 R
8 * RX Cas	58.8	+67 11	8.8-9.6	.....	gG5+ gA5e	6.863571 32.315	ph 30.3	14	0.21	36	-26	3.4	.....	0.033	He I lines
9 * AB Per	03 31.1	+40 26	9.4-10.2	A5	A5	7.16	ph 4.7	226	0.21	27	-5	2.6	0.013	.....	Struve <i>Apj</i> 101, 235, 1945 R
10 * RW Per	04 13.4	+42 04	9.9-12.0	A	.....	13.20	0.4 P	.....	0.00	18.5	+6.5	3.4	0.009	.....	Struve <i>Apj</i> 102, 74, 1945 R
11 * RZ Eri	36.9	-10 58	7.8-9.0	A5	.....	39.28074	ph 28.0	314.3	0.36	25.8	+32.0	13.000	0.06	.....	Cesco, Sahade <i>Apj</i> 101, 370, 1945 R
12 * RS Cep	41.1	+80 06	10.2-11.8	.....	A5+G	12.42	0.71 P	341	0.14	36	-21	6.08	0.038	.....	Struve <i>Apj</i> 104, 253, 1946 R
13 +40 ¹ 196	05 03.7	+40 53	8.1	B3	B3e	3710	23412	77	0.31	31.5	+9.3	1328.000	10.4	.....	Merrill <i>Apj</i> 79, 363, 1934 R
14 ξ Tau	31.7	+21 05	3.0	B3p	B3e	133.0	10291.541	326.23	0.329	11.2	+29.8	19.290	0.016	.....	Miss Losh <i>MO</i> , 4, 1, 1931 R
15 * Z Ori	50.3	+13 40	9.6-10.5	.....	Ao	5.20	0.25 P	.....	0.00	48	+2	3.43	0.060	.....	Struve <i>Apj</i> 106, 92, 1947 R
16 * SV Gem	54.6	+24 28	10.0-11.3	A	B3	4.006	0.56 P	266	0.16	44.5	+29	2.4	0.035	.....	Struve <i>Apj</i> 102, 74, 1945 R
17 * AU Mon	06 49.8	-1 15	8.3-9.4	.....	B5+Fo	11.1126	8.29	340	0.13	32.2	+11.8	4.9	0.04	.....	Sahade, Cesco <i>Apj</i> 101, 235, 1945 R
18 * -6 ² 376	07 52.7	-6 56	9.4-10.6	.....	B5+F2	3.8735	.....	60	0.20	65	+7	3.370	0.104	.....	Chang <i>Apj</i> 106, 308, 1947 R
19 * UX Mon	54.4	-7 14	8.2-9.2	.....	A7p+	5.904604	0.75 P	.....	0.00	60	-20	4.9	.....	3.4	Struve <i>Apj</i> 106, 255, 1947 R
20 * T LMi	09 42.5	+33 45	10.2-12.6	A	Ao	3.02	0.35 P	.....	0.00	140	+5	11.4	.....	1.5	Struve <i>Apj</i> 104, 253, 1946 R
21 * TT Hya	11 08.3	-25 55	7.5-10.0	A3, G5	.....	6.953401	5.1	319.8	0.12	41.2	+17.5	3.9	0.05	.....	Ca II. Sahade, Cesco <i>Apj</i> 103, 71, 1946 R
22 α^1 Cru	12 21.0	-62 33	1.6	Bi	Bin	59.31	5.7	342.2	0.24	46.3	+10.0	4.3	0.07	.....	H lines
23 α^2 Cru	21.0	-62 32	2.1	Bi	B3n	56	23959.0	164	0.20	23.4	-10.3	18.500	0.070	.....	Luyten <i>ASP</i> 47, 263, 1935 R
24 κ Dra	29.2	+70 20	3.88	B5p	B5e	0.89038	23973.6	191	0.25	24.1	-1.4	18.000	0.073	.....	Luyten <i>ASP</i> 47, 263, 1935 R
25 ϵ UMa	49.6	+56 30	1.68	Aop	A2s	4.15 yr	24650.429	284.47	0.186	18.87	-11.43	0.227	0.0006	.....	Hill <i>DAO</i> 3, 349, 1936 R
26 σ Sco	16 15.1	-25 21	3.08	Bi	.....	34.08	1907.40	55.8	0.31	3.5	-11.9	69.360	0.0058	.....	Ludendorff <i>AN</i> 195, 369, 1913 R
27 HD 152248	47.1	-41 39	7.3	B	O9	3.10	21715.35	270	0.33	33	-3.2	14.600	0.107	.....	Henroteau <i>LOB</i> 9, 177, 1918 R
28 HD 152270	47.3	-41 40	6.7	Oa	WC6	8.82	ph 1.75	.....	0.00	215	-35.0	9	12.2	.....	Struve <i>Apj</i> 100, 189, 1944 R
							31212.25	190	0.24	45	-44	.....	.....	.....	Abs lines Struve <i>Apj</i> 100, 384, 1944 R
								10	0.24	167.5	+108$\pm$	.....	.....	.....	Emis lines

