

ROYAL OBSERVATORY, GREENWICH.

SPECTROSCOPIC OBSERVATIONS

MADE AT THE

ROYAL OBSERVATORY, GREENWICH.

1891.

GREENWICH OBSERVATIONS, 1891.

5 A

MOTIONS OF STARS IN THE LINE OF SIGHT, INFERRED FROM SPECTROSCOPIC OBSERVATIONS

MEASURES OF DISPLACEMENT OF LINES in the SPECTRA of STARS, AND MOON, as compared with those of TERRESTRIAL ELEMENTS, and CONCLUDED MOTIONS in the LINE of SIGHT, from OBSERVATIONS at the ROYAL OBSERVATORY, GREENWICH, in the Year 1891.

The day specified in the first column is the Civil Day, and the hours and minutes are those of Greenwich Civil Time, commencing at Greenwich Mean Midnight and counting from 0 to 24 hours.

Note.—The motion corresponding to the displacement actually observed may be inferred from the Concluded Motion by adding the Earth's Motion algebraically.

The "Half-prism" Spectroscope was used throughout. Each "Half-prism" is compound, and is composed of a flint "half-prism" (i.e., the half of an isosceles prism, cut by a plane perpendicular to the base,) and a crown prism, cemented on the emergent face so as to form the half of a direct-vision prism. With one such half-prism a dispersion of about $18\frac{1}{2}^\circ$ from A to H, equivalent to that produced by four flint prisms of 60° , is obtained; and with a train of two, a dispersion of about 80° , equivalent to that produced by sixteen flint prisms of 60° . One half-prism has been always employed. The dispersions have been inferred from measurements of the distance between b_1 and b_2 as compared with the wave-length measure.

rev. of the micrometer corresponds with one "half-prism" to 10.4 tenth-metres or 375 miles per second for the b lines, and to 7.91 tenth-metres or 304 miles per second for the F line.

rev. of the screw for opening the slit corresponds to 0.01 inch, or about $10''$.

The slit lies north and south when the reading of the Position Circle is 6° .

The velocity of light has been taken as 186,660 miles per second, and the distance of the Sun as 92,250,000 miles.

The estimations of displacements have been made by indirect comparison with the comparison-line, except where the contrary is expressly stated. The displacement is estimated in terms of the breadth of the comparison-line.

The sign + denotes a displacement towards the red or a motion of recession, — a displacement towards the blue or a motion of approach.

Date, 1891. Greenwich Civil Time.	Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
						Measured.	Estimated.		Measured.	Estimated.	
June 26. ^d 23. ^h 16	M	Vega	6	F	r	-0.073	- $\frac{1}{3}$	- 1.3	- 20.9	- 30.3	Sky not clear enough for a second observation.
July 2. 22. 22	M	Vega	6	F	0.210	-0.045	- $\frac{1}{4}$	- 0.4	- 13.3	- 23.3	Spectrum bright and fairly steady.
22. 25	M	"	6	F	0.210	-0.089	- $\frac{1}{4}$	- 0.4	- 25.6	- 23.3	
22. 54	M	"	96	F	0.210	-0.036	0	- 0.4	- 10.5	+ 0.4	
22. 56	M	"	96	F	0.210	-0.016	0	- 0.4	- 4.5	+ 0.4	Spectrum bright and fairly steady. Star-line very diffused. It was found easier to observe at P.A. 6° than at 96° .
23. 27	M	Altair.....	96	F	0.210	-0.011	0	- 5.2	+ 1.9	+ 5.2	
23. 29	M	"	96	F	0.210	-0.068	- $\frac{1}{3}$	- 5.2	- 15.4	- 26.4	
23. 42	M	"	6	F	0.210	-0.037	- $\frac{1}{10}$	- 5.2	- 6.1	- 4.3	
23. 45	M	"	6	F	0.210	-0.022	- $\frac{1}{10}$	- 5.2	- 1.5	- 4.3	
23. 59	M	α Cygni	6	F	0.210	-0.089	- $\frac{2}{5}$	- 7.1	- 19.9	- 30.8	
3. 0. 4	M	"	6	F	0.210	-0.035	- $\frac{1}{5}$	- 7.1	- 3.6	- 11.8	
0. 17	M	"	96	F	0.210	-0.093	- $\frac{2}{5}$	- 7.1	- 21.1	- 30.8	
0. 24	M	"	96	F	0.210	-0.079	- $\frac{1}{3}$	- 7.1	- 16.9	- 24.5	
0. 44	M	Vega	96	F	0.210	-0.194	- $\frac{2}{3}$	- 0.4	- 58.5	- 47.0	Sky not clear enough for second observation.
0. 47	M	"	96	F	0.210	-0.078	- $\frac{1}{10}$	- 0.4	- 23.3	- 9.0	
0. 53	M	"	6	F	0.210	-0.014	- $\frac{1}{10}$	- 0.4	- 3.9	- 9.1	
July 6. 22. 30	M	Altair.....	6	F	0.192	-0.136	- $\frac{2}{5}$	- 4.2	- 37.1	- 32.2	Observations much interrupted by cloud.
22. 33	M	"	6	F	0.192	-0.185	- $\frac{1}{2}$	- 4.2	- 51.9	- 41.3	
22. 57	M	"	276	F	0.192	-0.316	- 1	- 4.2	- 91.8	- 86.9	
22. 59	M	"	276	F	0.192	-0.052	- $\frac{1}{4}$	- 4.2	- 11.5	- 18.6	Observations much interrupted by cloud.
23. 25	M	"	96	F	0.192	-0.030	- $\frac{1}{10}$	- 4.2	- 4.9	- 4.9	
23. 32	M	"	96	F	0.192	-0.030	- $\frac{1}{10}$	- 4.2	- 4.9	- 4.9	
23. 38	M	"	6	F	0.192	-0.249	- $\frac{3}{5}$	- 4.2	- 71.4	- 50.5	Observations much interrupted by passing clouds. Measures very rough.
23. 43	M	"	6	F	0.192	-0.147	- $\frac{2}{3}$	- 4.2	- 40.5	- 41.3	
7. 0. 1	M	"	186	F	0.192	-0.127	- $\frac{2}{3}$	- 4.2	- 34.4	- 26.2	
0. 7	M	"	186	F	0.192	-0.170	- $\frac{2}{3}$	- 4.2	- 47.4	- 41.3	
0. 14	M	"	276	F	0.192	-0.159	- $\frac{2}{3}$	- 4.2	- 44.1	- 41.3	
0. 18	M	"	276	F	0.192	-0.046	- $\frac{1}{10}$	- 4.2	- 9.8	- 23.1	
0. 27	M	"	96	F	0.192	-0.065	- $\frac{1}{4}$	- 4.2	- 15.5	- 18.6	
0. 30	M	"	96	F	0.192	-0.148	- $\frac{2}{5}$	- 4.2	- 40.8	- 32.2	

