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Orbit of μ Persei

BY

J. B. CANNON, M.A.

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85435—1

ORBIT OF μ PERSEI.

BY J. B. CANNON, M.A.

μ Persei ($\alpha = 4^h\ 8^m \cdot 6$, $\delta = +48°11'$) was announced a spectroscopic binary in L.O.B. 199, which gives seven measures having a range of 39 km. It was under observation here during the years 1913, 1914 and 1915. Forty-eight plates in all were taken, fourteen in 1913, eighteen in 1914 and the remainder in 1915. On these forty-eight plates the following work is based. The period, being exceptionally long, —284 days— cannot be considered very closely defined, as the epoch between the first of the Lick observations and the last of ours covers only a little over 22 periods. The spectrum is of G–type and a good number of lines were employed, most of which admit of fairly close measurement. Table I gives the lines used and the elements to which they are due. The wave-lengths were computed by averaging the line-residuals in all plates.

TABLE I.

LINES MEASURED IN μ PERSEI.

Wave-Length.	Element.	Wave-Length.	Element.
4861·334	Hydrogen	*4271·746	Iron
4583·963	Iron	4260·569	Iron
*4572·082	Titanium	4233·370	Mangan-Iron
*4549·759	Iron	4227·213	Iron
4481·400	Magnesium	*4215·780	Iron
4468·987	Titanium	4202·161	Iron
4437·718	Iron	4198·494	Iron
*4415·405	Iron	4143·749	Iron
*4404·986	Iron	4136·985	Iron
4395·548	Titan-Ven.	4131·047	Silicon
*4351·745	Chrom-Mag.	4128·075	Silicon
*4340·749	Hydrogen	*4101·904	Hydrogen
*4325·687	Iron	4071·901	Iron
*4314·848	Iron-Titan.	4063·956	Iron
4294·301	Iron	*4045·909	Iron
*4289·972	Chrom-Titan.	*4005·421	Iron

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Those marked with an asterisk are the lines most generally used. The others are used only in a few plates.

Table II gives the Lick observations, Table III the Ottawa observations, the phase being from the final periastron date and the residual from the final curve.

TABLE II.

LICK OBSERVATIONS.

Date.	Julian Day.	Phase.	Velocity.	Residual.
1897, Dec. 23·808	2,414,282·808	184·84	− 8·1	+ 3·7
1898, Feb. 2·721	323·721	225·75	− 6·8	+ 0·1
Oct. 26·960	589·960	207·99	− 9·1	+ 1·9
1905, Oct. 10·900	7,129·900	191·93	− 9·3	+ 3·7
1908, Feb. 26·673	998·673	208·70	−10·8	± 0·0
1910, Sept. 1·001	8,916·001	274·03	+15·0	+ 0·6
Oct. 7·940	952·940	26·97	+28·4	+ 0·3

TABLE III.

OTTAWA OBSERVATIONS.

Plate.	Observer.*	Date.	Exposure.	Julian Day.	Phase.	Velocity.	Weight.	O-C.
		1913	m.					
5329(*a*)	H	Jan. 28.....	75	2,419,796·60	18·62	+24·0	8	− 1·8
5338	P¹	Feb. 3.....	90	802·70	24·73	+24·0	7	− 3·0
5349	H	Feb. 6.....	88	805·66	27·69	+30·3	8	+ 2·5
5383	H	Feb. 18.....	60	817·56	39·59	+30·2	7	+ 1·3
5391	C	Feb. 24.....	60	823·57	45·60	+32·5	7	+ 3·7
5415	C	Mar. 7.....	65	834·53	36·56	+27·0	6	− 0·6
5426	C	Mar. 11.....	65	838·54	60·57	+23·8	7	− 3·0
5696	G	Sept. 24.....	65	20,035·90	257·93	+ 5·5	6	+ 1·3
5757	C	Oct. 6.....	60	047·90	269·93	+13·4	5	+ 0·9
5782	P¹	Oct. 13.....	67	054·89	276·92	+19·9	5	+ 4·4
5795	G–P¹	Nov. 5.....	60	077·75	15·78	+20·6	5	− 4·5
5803	Y	Nov. 6.....	80	078·66	16·69	+22·1	4	− 3·1
5864	P	Dec. 31.....	55	133·68	71·71	+25·3	6	+ 1·1
		1914						
5871	Y	Jan. 1.....	45	134·62	72·65	+20·5	7	− 3·6
5886	P¹	Jan. 12.....	40	145·71	83·74	+15·5	5	− 9·7

TABLE III.