TABLE II—(Continued)

	Star	α 1900 δ		Mag.	Spec. Class		P (days)	T (2,400,000)	ω°	e	K (km/sec)	γ (km/sec)	$a \sin i$ 10 ⁶	$f(w)$	$m \sin^2 i$	Authority
		h	m		Hvd.	Rev.										
29	* W Ser	18	4.1	-15 34	.....	cG3v	14.15326	ph 6.9	296	0.50	28	-10.2	4.7	0.021	.....	Bauer <i>ApJ</i> 101, 208, 1945 R
30	HD 168206	13.5	-11 40	8.9	Oa	WC7	29.675	31543.10	.....	0.0	165	+45	.....	.....	8.2	Emis lines. Hiltner <i>ApJ</i> 102, 492, 1945 R
31	* XZ Sgr	16.0	-25 17	8.9 -11.2	.....	A3+G	3.275537	ph 0.217	132.5	0.05	55	+10	.....	.....	24.8	Hy abs.
32	* U Scu	48.8	-12 44	9.7 -10.6	Fo	Fo	0.95	0.025 P	.....	0.00	86	+4.1	0.52	0.0005	.....	Sahade <i>ApJ</i> 102, 470, 1945 R
33	* QS Aql	19 36.5	+13 35	5.84	B3	B5	2.4968	23963.599	95.7	0.056	47.31	-14	1.13	0.063	.....	Struve <i>ApJ</i> 103, 76, 1946 R
34	HD 186943	42.2	+28 01	10.0	Oa	WN5+B	9.550	.....	.....	0.00	65	+10	1.620	0.0293	.....	Hill <i>DAO</i> 6, 11, 1931 R
35	* VW Cyg	20 11.3	+34 12	9.7 -12.4	.....	Ao	8.43	0.90 P	15	0.18	235	+115	.....	.....	5.8	Abs lines. Hiltner <i>ApJ</i> 101, 356, 1945 R
36	HD 193928	17.8	+36 36	9.4	Oa	WN6	21.64	.....	.....	0.00	34	-30	3.88	0.033	.....	Emis bands
37	Σ 2762 A	21 04.4	+29 48	(5.7)	Ao	B8	3.3137	22521.230	.....	0.0	26	-119	.....	.....	.....	Struve <i>ApJ</i> 103, 76, 1946 R
38	σ Cyg	13.5	+38 59	4.28	Aop	cAo	11.043	21069.27	119.1	0.40	1.98	-26.8	1.185	0.0060	.....	λ 4686, Hiltner <i>ApJ</i> 101, 356, 1945 R
39	* AW Peg	47.8	+23 32	(7.2-8.0)	A2	A2+Fo	10.6228	ph 0.25 P	.....	0.0	50	0	0.276	0.0000	.....	Young <i>DAO</i> 1, 319, 1921 R
40	HD 211853	22 15.0	+55 37	9.0	Ob	WN6	6.6854	.....	.....	0.0	245	+50	7.3	0.14	.....	Henroteau <i>MO</i> 3, 39, 1917 R
41	* TW Lac	26.5	+54 07	11.5 -13.3	.....	A2	3.04	0.25 P	.....	0.0	33	-125	.....	.....	.....	Struve <i>ApJ</i> 102, 74, 1945 R
42	* WX Cep	27.8	+63 01	9.1 -9.5	Ao	A2	3.37843	.....	.....	0.0	90 $\pm$	-3	1.38	0.011	.....	λ 4686
43	HD 214419	32.9	+56 23	8.92	.....	WN6	1.6410	.....	.....	0.0	295	+62	.....	.....	.....	λ 4603. Hiltner <i>ApJ</i> 101, 356, 1945 R
44	* WW And	23 39.9	+45 08	10.3 -11.4	.....	A5+F3	23.28	0.75 P	.....	0.0	27	-17	6.66	4.38	.....	λ 4058
										0.0			8.64	0.048	.....	Struve <i>ApJ</i> 104, 253, 1946 R
																Sahade, Cesco <i>ApJ</i> 102, 128, 1945 R
																Hiltner <i>ApJ</i> 99, 273, 1944 R
																Struve <i>ApJ</i> 103, 76, 1946 R

NOTES TO TABLE II