AT THE ROYAL OBSERVATORY, GREENWICH, IN THE YEAR 1891.

3

Date, 1891. Greenwich Civil Time.		Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
							Measured.	Estimated.		Measured.	Estimated.	
July 7.	d h m 0. 50	M	Altair.....	186	F	0'192	-0'080	- $\frac{1}{4}$	- 4'2	- 20'0	- 18'6	
	0. 53	M	,,	186	F	0'192	-0'070	- $\frac{1}{3}$	- 4'2	- 17'0	- 26'2	
July 8.	22. 38	M	Altair.....	96	F	0'192	-0'171	- $\frac{1}{3}$	- 3'7	- 48'3	- 44'0	Observations continually interrupted by cloud throughout the evening.
	22. 43	M	,,	96	F	0'192	-0'123	- $\frac{1}{3}$	- 3'7	- 33'7	- 34'5	
	22. 36	M	,,	6	F	0'192	-0'163	- $\frac{1}{3}$	- 3'7	- 45'8	- 34'5	
	22. 39	M	,,	6	F	0'192	-0'147	- $\frac{1}{3}$	- 3'7	- 41'0	- 28'1	
	23. 24	M	,,	276	F	0'192	-0'330	- 1	- 3'7	- 96'5	- 91'6	
July 10.	22. 45	M	Vega	96	F	0'168	-0'158	- $\frac{1}{3}$	+ 0'7	- 48'7	- 38'5	The earlier observations took a long while to make owing to the awkward position of the observer, and there was much light cloud about. The second series, after 0 ^h 10 ^m , were made under more favourable conditions. The definition was bad throughout the evening, the star spectra ex- ceedingly tremulous, and owing to passing cloud the observations were made with difficulty.
	22. 53	M	,,	96	F	0'168	-0'169	- $\frac{1}{3}$	+ 0'7	- 52'0	- 38'5	
	23. 16	M	,,	6	F	0'168	-0'204	- $\frac{1}{3}$	+ 0'7	- 62'6	- 46'1	
	23. 26	M	,,	6	F	0'168	-0'107	0	+ 0'7	- 33'2	- 0'7	
	23. 47	M	,,	276	F	0'168	-0'121	- $\frac{1}{3}$	+ 0'7	- 37'4	- 38'5	
	23. 50	M	,,	276	F	0'168	-0'116	- $\frac{1}{3}$	+ 0'7	- 36'0	- 38'5	
	11. 0. 7	M	,,	186	F	0'168	-0'130	- $\frac{1}{3}$	+ 0'7	- 40'2	- 61'2	
	0. 10	M	,,	186	F	0'168	-0'062	- $\frac{1}{3}$	+ 0'7	- 19'5	- 31'0	
	0. 17	M	,,	96	F	0'168	-0'239	- $\frac{1}{3}$	+ 0'7	- 73'3	- 38'5	
	0. 21	M	,,	96	F	0'168	-0'018	- $\frac{1}{10}$	+ 0'7	- 6'2	- 8'3	
	0. 28	M	,,	6	F	0'168	-0'040	- $\frac{1}{10}$	+ 0'7	- 12'8	- 15'8	
	0. 33	M	,,	6	F	0'168	-0'142	- $\frac{1}{10}$	+ 0'7	- 43'8	- 31'0	
	0. 40	M	,,	276	F	0'168	-0'200	- $\frac{1}{10}$	+ 0'7	- 61'4	- 46'1	
	0. 43	M	,,	276	F	0'168	-0'181	- $\frac{1}{10}$	+ 0'7	- 55'6	- 46'1	
	0. 50	M	,,	186	F	0'168	-0'162	- $\frac{1}{10}$	+ 0'7	- 49'9	- 38'5	
	0. 51	M	,,	186	F	0'168	-0'199	- $\frac{1}{10}$	+ 0'7	- 61'1	- 46'1	
July 14.	22. 44	M	Vega	96	F	0'208	+0'029	+ $\frac{1}{10}$	+ 1'4	+ 7'4	+ 8'9	
	22. 52	M	,,	96	F	0'208	+0'043	+ $\frac{1}{10}$	+ 1'4	+ 11'7	+ 8'9	
	22. 59	M	,,	6	F	0'208	-0'035	- $\frac{1}{10}$	+ 1'4	- 12'0	- 11'7	
	23. 3	M	,,	6	F	0'208	-0'092	- $\frac{1}{3}$	+ 1'4	- 29'3	- 35'8	
	23. 28	M	,,	276	F	0'208	-0'178	- $\frac{1}{3}$	+ 1'4	- 55'5	- 63'4	
July 22.	22. 25	M	Vega	6	F	0'208	-0'043	- $\frac{1}{5}$	+ 2'3	- 15'4	- 22'9	The sky clouded over before any observations could be secured at 186°. The observations at 6° and 276° were made under fair con- ditions, although light cloud inter- rupted the work from time to time. Still, at the moments of bisection the spectrum was fairly bright and steady, and the star-line fairly well seen.
	22. 30	M	,,	6	F	0'208	-0'046	- $\frac{1}{5}$	+ 2'3	- 16'2	- 22'9	
	22. 45	M	,,	276	F	0'208	-0'156	- $\frac{1}{5}$	+ 2'3	- 49'7	- 53'8	
	22. 50	M	,,	276	F	0'208	-0'321	- 1	+ 2'3	- 99'8	- 105'6	
July 24.	22. 53	M	Vega	186	F	0'212	-0'064	- $\frac{1}{10}$	+ 2'6	- 22'0	- 12'9	
	22. 55	M	,,	186	F	0'212	-0'150	- $\frac{1}{3}$	+ 2'6	- 48'1	- 40'2	
	23. 6	M	,,	96	F	0'212	-0'165	- $\frac{1}{3}$	+ 2'6	- 52'7	- 58'9	
	23. 11	M	,,	96	F	0'212	-0'062	- $\frac{1}{4}$	+ 2'6	- 21'4	- 30'7	
	23. 33	M	,,	6	F	0'212	-0'059	- $\frac{1}{4}$	+ 2'6	- 20'5	- 30'7	
	23. 37	M	,,	6	F	0'212	-0'138	- $\frac{1}{4}$	+ 2'6	- 44'5	- 40'2	
	23. 50	M	,,	276	F	0'212	-0'255	- $\frac{1}{3}$	+ 2'6	- 80'1	- 77'8	
	23. 52	M	,,	276	F	0'212	-0'171	- $\frac{1}{2}$	+ 2'6	- 54'5	- 58'9	
	25. 0. 4	M	,,	186	F	0'212	-0'015	0	+ 2'6	- 7'1	- 2'6	
	0. 6	M	,,	186	F	0'212	-0'092	- $\frac{1}{4}$	+ 2'6	- 30'5	- 30'7	
	0. 13	M	,,	276	F	0'212	-0'070	- $\frac{1}{4}$	+ 2'6	- 23'9	- 30'7	