OTTAWA OBSERVATIONS—*Continued.*

Plate	Observer.*	Date	Exposure.	Julian Day	Phase	Velocity	Weight.	O–C.
		1914	m.					
5921	P¹	Feb. 9.....	60	2,420,173·63	111·66	+ 6·7	7	− 2·7
5943	P¹	Feb. 16.....	60	180·58	118·61	+ 9·7	6	+ 3·0
5956	C	Feb. 23.....	60	187·61	125·64	+ 5·6	5	+ 1·9
5975	C	Mar. 13.....	25	205·52	143·55	−10·4	2	− 7·6
5986	C	Mar. 20.....	60	212·59	150·62	− 8·5	4	− 3·2
6387	C	Sept. 16.....	60	392·81	46·84	+36·7	4	+ 7·9
6449	C	Sept. 30.....	60	406·80	60·83	+40·9	4	+14·1
6501	H	Oct. 13.....	60	419·86	73·89	+28·1	5	+ 4·3
6518	P¹	Oct. 21.....	55	427·94	81·97	+18·0	7	− 8·0
6572	C–P¹	Nov. 23.....	65	460·75	114·78	+ 8·6	4	+ 0·2
6583	C	Nov. 27.....	107	464·77	118·80	+ 3·1	3	− 3·6
6592	C	Dec. 4.....	85	471·69	125·72	+ 1·7	4	− 2·0
6616	C	Dec. 11.....	80	478·68	132·71	+ 0·8	5	− 0·1
6628	Y	Dec. 15.....	55	482·68	136·71	+ 0·2	3	+ 0·7
6654	Y	Dec. 22.....	60	489·66	143·69	− 9·6	3	− 6·8
6666	Y	Dec. 30.....	60	497·52	151·55	− 4·2	6	+ 1·3
		1915						
6693	C	Jan. 8.....	75	506·68	160·71	− 2·4	7	− 5·6
6719	C	Jan. 20.....	63	518·56	172·59	− 2·6	5	+ 7·9
6730	Y	Jan. 24.....	55	522·57	176·60	−17·6	4	− 6·6
6734	C	Jan. 25.....	56	523·65	177·68	− 8·5	3	+ 2·5
6744	P¹	Jan. 27.....	75	525·69	179·72	−11·7	6	− 0·3
6761	P	Jan. 30.....	60	528·50	182·53	−11·8	7	− 0·1
6782	C	Feb. 12.....	55	541·60	195·63	−13·5	7	− 1·6
6787	H	Feb. 17.....	55	546·55	200·58	−11·1	7	+ 0·6
6818	Y	Feb. 28.....	60	557·55	211·58	−10·2	8	+ 0·3
6827	H	Mar. 3.....	55	560·56	214·59	− 8·9	8	+ 0·9
6855	H	Mar. 11.....	60	568·57	222·60	−13·6	7	− 5·9
6863	Y	Mar. 14.....	55	571·56	225·59	−10·6	7	− 3·8
6883	H	Mar. 22.....	50	579·57	233·60	− 2·6	8	+ 1·2
6892	H	Mar. 29.....	44	586·55	240·58	+ 4·1	7	+ 5·5
6905	H	April 7.....	60	595·54	249·57	+ 4·4	8	+ 1·9
6923	H	April 14.....	64	602·54	256·57	+ 3·2	6	+ 2·8
6966	H	May 6.....	60	624·56	278·59	+14·6	3	− 2·1

*P=Plaskett; H=Harper; P¹=Parker; Y=Young; G=Gibson; C=Cannon.

MEASURES OF μ PERSEI.