1. SX Cas. *T* is phase after Dugan's light minimum. Although these are the best elements for the observed velocity-curve, they are very uncertain, and do not represent even approximately the orbital motion, not only because of the large irregular departures of the observations from a smooth curve, but especially because they are in violent disagreement with the photometric elements. Struve concludes that an appreciable portion of the measured velocities must come from some other type of motion than that of orbital velocity, and suggests a tenuous absorbing cloud resembling in character the peculiar streams in the system of β Lyrae. This phenomenon is found to be present in a number of eclipsing variables listed by Struve in *ApJ* **103**, 96, 1946. It will be noted in the Remarks for these stars by "Possesses ringlike gaseous structure."
2. ZZ Cas. *T* is phase of periastron. The velocity-curve depends upon only 9 observations, with portions of the curve poorly represented.
3. U Cep. *T* is phase in days after minimum light. Earlier orbits by Carpenter (*ApJ* **72**, 205, 1930) Ellsworth (*Pub Lyon* 1937) and Kopal (*HCO Bull* **914**, 1, 1940). The latter finds $P = 2^d.492934$. The velocity-curve is unsymmetrical (Carpenter found $e = 0.47$, $\omega = 2^\circ$) while the light-curve gives $e = 0.08$, $\omega = 99^\circ$. Struve suggests that the observed radial velocities may be affected by absorption by a tenuous stream of gas, which moves around the G2 star, although he points out that the evidence for this interpretation is not so compelling as in the case of SX Cassiopeiae. The velocity-curve shows a large rotational disturbance: $V_{rot} = 220$ km/sec.
4. AQ Cas. *T* is phase of minimum velocity. The absorption lines undergo very large variations in intensity. At one node the spectra of both components are observed while at the other node the lines of only one component were measured. The spectral variations—especially the great strengthening of the He I and H lines from phase 0.46 P to 0.64 P—he interprets as due to a gaseous stream. The large departures of the observations from a smooth curve, as well as the peculiar spectral phenomena lead one to accept the orbital elements with considerable caution. The star merits an extensive and detailed study, which Struve plans to make.
5. ϕ Persei. The orbital elements are based on Dustheimer's period and epoch (*MO* **7**, 171, 1939) and upon a new series of spectrograms at Yerkes and Perkins observatories. Although orbits have been determined by several earlier observers (Cannon, Ludendorff, Jordan, etc.) it has not been possible to interpret satisfactorily the observed displacements of the spectral lines on the hypothesis of orbital motion. Hynek's investigation has not succeeded in clearing up all of the difficulties, and the elements quoted may be only of value in calling attention to the need of further investigation of this mysterious star.
6. $+55^\circ 616$. The author states "It is unknown which of these sets of elements, if either, represents the actual orbital motion." Both velocity-curves show evidence of rotational effect.