MOTIONS OF STARS IN THE LINE OF SIGHT, INFERRED FROM SPECTROSCOPIC OBSERVATIONS

Date, 1891. Greenwich Civil Time.		Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
							Measured.	Estimated.		Measured.	Estimated.	
July 25.	^d 0.18	M	Vega	96	F	0'212	+0'040	+ $\frac{1}{10}$	+ 2'6	+ 9'5	+ 8'7	
	^h 0.20	M	"	96	F	0'212	-0'073	- $\frac{1}{4}$	+ 2'6	- 24'7	- 30'7	
	^m 0.38	M	Moon	96	F	0'212	-0'111			- 33'7		
	0.39	M	"	96	F	0'212	-0'042			- 12'7		
	0.40	M	"	96	F	0'212	-0'020			- 6'1		
	0.41	M	"	96	F	0'212	-0'117			- 35'5		
	0.42	M	"	96	F	0'212	+0'039			+ 11'8		
	0.47	M	"	6	F	0'212	+0'006			+ 1'8		
	0.48	M	"	6	F	0'212	+0'006			+ 1'8		
	0.50	M	"	6	F	0'212	+0'014			+ 4'2		
	0.51	M	"	6	F	0'212	+0'026			+ 7'9		
	0.52	M	"	6	F	0'212	-0'027			- 8'2		
	0.56	M	"	276	F	0'212	-0'064			- 19'4		
	0.57	M	"	276	F	0'212	-0'037			- 11'2		
	0.59	M	"	276	F	0'212	-0'030			- 9'1		
	1. 0	M	"	276	F	0'212	-0'018			- 5'5		
	1. 1	M	"	276	F	0'212	-0'074			- 22'5		
	1. 7	M	"	186	F	0'212	+0'033			+ 10'0		
	1. 8	M	"	186	F	0'212	+0'006			+ 1'8		
	1.10	M	"	186	F	0'212	-0'002			- 0'6		
	1.11	M	"	186	F	0'212	+0'004			+ 1'2		
	1.12	M	"	186	F	0'212	+0'007			+ 2'1		
July 27.	22.27	M	Altair.....	96	F	0'176	-0'061	- $\frac{1}{10}$	+ 1'2	- 19'7	- 10'0	
	22.31	M	"	96	F	0'176	+0'022	+ $\frac{1}{4}$	+ 1'2	+ 5'5	+ 20'9	
	22.37	M	"	6	F	0'176	-0'146	- $\frac{1}{2}$	+ 1'2	- 45'5	- 45'4	
	22.43	M	"	6	F	0'176	-0'204	- $\frac{3}{4}$	+ 1'2	- 63'1	- 60'1	
	22.47	M	"	276	F	0'176	-0'125	- $\frac{1}{2}$	+ 1'2	- 39'1	- 30'7	
	22.54	M	"	276	F	0'176	-0'293	- $\frac{3}{4}$	+ 1'2	- 90'2	- 67'5	
	23.15	M	"	186	F	0'176	-0'234	- $\frac{1}{2}$	+ 1'2	- 72'2	- 36'5	
	23.17	M	"	186	F	0'176	-0'103	- $\frac{1}{2}$	+ 1'2	- 32'5	- 30'7	
	23.30	M	Vega	186	F	0'176	-0'056	- $\frac{1}{2}$	+ 3'0	- 20'0	- 20'7	
	23.34	M	"	186	F	0'176	-0'070	- $\frac{1}{2}$	+ 3'0	- 24'2	- 25'1	
	23.40	M	"	276	F	0'176	-0'027	- $\frac{1}{2}$	+ 3'0	- 11'2	- 32'5	
	23.43	M	"	276	F	0'176	-0'053	- $\frac{1}{2}$	+ 3'0	- 19'1	- 32'5	
	23.48	M	"	6	F	0'176	+0'002	- $\frac{1}{10}$	+ 3'0	- 2'4	- 11'8	
	23.53	M	"	6	F	0'176	-0'014	- $\frac{1}{10}$	+ 3'0	- 7'2	- 11'8	
28.	0. 0	M	"	96	F	0'176	+0'006	0	+ 3'0	- 1'2	- 3'0	
	0. 3	M	"	96	F	0'176	+0'038	+ $\frac{1}{10}$	+ 3'0	+ 8'5	+ 5'8	
	0.14	M	Altair.....	96	F	0'176	-0'044	- $\frac{1}{8}$	+ 1'2	- 14'6	- 18'9	
	0.17	M	"	96	F	0'176	+0'010	0	+ 1'2	+ 1'8	- 1'2	
	0.25	M	"	6	F	0'176	+0'298	- $\frac{3}{4}$	+ 1'2	- 91'7	- 67'5	
	0.27	M	"	6	F	0'176	-0'184	- $\frac{1}{2}$	+ 1'2	- 57'1	- 45'4	
	0.34	M	"	276	F	0'176	-0'118	- $\frac{2}{5}$	+ 1'2	- 37'0	- 36'5	
	0.37	M	"	276	F	0'176	-0'032	- $\frac{1}{5}$	+ 1'2	- 10'9	- 18'9	
	0.43	M	"	186	F	0'176	+0'004	0	+ 1'2	0'0	- 1'2	
	0.44	M	"	186	F	0'176	-0'132	- $\frac{2}{5}$	+ 1'2	- 41'2	- 36'5	
July 29.	22.35	M	Vega	96	F	0'176	+0'103	+ $\frac{1}{8}$	+ 3'3	+ 28'0	+ 26'2	
	22.55	M	"	96	F	0'176	+0'059	+ $\frac{1}{4}$	+ 3'3	+ 14'6	+ 18'8	
Aug 3.	22.26	M	Vega	186	F	0'196	-0'137	- $\frac{1}{3}$	+ 3'9	- 45'5	- 29'7	
	22.30	M	"	186	F	0'196	-0'121	- $\frac{1}{3}$	+ 3'9	- 40'6	- 29'7	
	22.37	M	"	276	F	0'196	-0'067	- $\frac{1}{3}$	+ 3'9	- 24'2	- 29'7	
	22.45	M	"	276	F	0'196	-0'026	- $\frac{1}{5}$	+ 3'9	- 11'8	- 19'4	
	22.51	M	"	6	F	0'196	-0'054	- $\frac{1}{4}$	+ 3'9	- 20'3	- 23'3	
	22.57	M	"	6	F	0'196	-0'070	- $\frac{1}{4}$	+ 3'9	- 25'2	- 23'3	
	23. 6	M	"	96	F	0'196	-0'092	- $\frac{1}{3}$	+ 3'9	- 31'8	- 29'7	
	23.15	M	"	96	F	0'196	+0'016	0	+ 3'9	+ 0'9	- 3'9	
The micrometer was reversed after the observations at 276° and before those at 186°.												
Spectra bright and fairly steady. The definition was, however, only moderately good for Vega, and decidedly poor for Altair. With both stars the definition at 276° and 96° was markedly inferior to that at 6° and 186°.												
Several other bisections were made which are not recorded, but which were all in close accord and all gave a displacement towards the red, not towards the blue.												