λ	5329 (*a*)		5338		5349		5383		5391		5415		5426	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4861·334	+44·65	½	+47·86	½	.....	....	.....	....	+66·49	¼	+61·67	¼	+41·54	¼
4583·963	.....	....	.....	....	+44·57	¼	.....	....	+44·78	¼	+41·65	¼	.....	.....
4572·082	+45·69	½	+50·91	½	+39·20	¼	+63·36	½	+61·87	½	+52·13	½	+47·19	½
4549·759	+43·22	½	+47·49	½	+52·69	¼	+47·49	½	+63·67	½	+54·08	½	+64·21	¼
4481·400	.....	....	.....	....	.....	....	+55·04	½	.....	....	.....	....	+51·69	¼
4468·987	+51·36	½	+51·61	¼	+55·53	½	+55·79	¼	+61·73	¼	+55·10	¼	+60·95	½
4437·718	+25·87	½	.....	....	.....	....	.....	....	.....	....	+66·45	½	+53·37	¼
4415·405	+48·72	½	+47·29	½	+51·50	½	+51·31	½	+55·83	½	.....	....	.....	.....
4404·986	+46·90	½	+46·35	¼	+65·60	¼	+60·16	¼	.....	....	.....	....	.....	.....
4351·745	+49·86	¼	+41·66	¼	+60·65	½	+57·39	¼	+55·99	½	.....	....	+42·01	¼
4340·749	+47·39	1	+47·04	1	+55·12	1	+55·01	1	+51·08	½	+59·39	½	+47·62	½
4325·687	+47·67	½	+50·54	½	+57·64	½	+50·65	½	+52·48	¼	.....	....	+53·81	¼
4289·972	+46·34	½	+52·47	½	+53·58	½	+66·61	½	+62·27	½	+61·94	¼	+50·35	½
4271·746	+46·34	½	.....	....	+61·33	½	+57·04	½	+57·04	¼	+54·62	½	.....	.....
4260·569	+43·94	½	.....	....	+56·71	¼	.....	....	.....	....	.....	....	+53·31	½
4233·370	+47·66	¼	+55·63	¼	+54·11	½	.....	....	+65·42	¼	.....	....	+42·61	½
4227·213	+47·11	½	.....	....	+60·93	½	.....	....	.....	....	.....	....	+35·85	¼
4128·075	+43·55	¼	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....
4101·904	+32·22	¼	+40·89	¼	+52·06	1	+57·36	½	.....	....	.....	....	+53·26	½
4045·909	+50·93	½	+46·52	¼	+51·39	½	+65·43	½	+60·29	¼	+72·50	¼	+49·83	¼
Weighted mean	+47·46		+ 48·86		+ 55·77		+ 56·87		+ 58·46		+ 55·08		+ 50·49	
V_o	−23·08		− 24·41		− 24·96		− 26·46		− 26·79		− 26·36		− 26·30	
V_d	− ·09		− ·19		− ·17		− ·10		− ·14		− ·12		− ·12	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 24·0		+ 24·0		+ 30·3		+ 30·0		+ 32·2		+ 28·1		+ 23·8	

MEASURES OF μ PERSEI—*Continued.*

λ	5696		5757		5782		5795		5803		5864		5871	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4583·963	−11·98	¼	− 2·18	¼	− 8·03	¼	+ 3·95	¼	+18·92	¼	.....	....	.....	....
4572·082	−16·31	½	− 5·50	½	− 4·82	½	− 3·07	½	+ 8·96	½	+57·30	½	+39·64	½
4549·759	−21·93	½	− 8·92	½	+ 9·06	½	+ 2·45	¼	+25·71	¼	+39·72	½	+25·09	½
4481·400	−16·89	¼	− 0·77	½	.....	....	.....	....	.....	....	.....	....	.....	....
4415·405	.....	....	−10·39	¼	+ 1·90	½	− 9·31	¼	.....	....	+40·87	½	+24·18	¼
4404·986	−24·86	½	−15·65	½	− 5·24	½	+ 0·45	¼	.....	....	.....	....	.....	....
4395·548	.....	....	+ 2·28	½	.....	....	.....	....	.....	....	.....	....	+29·95	¼
4351·745	.....	....	.....	....	.....	....	+15·33	½	+13·93	½	+39·65	½	+51·12	½
4340·749	−15·85	1	− 7·54	½	+ 9·90	1	+ 8·98	1	+ 5·86	½	+37·38	½	+27·95	½
4325·687	−21·24	½	− 6·36	¼	− 2·47	½	+18·35	½	+ 9·42	¼	+38·64	¼	+35·03	½
4314·848	.....	....	− 9·78	½	+ 0·66	½	+ 5·99	½	+ 6·79	½	+40·06	½	.....	....
4289·972	−12·81	¼	.....	....	.....	....	.....	....	.....	....	+41·48	¼	+42·46	½
4271·746	−19·51	½	−15·13	½	− 1·09	¼	+ 5·72	¼	+11·88	¼	+29·70	½	.....	....
4233·370	− 9·59	¼	− 5·65	½	.....	....	+14·74	½	.....	....	.....	....	+25·79	½
4227·213	.....	....	−12·46	¼	.....	....	+ 4·02	¼	.....	....	+28·90	¼	+31·50	½
4202·161	−13·73	¼	.....	....	− 1·87	½	.....	....	.....	....	.....	....	.....	....
4136·985	−15·38	½	.....	....	− 6·94	½	+14·48	½	.....	....	.....	....	+36·06	¼
4131·047	−28·43	½	.....	....	.....	....	+ 1·28	¼	+10·82	½	.....	....	.....	....
4101·904	−22·02	¼	−18·66	¼	+ 4·95	½	+15·22	½	+10·04	¼	+31·75	½	+31·28	¼
4045·909	.....	....	.....	....	− 3·87	½	+14·21	½	.....	....	.....	....	+36·83	¼
4005·421	.....	....	.....	....	.....	....	.....	....	.....	....	+44·00	½	+43·57	½
Weighted mean	− 18·36		− 8·07		+ 0·51		+ 9·40		+ 11·24		+ 39·45		+ 34·90	
V_a	+ 24·36		+ 21·78		+ 19·82		+ 11·49		+ 11·10		− 13·75		− 14·13	
V_d	− ·19		− ·07		− ·11		+ ·01		+ ·06		− ·10		− ·03	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 5·5		+ 13·4		+ 19·9		+ 20·6		+ 22·1		+ 25·3		+ 20·5	