7. RY Per. The velocity-curves of hydrogen and helium give different elements, but it is not known which one represents the orbital motion of the star. Helium gives a rotational velocity approximately twice that of hydrogen.
8. RX Cas. *T* is phase from primary minimum. "Possesses a gaseous ringlike structure." In spectral phenomena it shows a remarkable similarity to SX Cassiopeiae, except that for RX the total light of the G star predominates at all phases. In both stars the velocity-curve of the A star is distorted. For RX the velocity-curve of the G star appears to be regular, although many of the lines measured are probably affected by blending with those of the A star. The elements quoted were obtained for the G star and probably represent its orbital motion, and might have been included in Table I.
9. AB Per. *T* is phase in days after principal minimum. The spectrum changes in character. The velocity-curve shows a secondary minimum. In the derivation of the elements this secondary minimum was disregarded. The velocity-curve is not consistent with the light-curve, and the orbital elements are probably affected by unknown causes. The character of the distortion of the velocity-curve does not resemble those found in U Cephei and SX Cassiopeiae.
10. RW Per. *T* is phase of minimum velocity after principal eclipse. The H absorption lines outside eclipse are variable in intensity. During eclipse strong double emission lines of H and weaker ones of Fe II and Ca II undergo eclipses, as in SX Cassiopeiae. The star is classed by Struve as one which "possesses gaseous ringlike structure," and the orbital elements quoted are doubtless affected by causes other than orbital motion.
11. RZ Eri. *T* is phase in days after minimum light. The system is found to consist of a main sequence F5 star, which at primary minimum is eclipsed by a sub-giant, G8 star, surrounded by an envelope of calcium gas. The scatter in the observed velocities is fairly large and only a graphical solution was made.
12. RS Cep. *T* is phase of periastron. The elements were derived from the Ca II velocity-curve. The plots for Fe I, Fe II, and Ti II show the same general trend of the velocity-curve, a large scatter is shown by the measures of all lines, even by those of Ca II, and the graphical solution from the latter is subject to considerable uncertainty. Emission lines of H are present in the spectrum, resembling that of RW Persei, VW Cyg, and AQ Pegasi.
13. $+40^\circ 1196$. Orbital elements were computed from the radial velocities given by the hydrogen lines. Widely differing amplitudes are given by the displacements of lines of various elements; interpretation on the binary hypothesis is difficult.
14. ζ Tau. Elements were derived from measures of hydrogen absorption lines on spectrograms taken in 1923 and 1924. Comparison with velocity-curves of 1914 and 1925-27, and with that by Adams, 1902-05 (*ApJ* **22**, 115, 1905) indicates that the velocity of the system is probably variable. The hypothesis of simple orbital motion is not sufficient to account for the observed irregularities and variation in the displacement of the hydrogen lines. Marked peculiarities are also shown by the lines of other elements. Hynek and Struve (*ApJ* **96**, 425, 1942) have made an extensive study of the composite spectrum of this star, and have shown that the peculiarities noted above have their origin in a shell surrounding the star.
15. Z Ori. *T* is phase of minimum velocity. Measures were difficult and the orbital elements are very uncertain.
16. SV Gem. *T* is phase from primary minimum. The lines are broad and ill-defined, and the measurements are difficult. The observations are confined to four groups on the velocity-curve. This with the large scatter of the velocities render the elements quite uncertain.
17. AU Mon. The orbit was derived from the He I lines, measures of which show a large scatter, and the orbital elements are uncertain. Velocities given by hydrogen lines suggest the existence of a mass of relatively cool hydrogen gas flowing from the F star toward the B star.
18. $-6^\circ 2376$. The variability in light of this star was announced by Dr. Chang, and was shown by Dr. Yuin of Harvard to be an eclipsing variable with period $3^d.8735833$. The spectral lines measured (three of He I) are broad and diffuse, and the measures show large scatter. The elements are very uncertain.