Date, 1891. Greenwich Civil Time.	Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
						Measured.	Estimated.		Measured.	Estimated.	
Aug. 3. ^{d h m} 23. 34	M	Altair.....	96	F	0'196	+0'002	0	+ 3'0	- 2'5	- 3'0	
23. 36	M	"	96	F	0'196	+0'007	0	+ 3'0	- 0'9	- 3'0	
23. 48	M	"	6	F	0'196	-0'105	- 2/3	+ 3'0	- 35'1	- 34'0	
23. 50	M	"	6	F	0'196	-0'041	- 1/3	+ 3'0	- 15'4	- 18'5	
4. 0. 1	M	"	276	F	0'196	-0'101	- 1/4	+ 3'0	- 33'6	- 22'4	
0. 3	M	"	276	F	0'196	-0'103	- 1/3	+ 3'0	- 34'3	- 41'8	
0. 8	M	"	186	F	0'196	-0'027	- 1/5	+ 3'0	- 11'2	- 18'5	
0. 12	M	"	186	F	0'196	-0'008	- 1/10	+ 3'0	- 5'4	- 10'8	
Aug. 29. 20. 59	M	Vega	96	F	0'178	+0'112	+ 1/3	+ 6'8	+ 27'2	+ 20'8	Definition very bad, measures made with extreme difficulty. Nevertheless several other bisections all agreed in giving displacement towards the red, and to about the same amount as above observations. Spectrum bright and steady.
21. 1	M	"	96	F	0'178	+0'173	+ 1/2	+ 6'8	+ 45'7	+ 34'7	Star-line seen very much better than at 96°.
21. 21	M	"	6	F	0'178	-0'146	- 2/5	+ 6'8	- 51'1	- 40'0	
21. 24	M	"	6	F	0'178	-0'194	- 1/4	+ 6'8	- 65'7	- 27'5	
21. 43	M	"	276	F	0'178	-0'145	- 1/3	+ 6'8	- 50'8	- 34'4	
21. 49	M	"	276	F	0'178	-0'028	- 1/3	+ 6'8	- 15'3	- 34'4	
22. 0	M	"	186	F	0'178	-0'197	- 1/3	+ 6'8	- 66'6	- 48'3	
22. 4	M	"	186	F	0'178	-0'128	- 1/2	+ 6'8	- 45'7	- 48'3	
22. 36	M	Altair.....	186	F	0'178	-0'096	- 1/5	+ 9'2	- 38'3	- 25'8	
22. 41	M	"	186	F	0'178	+0'002	0	+ 9'2	- 8'6	- 9'2	
22. 50	M	"	276	F	0'178	-0'163	- 1/3	+ 9'2	- 58'7	- 50'7	
22. 55	M	"	276	F	0'178	-0'269	- 1/3	+ 9'2	- 90'9	- 59'0	
23. 1	M	"	6	F	0'178	-0'049	- 1/3	+ 9'2	- 24'1	- 36'8	
23. 3	M	"	6	F	0'178	-0'121	- 1/3	+ 9'2	- 45'9	- 42'4	
23. 11	M	"	96	F	0'178	+0'137	+ 1/3	+ 9'2	+ 32'4	+ 18'4	Definition for Altair bad throughout, especially at 96°.
23. 17	M	"	96	F	0'178	-0'002	0	+ 9'2	- 9'8	- 9'2	
Sept. 4. 22. 56	M	Vega	96	F	0'178	-0'101	- 1/3	+ 7'3	- 37'9	- 35'0	Definition at 96° much better than usual at that reading.
23. 0	M	"	96	F	0'178	-0'082	- 1/3	+ 7'3	- 32'2	- 40'6	
23. 6	M	"	6	F	0'178	-0'233	- 1/3	+ 7'3	- 78'1	- 57'2	
23. 9	M	"	6	F	0'178	-0'061	- 1/4	+ 7'3	- 25'8	- 28'1	Definition at 6° very poor.
Sept. 9. 20. 6	M	Vega	96	F	0'178	+0'111	+ 1/3	+ 7'7	+ 26'0	+ 20'0	The spectrum was very tremulous and observations therefore made with difficulty. Star-line seen fairly well at times, but very difficult to hold.
20. 11	M	"	96	F	0'178	+0'152	+ 1/2	+ 7'7	+ 38'5	+ 33'9	Spectrum still very tremulous, but star-line seen better than at 96°.
20. 20	M	"	6	F	0'178	-0'042	- 1/5	+ 7'7	- 20'4	- 21'4	Spectrum steadier.
20. 25	M	"	6	F	0'178	-0'098	- 1/3	+ 7'7	- 37'5	- 35'4	
20. 34	M	"	276	F	0'178	-0'053	- 1/4	+ 7'7	- 23'8	- 28'5	
20. 38	M	"	276	F	0'178	-0'047	- 1/5	+ 7'7	- 21'9	- 41'0	
20. 57	M	"	186	F	0'178	-0'198	- 1/5	+ 7'7	- 67'8	- 49'3	
21. 1	M	"	186	F	0'178	-0'167	- 1/2	+ 7'7	- 58'4	- 49'3	
21. 12	M	Altair.....	186	F	0'178	+0'034	0	+ 11'5	- 1'2	- 11'5	Spectrum rather faint, but fairly steady. Star-line seen fairly well; other and independent bisections gave the same result; measures considered good.
21. 17	M	"	186	F	0'178	-0'010	0	+ 11'5	- 14'5	- 11'5	Spectrum tremulous; definition bad.
21. 26	M	"	276	F	0'178	-0'090	- 1/4	+ 11'5	- 38'8	- 32'3	Spectrum unsteady; definition poor.
21. 30	M	"	276	F	0'178	-0'176	- 1/3	+ 11'5	- 65'0	- 53'1	
21. 43	M	"	6	F	0'178	-0'096	- 1/3	+ 11'5	- 40'6	- 53'1	
21. 47	M	"	6	F	0'178	-0'150	- 1/3	+ 11'5	- 57'0	- 53'1	
21. 54	M	"	96	F	0'178	-0'003	0	+ 11'5	- 12'4	- 11'5	
21. 57	M	"	96	F	0'178	-0'032	+ 1/5	+ 11'5	- 21'2	+ 5'1	
22. 5	M	"	186	F	0'178	-0'094	+ 1/5	+ 11'5	- 40'0	+ 5'1	
22. 7	M	"	186	F	0'178	-0'030	+ 1/10	+ 11'5	- 20'6	- 3'2	
22. 14	M	"	276	F	0'178	-0'020	- 1/4	+ 11'5	- 17'6	- 32'3	
22. 19	M	"	276	F	0'178	-0'011	- 1/4	+ 11'5	- 14'8	- 32'3	
22. 25	M	"	6	F	0'178	-0'147	- 1/2	+ 11'5	- 56'1	- 53'1	Definition bad.