MEASURES OF μ PERSEI—*Continued.*

λ	5886		5921		5943		5956		5975		5986		6387	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4583·963	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	+ 9·49	½
4572·082	+37·50	½	+21·31	½	+32·15	½	+46·20	½	+10·87	½	+19·30	½	− 2·49	½
4549·759	+39·85	¼	+19·16	¼	+31·68	½	+18·23	½	+ 3·21	¼	+ 1·89	½	+29·49	¼
4415·405	.....	....	+42·08	⅓	.....	....	.....	....	.....	....	+11·21	¼	+25·61	½
4404·986	+25·82	¼	+33·57	¼	+39·17	½	+37·98	¼	.....	....	.....	....	.....	....
4395·548	+41·67	¼	.....	....	+35·52	½	+29·12	¼	.....	....	.....	....	.....	....
4351·745	.....	....	+37·02	¼	+26·46	¼	.....	....	.....	....	+ 1·34	¼	+32·35	¼
4340·749	+34·66	½	+34·77	½	+38·86	1	+35·91	1	+ 9·75	⅓	+22·60	1	+ 4·71	½
4325·687	.....	....	+36·84	¼	+36·61	½	+31·32	¼	+21·65	½	+15·12	¼	.....	....
4314·848	+32·81	¼	+35·60	½	+30·88	½	+30·44	½	+20·21	½	+13·93	½	+ 3·43	¼
4289·972	.....	....	+29·99	¼	+37·43	½	+26·60	½	.....	....	+18·83	¼	+ 5·98	½
4271·746	+23·77	¼	+41·79	½	.....	....	.....	....	.....	....	.....	....	+12·64	¼
4260·569	.....	....	.....	....	.....	....	+32·85	¼	.....	....	.....	....	.....	....
4233·370	.....	....	.....	....	+41·50	¼	+40·56	¼	.....	....	+18·39	½	.....	....
4227·213	.....	....	.....	....	.....	....	.....	....	.....	....	+16·09	¼	+20·44	¼
4215·780	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	+ 1·16	½
4143·749	.....	....	+28·28	½	.....	....	.....	....	.....	....	.....	....	.....	....
4128·075	.....	....	+28·24	¼	.....	....	.....	....	.....	....	.....	....	+13·04	¼
4101·904	.....	....	+24·78	½	+48·31	¼	+30·90	¼	.....	....	+24·50	1	+12·64	½
4045·909	.....	....	+34·15	1	+15·93	½	.....	....	.....	....	+17·54	½	.....	....
4005·421	.....	....	+32·54	½	.....	....	.....	....	.....	....	.....	....	.....	....
Weighted mean	+ 34·25		+ 32·53		+ 34·37		+ 32·75		+ 16·02		+ 17·09		+ 11·28	
V_e	− 18·30		− 25·41		− 24·27		− 26·74		− 26·19		− 25·19		+ 25·55	
V_d	− ·16		− ·16		− ·12		− ·16		± 0·00		− ·15		+ ·09	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 15·5		+ 6·7		+ 9·7		+ 5·6		− 10·4		− 8·5		+ 36·7	