19. UX Mon. *T* is minimum velocity of G star phase 0.75 P and of A star 0.25 P. Struve's intensive study of the complex spectral phenomenon exhibited by this eclipsing variable led him to sug-

- gest that a stream of calcium gas flows from the advancing side of the G star to the receding side of the A star, with a similar stream from the advancing side of the A star to receding side of the G star. Under such conditions the circular elements here adopted for the two stars are probably the best obtainable, but are doubtless subject to some uncertainty.
20. T LMi. T is phase of minimum velocity. The observations are confined to three groups on velocity-curve, and the elements are therefore quite uncertain.
 21. TT Hya. T is phase from primary minimum. Earlier orbit by Sanford (*ApJ* **86**, 153, 1937), $e = 0.08$, $\omega = 64^\circ 0$, $K = 32.2$, $\gamma = +11.4$. Double H lines near principal eclipses. "Possesses gaseous ringlike structure" (Struve, *ApJ* **103**, 96, 1946).
 22. α^1 Crucis. Orbit by Neubauer (*LOB* **15**, 190, 1932) gave $P = 0^d 977029$, $T = 2423957.548$, $\omega = 100^\circ 35$, $e = 0.322$, $K = 27.7$ km/sec, $\gamma = -12.2$ km/sec. Luyten from the same material showed that the observations were represented equally well by a period of $59^d 31$, and the elements quoted here. It is impossible to determine without further observations which of the two sets of elements is the correct one.
 23. α^2 Crucis. Orbit by Neubauer (*LOB* **15**, 190, 1932) gave $P = 0^d 97623$, $T = 2423957.170$, $\omega = 132^\circ 91$, $e = 0.06$, $K = 32.0$ km/sec, $\gamma = +0.3$ km/sec. Luyten from same observations found that a period of 56^d would also give as good representation, and that further observations are necessary to distinguish between the two periods.
 24. κ Dra. Earlier orbit by Baker (*MO* **3**, **33**, 1920) was shown by Hill to be based on erroneous period. For this Be star, Hill finds the velocity-curve regular and that all lines give the same velocity. Except for the small mass function the elements would be above suspicion, and might properly have been placed in Table I.
 25. ϵ U Ma. The elements are probably of little more than historical interest, and for the present should be excluded in statistical studies of orbital elements. Harper (*DAO* **7**, 1, 1937) found that the Victoria observations of 1925, 28, 35, and 36 were not in agreement with Ludendorff's orbit. Gutnick and Prager (*VBB* **2**, Pt 3, 52, 1918) found the light variable in a period of $0^d 95203$ and evidence of variation in velocity in same period from Ludendorff's observations. More recently Gutnick (*Sitz Ber Acad*, 1931, **27**; 1934, **30**) found periodic variations in line intensity, and some variation in velocity with $P = 5^d 09$. Struve and Hiltner (*ApJ* **98**, 225, 1943) confirmed the variation in line intensity with Gutnick's period, but showed that the observed doubling of the lines was not due to orbital motion. Until these various contradictions are cleared up, all orbital elements that have been given for this star should be rejected.
 26. σ Sco. Henroteau's later work (*DO* **5**, 303, 1921, **8**, 45, 1922, and **9**, 91, 1925) indicates that the form and amplitude of the velocity-curve change. He finds that all observations 1915 to 1924 are represented better by a period of $33^d 0$. The evidence for a variation in systemic velocity in a long period, noted by him, may be further vitiated by the presence in some of his observations of a systematic error of $+9.4$ km/sec.
 27. HD 152248. T is time of maximum relative velocity. The elements are approximate and a period of $1^d 475$ cannot be excluded by observations at MacDonald.
 28. HD 152270. The elements derived from absorption lines were based on measures of central absorption in the hydrogen lines. It is possible but not certain that the velocity-curve from the absorption lines represents the motion of a second component. The broad emission features of C III, C IV, and He II at 4647 to 4686 show oscillations in wave length, and from these the second set of elements was derived. The scatter of the observations is large, and both sets of elements are uncertain.