MOTIONS OF STARS IN THE LINE OF SIGHT, INFERRED FROM SPECTROSCOPIC OBSERVATIONS

Date, 1891. Greenwich Civil Time.	Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
						Measured.	Estimated.		Measured.	Estimated.	
Sept. 9. ^{d h m} 22. 30	M	Altair.....	6	F	0'178	-0'255	- $\frac{3}{8}$	+ 11'5	- 89'0	- 61'4	Definition bad.
22. 35	M	,,	96	F	0'178	-0'047	- $\frac{1}{10}$	+ 11'5	- 25'7	- 19'8	
22. 41	M	,,	96	F	0'178	+0'083	+ $\frac{2}{8}$	+ 11'5	+ 13'7	+ 21'8	
Sept. 10. 22. 32	M	Vega	276	F	0'216	-0'048	- $\frac{1}{4}$	+ 7'8	- 22'4	- 34'2	
22. 40	M	,,	276	F	0'216	-0'113	- $\frac{1}{3}$	+ 7'8	- 42'1	- 43'0	
23. 8	M	,,	186	F	0'216	-0'013	0	+ 7'8	- 11'7	- 7'8	
23. 12	M	,,	186	F	0'216	-0'009	0	+ 7'8	- 10'5	- 7'8	
23. 30	M	Altair.....	186	F	0'216	-0'189	- $\frac{2}{8}$	+ 11'7	- 69'1	- 54'0	
23. 33	M	,,	186	F	0'216	-0'148	- $\frac{2}{8}$	+ 11'7	- 56'6	- 54'0	
23. 54	M	,,	276	F	0'216	-0'020	- $\frac{1}{10}$	+ 11'7	- 17'8	- 22'3	
11. 0. 1	M	,,	276	F	0'216	-0'179	- $\frac{1}{10}$	+ 11'7	- 66'0	- 64'5	
0. 10	M	,,	6	F	0'216	-0'181	- $\frac{2}{8}$	+ 11'7	- 66'7	- 54'0	
0. 11	M	,,	6	F	0'216	-0'186	- $\frac{1}{2}$	+ 11'7	- 68'1	- 64'5	
0. 23	M	,,	96	F	0'216	+0'084	+ $\frac{1}{8}$	+ 11'7	+ 13'8	+ 9'4	
0. 27	M	,,	96	F	0'216	+0'066	+ $\frac{1}{10}$	+ 11'7	+ 8'3	- 1'1	
Sept. 16. 22. 47	M	Vega	96	F	0'216	+0'093	+ $\frac{1}{4}$	+ 8'1	+ 20'1	+ 18'3	
22. 51	M	,,	96	F	0'216	+0'245	+ $\frac{1}{8}$	+ 8'1	+ 66'3	+ 44'7	
22. 59	M	,,	6	F	0'216	-0'194	- $\frac{1}{4}$	+ 8'1	- 67'0	- 60'9	
23. 9	M	,,	6	F	0'216	-0'090	- $\frac{1}{4}$	+ 8'1	- 35'4	- 34'5	
23. 21	M	,,	276	F	0'216	-0'038	- $\frac{1}{3}$	+ 8'1	- 19'6	- 43'3	
23. 27	M	,,	276	F	0'216	+0'003	0	+ 8'1	- 7'3	- 8'1	
Sept. 15. 21. 14	M	Vega	96	F	0'195	-0'078	- $\frac{1}{8}$	+ 8'5	- 32'2	- 27'2	
21. 18	M	,,	96	F	0'195	+0'080	+ $\frac{1}{4}$	+ 8'5	+ 15'8	+ 14'9	
21. 26	M	,,	6	F	0'195	-0'182	- $\frac{1}{2}$	+ 8'5	- 63'8	- 55'3	
21. 30	M	,,	6	F	0'195	-0'039	- $\frac{1}{4}$	+ 8'5	- 20'3	- 31'9	
21. 35	M	,,	276	F	0'195	-0'065	- $\frac{1}{3}$	+ 8'5	- 28'2	- 39'7	
21. 39	M	,,	276	F	0'195	-0'098	- $\frac{1}{2}$	+ 8'5	- 38'3	- 55'3	
21. 57	M	,,	186	F	0'195	+0'032	+ $\frac{1}{4}$	+ 8'5	+ 1'2	+ 10'2	
22. 0	M	,,	186	F	0'195	+0'119	+ $\frac{1}{4}$	+ 8'5	+ 27'6	+ 14'9	
22. 10	M	,,	96	F	0'195	-0'018	- $\frac{1}{10}$	+ 8'5	- 14'0	- 13'2	
22. 14	M	,,	96	F	0'195	-0'035	- $\frac{1}{10}$	+ 8'5	- 19'1	- 17'9	
22. 31	M	,,	6	F	0'195	-0'033	- $\frac{1}{10}$	+ 8'5	- 18'5	- 17'9	
22. 34	M	,,	6	F	0'195	-0'187	- $\frac{1}{2}$	+ 8'5	- 65'3	- 57'3	
22. 42	M	,,	276	F	0'195	-0'041	- $\frac{1}{4}$	+ 8'5	- 20'9	- 31'9	
22. 45	M	,,	276	F	0'195	+0'003	0	+ 8'5	- 7'6	- 8'5	
22. 53	M	,,	186	F	0'195	-0'218	- $\frac{1}{3}$	+ 8'5	- 74'7	- 39'7	
22. 55	M	,,	186	F	0'195	-0'139	- $\frac{1}{2}$	+ 8'5	- 50'7	- 39'7	
23. 2	M	,,	186	F	0'195	+0'038	+ $\frac{1}{4}$	+ 8'5	+ 3'0	+ 14'9	
23. 8	M	,,	186	F	0'195	+0'009	0	+ 8'5	- 5'8	- 8'5	
23. 16	M	,,	96	F	0'195	-0'167	- $\frac{1}{3}$	+ 8'5	- 59'2	- 39'7	
23. 18	M	,,	96	F	0'195	-0'013	0	+ 8'5	- 12'4	- 8'5	
Sept. 28. 20. 53	M	Altair.....	96	F	0'243	+0'022	0	+ 14'5	- 7'8	- 14'5	Spectrum bright, but very unsteady. The star-line was very broad, faint, and diffused. It was most difficult to observe, the definition being bad, and the measures must be regarded as extremely rough. Conditions unchanged.
20. 59	M	,,	96	F	0'243	+0'157	+ $\frac{1}{3}$	+ 14'5	+ 33'2	+ 23'4	
21. 10	M	,,	6	F	0'243	-0'004	0	+ 14'5	- 15'7	- 14'5	
21. 13	M	,,	6	F	0'243	-0'258	- $\frac{1}{2}$	+ 14'5	- 92'9	- 71'3	
21. 24	M	,,	276	F	0'243	-0'001	0	+ 14'5	- 14'8	- 14'5	
21. 27	M	,,	276	F	0'243	-0'138	- $\frac{1}{2}$	+ 14'5	- 56'4	- 82'7	
21. 37	M	,,	186	F	0'243	-0'024	0	+ 14'5	- 21'8	- 14'5	
21. 38	M	,,	186	F	0'243	-0'084	- $\frac{1}{4}$	+ 14'5	- 40'0	- 42'9	
21. 46	M	,,	96	F	0'243	-0'124	- $\frac{1}{3}$	+ 14'5	- 52'2	- 52'4	
21. 48	M	,,	96	F	0'243	+0'143	+ $\frac{1}{2}$	+ 14'5	+ 28'9	+ 42'3	