MEASURES OF μ PERSEI—*Continued.*

λ	6449		6501		6518		6572		6583		6592		6616	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4583·963	+25·92	¼	+16·58	¼	.....	....	.....	....	.....	....	.....	....	.....	....
4572·082	+22·64	½	− 0·76	½	−10·08	½	+11·79	½	+ 8·33	½	− 9·51	½	− 1·52	½
4549·759	.....	....	+ 6·35	½	−14·29	¼	+ 1·16	½	− 1·86	¼	− 4·48	½	+ 2·47	½
4468·987	+35·70	¼	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....
4415·405	.....	....	+18·71	½	+ 4·66	½	.....	....	.....	....	+ 4·95	½	+ 9·01	½
4404·986	+14·07	½	+17·31	½	+ 4·74	¼	− 2·70	¼	− 1·06	¼	+14·38	½	+ 3·35	½
4395·548	.....	....	.....	....	.....	....	− 5·63	¼	.....	....	.....	....	.....	....
4351·745	+ 6·53	¼	+ 4·75	¼	− 5·48	½	.....	....	+ 2·03	½	+10·13	¼	+ 0·89	¼
4340·749	+ 9·78	½	+ 7·87	½	+10·35	½	+ 6·93	½	− 8·56	1	− 2·01	½	+ 8·40	1
4325·687	+14·83	¼	− 7·85	½	+ 8·51	¼	+ 9·45	¼	+ 7·44	¼	− 1·84	½	+ 8·78	¼
4314·848	+20·46	¼	+11·49	½	+ 0·23	½	+ 4·48	½	− 3·84	½	+ 2·59	½	+ 4·81	1
4289·972	+14·85	1	+ 1·43	¼	+ 0·68	1	+ 0·68	½	+ 6·44	¼	+ 4·49	½	+ 1·66	¼
4271·746	+ 8·58	½	+ 9·34	½	+ 7·83	¼	+ 9·69	½	.....	....	.....	....	.....	....
4260·569	.....	....	.....	....	− 0·29	½	.....	....	.....	....	.....	....	.....	....
4227·213	+17·84	¼	+12·40	¼	.....	....	+ 5·27	¼	.....	....	.....	....	.....	....
4215·780	+18·24	½	+14·46	½	+ 7·42	1	+11·90	1	+ 2·71	½	+ 8·21	½	+12·43	½
4198·494	.....	....	+19·23	½	.....	....	.....	....	.....	....	.....	....	.....	....
4128·075	.....	....	.....	....	− 8·31	½	.....	....	.....	....	.....	....	.....	....
4101·904	+24·80	1	+ 6·78	½	+ 4·75	½	+ 3·48	1	− 3·05	1	+ 8·70	½	+ 6·00	½
4071·901	.....	....	.....	....	+ 2·24	½	.....	....	.....	....	.....	....	.....	....
4063·756	.....	....	+ 6·38	½	+ 0·09	¼	− 2·71	¼	+11·55	¼	.....	....	.....	....
4045·909	+17·89	1	− 1·71	¼	+ 1·12	½	+ 7·31	½	+11·39	½	+10·77	½	+10·06	½
4005·421	.....	....	+ 3·17	½	+ 1·13	½	+10·82	½	.....	....	.....	....	.....	....
Weighted mean	+ 17·90		+ 8·49		+ 1·70		+ 5·32		+ 1·81		+ 3·59		+ 5·91	
V_o	+ 23·27		+ 19·91		+ 17·28		+ 3·59		+ 1·71		− 1·54		− 4·81	
V_d	+ ·05		± ·00		− ·11		− ·05		− ·09		− ·04		− ·04	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 40·9		+ 28·1		+ 18·0		+ 8·6		+ 3·1		+ 1·7		+ 0·8	

MEASURES OF μ PERSEI—*Continued.*

λ	6628		6654		6666		6693		6719		6730		6734	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4572·082	+ 8·73	½	+ 3·67	½	+14·06	½	+22·18	½	+28·44	½	+ 2·47	½	+ 5·00	¼
4549·759	+18·99	½	− 1·99	½	+11·65	½	+12·18	½	+10·47	½	− 1·86	½	.....	....
4415·405	+12·24	½	+ 3·52	¼	+ 5·67	½	+ 9·01	¼	+20·84	½	− 2·46	¼	− 4·73	¼
4404·986	+17·40	¼	+ 5·25	½	+14·15	¼	+14·38	½	+10·71	½	+ 0·03	½	.....	....
4351·745	+ 2·94	¼	− 7·44	¼	.....	....	+24·85	¼	+16·63	¼	.....	....	+26·55	¼
4340·749	− 0·31	½	−24·40	½	+ 4·78	½	− 2·91	½	+13·37	½	+ 1·39	½	+ 2·25	½
4325·687	− 4·97	¼	+10·90	¼	+ 6·83	¼	+13·81	¼	+18·90	¼	− 0·50	¼	+25·89	¼
4314·848	− 4·17	½	+ 7·47	½	+ 7·25	½	+12·24	½	.....	....	+ 9·47	½	.....	....
4289·972	− 6·07	¼	− 0·52	½	+ 2·42	½	+17·00	¼	+ 4·38	¼	+10·64	¼	+11·79	½
4215·780	+10·06	½	+11·80	½	+14·16	½	+19·19	½	+17·34	½	+11·19	½	+18·61	1
4101·904	− 0·70	¼	+ 6·28	¼	+10·01	½	+14·95	½	+21·67	½	+10·76	½	+20·90	½
4045·909	+18·28	½	.....	....	+12·72	½	+22·74	½	+32·59	½	+ 6·86	½	+13·95	½
Weighted mean	+ 7·17		+ 0·88		+ 9·32		+ 14·73		+ 18·46		+ 4·65		+ 14·06	
V_e	− 6·66		− 10·15		− 13·17		− 16·77		− 20·78		− 21·92		− 22·13	
V_d	− ·06		− ·04		− ·10		− ·12		± ·00		− ·03		− ·13	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	+ 0·2		− 9·6		− 4·2		− 2·4		− 2·6		− 17·6		− 8·5	