 29. W Ser. T is the number of days after light minimum. The minimum radial velocity occurs about one day after minimum light, in stead of after several days. All spectrum lines vary with the phase. "The conclusion is that the velocity-curve does not represent the motion of the brighter component of the binary, but is probably a picture of complicated motions within an extended shell surrounding the system."
 30. HD 168206. T is arbitrarily assumed. Three emission bands: 4686 He II, C III-IV, CIV $\lambda 4441$ of the Wolf-Rayet star were measured to which upper elements correspond. H γ in absorption varies oppositely to the emission bands and presumably it is due to an early type component. Obviously the interpretation is uncertain.
 31. XZ Sgr. The scatter of observations is large and the elements are very uncertain.
 32. U Scu. T is phase of minimum velocity. The orbital elements depend upon only five observations, and, of course, are very uncertain.
 33. QS Aql. Gutnick (*Sitz Ber Acad Phys-Math* page 521, 1934) could not represent his light and radial velocity observations (1930) by Hill's period. He adopts $P = 2^d 5133$, which represents his light and velocity observation and those of Hill, but the scatter of the radial velocity data of both Victoria and Babelsberg is larger than the error of observation—evidence which he regards as indicating that part of the observed velocity arises from causes other than orbital motion, probably from motion in the star's atmosphere. This is doubtless similar to effects observed by others in short period eclipsing stars.
 34. HD 186943. The upper elements were derived from the absorption lines of the early B star and the lower ones from the emission bands He II 4686, N V 4603 and N V 4619 of the Wolf-Rayet star. The variation in velocity of the two stars in opposite phase is strongly suggested. The γ 's for the two sets of elements differ by over 100 km/sec.
 35. VW Cyg. T is phase of periastron. Elements are derived from Ca II line. "Possesses a gaseous ringlike structure." The scatter even of the Ca II lines, while less than that of the others, is rather large and the elements are subject to considerable uncertainty, since effects are doubtless present that do not arise from orbital motion.
 36. HD 193928. Only the Wolf-Rayet component was observed. γ for He II 4686 is $+59$, for N V 4603 is -119 . The complex features of the spectrum render elements nothing more than rough estimates.
 37. Σ 2762 A. Luyten (*ApJ* **84**, 85, 1936) has discussed the observations used by Young, and has shown that the large residuals given by the observed velocities from the computed curve, some of which are almost as large as K itself, render the orbital elements very uncertain, and that it is a question whether the orbit is even known approximately.
 38. σ Cyg. The elements are based upon the measures of 100 1-prism plates taken at Michigan. Under these circumstances one may be pardoned for regarding with suspicion orbital elements in which K is 2 km/sec. Attention is also called to the extremely small mass function.
 39. AW Peg. T is phase of maximum velocity of F star. The elements were derived from measures of Fe I, Ti II, Ca I, and Sr II lines, which presumably are due to the F α component (secondary), so that the value of K corresponds to K_2 . The scatter of observations is large and undoubtedly the positions of the lines are effected by blending. The elements are therefore quite uncertain.
 40. HD 211853. The velocity-curve was derived from three emission lines. From the absorption lines, which apparently belong to the B star, he estimates $K = 95$. The orbital elements are only estimates.
 41. TW Lac. T is phase of minimum velocity. Because of the poor distribution of the observations and large scatter of the velocities, the elements are entitled to small weight.

42. WX Cep. The elements are only estimates. The spectrum shows double lines, which change in intensity through the different phases.
43. HD 214419. The elements were derived from the velocity-curve for N IV 4058, for which the curve is well defined. Emission of He II in the Pickering series suggests a similar solution, except for a shift of the γ axis to $+180$ km/sec and a small decrease in K . He II 4686 gives an entirely different velocity-curve, which he suggests is due to other causes than orbital motion. While it

- appears probable that the elements given by the smooth velocity-curve of N IV 4058 represent orbital motion, one may question whether this has been established.
44. WW And. T is phase of minimum velocity. "The velocity-curves are complicated and indicate that the two spectra are badly blended." Ca II and H in the F₃ star show core-like appearance, which in other stars is produced by shell-like gaseous masses in front of the eclipsing star.