AT THE ROYAL OBSERVATORY, GREENWICH, IN THE YEAR 1891.

9

Date, 1891. Greenwich Civil Time.	Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
						Measured.	Estimated.		Measured.	Estimated.	
Sept. 28. ^d 21. ^h 55. ^m	M	Altair.....	6	F	0.243	-0.089	- $\frac{1}{3}$	+ 14.5	- 41.5	- 52.4	Definition still very bad.
21. 57	M	,,	6	F	0.243	-0.026	- $\frac{1}{10}$	+ 14.5	- 22.4	- 25.9	
22. 15	M	,,	276	F	0.243	-0.165	- $\frac{1}{4}$	+ 14.5	- 64.6	- 42.9	
22. 17	M	,,	276	F	0.243	-0.138	- $\frac{1}{4}$	+ 14.5	- 56.4	- 59.9	
22. 30	M	,,	186	F	0.243	-0.170	- $\frac{1}{3}$	+ 14.5	- 66.1	- 52.4	
22. 32	M	,,	186	F	0.243	-0.042	- $\frac{1}{10}$	+ 14.5	- 27.2	- 25.9	
Oct. 2. 21. 22	M	Altair.....	186	F	0.243	+0.036	+ $\frac{1}{10}$	+ 15.0	- 4.1	- 4.8	Definition fair throughout evening, much better than on Sept. 28.
21. 24	M	,,	186	F	0.243	+0.001	0	+ 15.0	- 14.7	- 15.0	
21. 38	M	,,	276	F	0.243	-0.042	- $\frac{1}{10}$	+ 15.0	- 27.7	- 25.2	
21. 42	M	,,	276	F	0.243	-0.006	0	+ 15.0	- 16.8	- 15.0	
21. 56	M	,,	6	F	0.243	-0.104	- $\frac{1}{4}$	+ 15.0	- 46.6	- 40.4	
21. 59	M	,,	6	F	0.243	-0.289	- $\frac{1}{2}$	+ 15.0	- 102.8	- 76.1	
22. 3	M	,,	96	F	0.243	+0.229	+ $\frac{2}{5}$	+ 15.0	+ 54.5	+ 25.7	
22. 6	M	,,	96	F	0.243	+0.253	+ $\frac{2}{5}$	+ 15.0	+ 61.8	+ 35.9	
22. 11	M	,,	96	F	0.243	+0.031	+ $\frac{1}{10}$	+ 15.0	- 5.6	- 4.8	
22. 23	M	,,	96	F	0.243	-0.029	0	+ 15.0	- 16.5	- 15.0	
22. 33	M	,,	6	F	0.243	-0.156	- $\frac{1}{3}$	+ 15.0	- 62.4	- 48.9	
22. 35	M	,,	6	F	0.243	-0.173	- $\frac{1}{3}$	+ 15.0	- 67.5	- 48.9	
22. 50	M	,,	276	F	0.243	-0.028	- $\frac{1}{10}$	+ 15.0	- 23.5	- 25.2	
22. 53	M	,,	276	F	0.243	-0.064	- $\frac{1}{10}$	+ 15.0	- 34.4	- 25.2	
23. 11	M	,,	186	F	0.243	-0.043	- $\frac{1}{10}$	+ 15.0	- 28.0	- 25.2	
23. 13	M	,,	186	F	0.243	-0.022	- $\frac{1}{10}$	+ 15.0	- 21.7	- 25.2	
Oct. 7. 21. 22	M	Vega	186	F	0.232	+0.202	+ $\frac{1}{3}$	+ 8.7	+ 52.7	+ 32.0	Cloud constantly passing; spectrum faint, and very unsteady; definition bad.
21. 24	M	,,	186	F	0.232	+0.121	+ $\frac{1}{3}$	+ 8.7	+ 28.0	+ 32.0	
21. 33	M	,,	276	F	0.232	-0.101	- $\frac{1}{4}$	+ 8.7	- 39.3	- 39.2	