MEASURES OF μ PERSEI—*Continued.*

λ	6744		6761		6782		6787		6818		6827		6855	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4572·082	+ 9·57	½	+13·26	½	+12·99	½	− 1·80	¼	+12·73	¼	+18·05	¼	+ 8·20	½
4549·759	+13·10	½	+17·82	½	+12·70	½	+ 6·28	¼	+18·61	½	+27·28	¼	+14·54	½
4415·405	+ 8·05	½	+ 0·24	¼	+ 8·65	¼	+11·04	¼	+19·16	½	+15·58	½	+ 7·21	½
4404·986	+ 4·57	¼	+16·62	¼	+ 3·75	¼	+21·50	½	+10·94	½	+26·92	¼	+ 8·92	½
4351·745	.....	....	+11·27	¼	+ 9·71	½	.....	....	+ 7·72	¼	+27·59	¼	.....	....
4340·749	+14·62	½	+12·13	½	+17·80	½	+10·89	½	+ 8·40	½	+15·46	½	+14·50	½
4325·687	+ 4·65	¼	.....	....	+20·79	¼	.....	....	+18·39	¼	.....	....	+20·85	¼
4314·848	+11·91	½	+ 5·39	½	− 0·82	¼	+12·69	½	+ 9·49	½	+19·45	¼	+16·24	½
4294·301	.....	....	.....	....	+16·39	¼	.....	....	.....	....	.....	....	.....	....
4289·972	+16·45	¼	+11·55	½	+16·59	¼	+17·30	¼	+15·90	½	+15·90	½	+ 1·94	½
4271·746	+10·97	½	+ 9·15	¼	+16·15	¼	+17·20	¼	+19·99	½	+11·51	½	+ 8·50	¼
4215·780	+16·91	½	+14·36	½	+11·19	½	+22·05	½	+26·88	½	+14·18	½	+17·02	½
4101·904	.....	....	+ 8·61	½	+14·20	½	+11·86	¼	+17·65	½	+21·56	½	+16·43	½
4045·909	.....	....	+11·12	½	+13·77	1	+27·70	½	+24·85	½	+18·57	½	+23·54	½
4005·421	.....	....	.....	....	+ 7·82	¼	+15·00	¼	+27·40	½	+22·46	¼	+16·11	¼
Weighted mean	+ 11·52		+ 11·88		+ 12·57		+ 15·68		+ 17·08		+ 18·36		+ 13·14	
V_o	− 22·74		− 23·42		− 25·71		− 26·34		− 26·84		− 26·80		− 26·35	
V_d	− ·17		+ ·03		− ·12		− ·12		− ·12		− ·14		− ·16	
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28		− ·28	
Radial Velocity	− 11·7		− 11·8		− 13·5		− 11·1		− 10·2		− 8·9		− 13·6	