21. 35	M	,,	276	F	0.232	-0.045	- $\frac{1}{10}$	+ 8.7	- 22.3	- 20.9	
Oct. 9. 21. 8	M	Vega	96	F	0.220	+0.011	+ $\frac{1}{8}$	+ 8.7	- 5.4	- 14.5	The spectrum was bright and the definition fair throughout the evening, except for the last two observations, which were much interrupted by light cloud.
21. 10	M	,,	96	F	0.220	-0.005	0	+ 8.7	- 10.2	- 8.7	
21. 19	M	,,	6	F	0.220	-0.190	- $\frac{1}{2}$	+ 8.7	- 66.4	- 66.9	
21. 22	M	,,	6	F	0.220	-0.164	- $\frac{1}{2}$	+ 8.7	- 58.5	- 47.5	
21. 29	M	,,	276	F	0.220	-0.089	- $\frac{1}{5}$	+ 8.7	- 35.7	- 55.2	
21. 37	M	,,	276	F	0.220	+0.003	0	+ 8.7	- 7.8	- 8.7	
21. 46	M	,,	186	F	0.220	+0.106	+ $\frac{1}{2}$	+ 8.7	+ 23.5	+ 49.5	
21. 50	M	,,	186	F	0.220	+0.026	+ $\frac{1}{5}$	+ 8.7	- 0.8	+ 14.5	
21. 55	M	,,	186	F	0.220	-0.051	- $\frac{1}{10}$	+ 8.7	- 24.2	- 20.3	
21. 56	M	,,	186	F	0.220	-0.005	0	+ 8.7	- 10.2	- 8.7	
22. 7	M	,,	276	F	0.220	-0.004	0	+ 8.7	- 9.9	- 8.7	
22. 13	M	,,	276	F	0.220	-0.028	- $\frac{1}{5}$	+ 8.7	- 17.2	- 31.9	
22. 20	M	,,	6	F	0.220	-0.101	- $\frac{1}{3}$	+ 8.7	- 39.4	- 47.5	
22. 23	M	,,	6	F	0.220	-0.192	- $\frac{1}{2}$	+ 8.7	- 67.0	- 66.9	
22. 29	M	,,	96	F	0.220	+0.038	+ $\frac{1}{10}$	+ 8.7	- 20.3	- 20.3	
22. 32	M	,,	96	F	0.220	-0.010	0	+ 8.7	- 11.7	- 8.7	
22. 35	M	,,	96	F	0.220	+0.054	+ $\frac{1}{5}$	+ 8.7	+ 7.7	+ 14.5	
22. 38	M	,,	96	F	0.220	-0.006	0	+ 8.7	- 10.5	- 8.7	
22. 49	M	,,	6	F	0.220	-0.102	- $\frac{1}{4}$	+ 8.7	- 39.7	- 37.8	
22. 53	M	,,	6	F	0.220	-0.094	- $\frac{1}{4}$	+ 8.7	- 37.3	- 37.8	
23. 3	M	,,	276	F	0.220	-0.139	- $\frac{1}{2}$	+ 8.7	- 50.9	- 66.9	
23. 11	M	,,	276	F	0.220	-0.104	- $\frac{1}{4}$	+ 8.7	- 40.3	- 37.8	
23. 29	M	,,	186	F	0.220	+0.014	0	+ 8.7	- 4.4	- 8.7	
23. 33	M	,,	186	F	0.220	+0.056	+ $\frac{1}{10}$	+ 8.7	+ 8.3	+ 2.9	
Oct. 12. 21. 30	M	Moon	6	F	0.168	-0.050			- 15.2		
21. 31	M	,,	6	F	0.168	-0.041			- 12.4		
21. 33	M	,,	6	F	0.168	-0.026			- 7.9		
21. 35	M	,,	6	F	0.168	+0.019			+ 5.8		
21. 36	M	,,	6	F	0.168	-0.117			- 5.1		
21. 39	M	,,	96	F	0.168	+0.038			+ 11.5		
21. 41	M	,,	96	F	0.168	+0.020			+ 6.1		