MEASURES OF μ PERSEI—*Concluded.*

λ	6863		6883		6892		6905		6923		6966			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4572·082	+ 7·13	½	+18·86	¼	+29·28	½	+35·12	½	+36·70	½	+25·96	½	.....	....
4549·759	+18·06	½	+20·98	½	+29·76	¼	+35·34	½	+23·62	½	+23·51	½	.....	....
4415·405	+ 8·76	½	+19·28	¼	+26·20	½	+17·01	½	+18·31	¼	.....	....	.....	....
4404·986	+ 7·74	½	+18·30	½	+12·24	¼	.....	....	+28·11	½	+27·18	¼	.....	....
4395·548	.....	....	+14·71	¼	.....	....	.....	....	.....	....	.....	....	.....	....
4351·745	+16·52	¼	+26·71	½	+36·49	¼	+25·76	¼	+20·96	¼	+27·20	¼	.....	....
4340·749	+24·66	½	+26·22	¼	+20·16	½	+23·30	1	+27·23	½	+35·41	½	.....	....
4325·687	+24·10	¼	+25·55	½	+32·26	¼	+28·45	¼	+26·40	¼	+45·78	¼	.....	....
4314·848	+25·33	½	+22·72	½	+34·64	½	+22·56	½	+17·48	½	+27·20	½	.....	....
4289·972	+11·45	¼	+24·18	¼	+18·95	¼	+22·52	¼	+13·23	½	+23·18	½	.....	....
4271·746	+17·85	½	.....	....	.....	....	+20·54	½	+21·09	¼	+10·29	½	.....	....
4215·780	+21·02	½	+35·61	½	+26·90	½	+26·77	½	+19·49	½	+26·00	¼	.....	....
4101·904	+21·18	½	+ 9·55	¼	+25·95	½	+22·31	½	+22·38	¼	.....	....	.....	....
4077·885	.....	....	.....	....	.....	....	+32·56	½	.....	....	.....	....	.....	....
4045·909	+ 9·82	½	+21·58	½	+32·12	¼	+30·71	½	+24·95	¼	.....	....	.....	....
4005·421	.....	....	+22·26	¼	+36·80	½	+24·81	¼	+15·32	¼	.....	....	.....	....
Weighted mean	+ 15·91		+ 22·76		+ 28·08		+ 26·18		+ 22·90		+ 26·07			
V_a	− 26·04		− 24·91		− 23·53		− 21·28		− 19·18		− 11·05			
V_d	− ·16		− ·19		− ·19		− ·19		− ·21		− ·19			
Curv.	− ·28		− ·28		− ·28		− ·28		− ·28		− ·28			
Radial Velocity	− 10·6		− 2·6		+ 4·1		+ 4·4		+ 3·2		+ 14·6			

Eleven normal places were formed which are given in Table IV with the mean Julian day, mean phase, velocity, weight and residual.

TABLE IV.

NORMAL PLACES.

No.	Julian Day	Phase	Velocity	Weight	Residual
1	2,419,958·950	50·87	+30·8	4·0	+ 2·3
2	20,248·930	77·03	+21·3	3·5	− 1·3
3	276·812	115·44	+ 7·4	2·0	− 0·4
4	392·131	129·69	+ 2·3	2·0	+ 0·2
5	439·197	152·50	− 5·7	2·5	− 0·3
6	524·307	178·34	−10·5	2·5	+ 0·6
7	552·066	206·10	−10·8	3·5	+ 0·4
8	573·519	227·55	− 8·6	2·5	− 2·2
9	470·400	250·65	+ 4·3	3·0	+ 1·2
10	183·669	274·61	+16·2	1·5	+ 1·3
11	19,879·385	21·54	+24·8	3·5	− 1·9

By the graphical method of Dr. King the following preliminary elements were obtained:—

γ = 7·92 km.
K = 21·50 km.
e = ·1
ω = 300°
T = 2,420,058·70 J. D.

The observation equations following were formed for a least-squares solution. The period was not included in the solution as the early Lick observations all occurred at the low part of the curve, where a variation of several days would make no appreciable difference in the residual, and hence no improvement could be hoped for by this means.

OBSERVATION EQUATIONS.

No.	x	y	z	u	v	$-n$	Weight.
1.....	1	+·991	−·177	− ·251	+ ·350	−1·6	4·0
2.....	1	+·657	−·954	− ·708	+ ·735	+0·7	3·5
3.....	1	−·047	−·294	− ·909	+ ·823	−0·5	2·0
4.....	1	−·301	+·205	− ·850	+ ·761	−0·9	2·0
5.....	1	−·649	+·842	− ·628	+ ·583	−0·3	2·5
6.....	1	−·902	+·901	− ·221	+ ·264	−1·0	2·5
7.....	1	−·920	+·031	+ ·331	− ·231	−1·0	3·5
8.....	1	−·698	−·826	+ ·750	− ·690	+1·5	2·5
9.....	1	−·225	−·945	+1·048	−1·100	−1·2	3·0
10.....	1	+·400	+·172	+1·023	−1·130	+0·3	1·5
11.....	1	+·978	+·983	+ ·459	− ·434	+4·1	3·5

In the above $x = \delta\gamma$
$y = \delta K$
$z = K\delta e$
$u = K\delta\omega$
$v = \dfrac{K\mu\delta T}{(1-e^2)^{\frac{1}{2}}}$

The normal equations resulting from these observation equations were:—

$$30\cdot500x + \cdot073y - \cdot961z + \cdot195u + \cdot210v + 1\cdot450 = 0$$
$$16\cdot630y - \cdot941z - 1\cdot406u + 1\cdot527v + 14\cdot225 = 0$$
$$15\cdot183z - 1\cdot733u + 1\cdot681v + 10\cdot221 = 0$$
$$13\cdot602u - 13\cdot472v + 8\cdot259 = 0$$
$$13\cdot497v - 8\cdot285 = 0$$

Solving these gave

$x = -\ \cdot0869$
$y = -\ \cdot9835$
$z = -\ \cdot8288$
$u = +\ \cdot7490$
$v = +1\cdot5772$

and therefore the corrections:—

$\delta\gamma = -\cdot09$ km.
$\delta K = -\cdot98$ km.
$\delta e = -\cdot0385$
$\delta\omega = +1^\circ\cdot99$
$\delta T = +3\cdot27$ days.

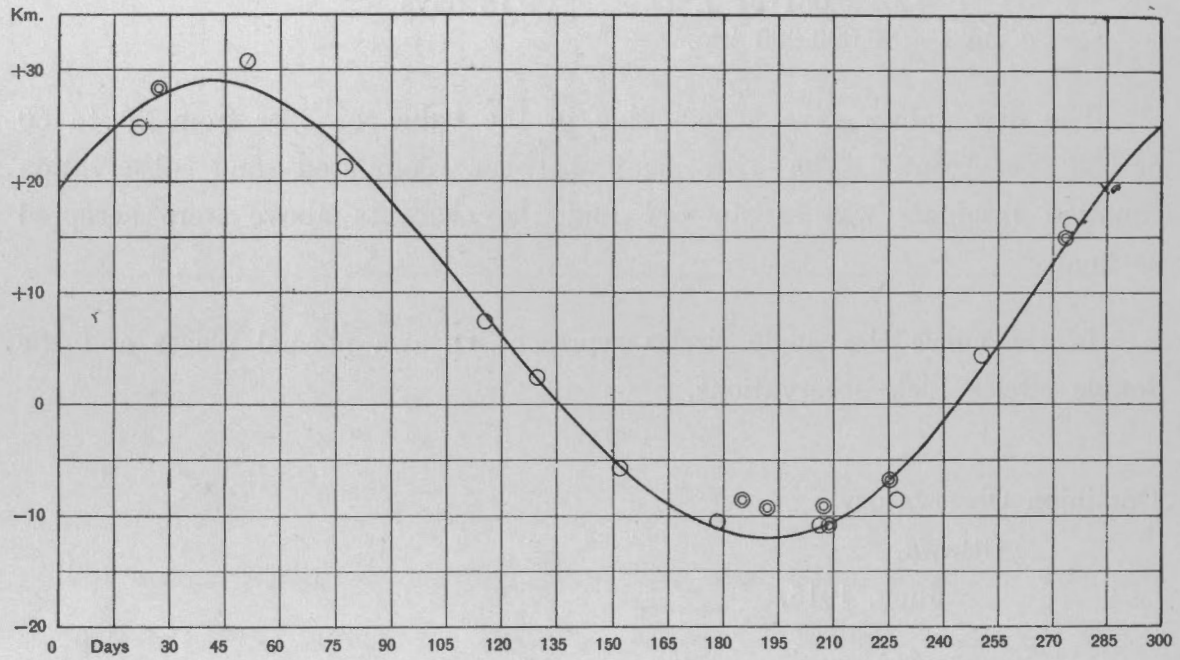
Hence the new values of the elements, to which the probable errors are appended.

γ = 7·83 km.	± ·36 km.
K = 20·50 km.	± ·62 km.
e = ·0615	± ·0313
ω = 301°·99	±18°·04
T = 2,420,061·97 J. D.	±14·18 days
$a \sin i$ = 80,000,000 km.	

The new values gave a reduction in the value of Σpvv from 90 to 60 or 33 per cent. The agreement between computed and observation equation residuals was satisfactory and the elements above were accepted as final.

In the curve the single circles represent Ottawa normal places and the double circles Lick observations.

Dominion Observatory,
Ottawa,
June, 1915.



VELOCITY CURVE OF μ PERSEI.