MOTIONS OF STARS IN THE LINE OF SIGHT, INFERRED FROM SPECTROSCOPIC OBSERVATIONS

Date, 1891. Greenwich Civil Time.	Observer.	Object.	Position Circle.	Line.	Width of Slit.	Displacement.		Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		REMARKS.
						Measured.	Estimated.		Measured.	Estimated.	
Oct. 12. 21. 43 ^{d h m}	M	Moon	96	F	0'168	+0'017			+ 5'1		The Moon was frequently in light cloud, which greatly interfered with the spectrum and its definition. It was best seen during the observations at 96°.
21. 45	M	,,	96	F	0'168	+0'051			+ 15'5		
21. 48	M	,,	96	F	0'168	+0'020			+ 6'1		
22. 5	M	,,	276	F	0'168	-0'004			- 1'2		
22. 7	M	,,	276	F	0'168	-0'052			- 15'8		
22. 9	M	,,	276	F	0'168	+0'102			+ 31'0		
22. 11	M	,,	276	F	0'168	-0'071			- 21'6		
22. 13	M	,,	276	F	0'168	+0'016			+ 4'9		
22. 20	M	,,	186	F	0'168	-0'021			- 6'4		
22. 21	M	,,	186	F	0'168	-0'075			- 22'8		
22. 23	M	,,	186	F	0'168	+0'024			+ 7'3		
22. 24	M	,,	186	F	0'168	-0'032			- 9'7		
22. 25	M	,,	186	F	0'168	-0'015			- 4'6		
22. 40	M	Vega	186	F	0'168	-0'080	- 1/4	+ 8'7	- 33'0	- 33'2	
22. 43	M	,,	186	F	0'168	+0'108	+ 3/10	+ 8'7	+ 24'1	+ 23'9	
22. 54	M	,,	276	F	0'168	+0'038	+ 1/10	+ 8'7	+ 2'9	+ 1'1	
22. 58	M	,,	276	F	0'168	-0'050	- 1/10	+ 8'7	- 23'9	- 33'2	
23. 7	M	,,	6	F	0'168	-0'055	- 1/3	+ 8'7	- 25'4	- 41'3	
23. 12	M	,,	6	F	0'168	-0'114	- 1/2	+ 8'7	- 43'3	- 57'6	
23. 18	M	,,	96	F	0'168	-0'008	0	+ 8'7	- 11'1	- 8'7	
23. 22	M	,,	96	F	0'168	+0'102	+ 1/2	+ 8'7	+ 22'3	+ 40'2	
23. 26	M	,,	96	F	0'168	+0'011	+ 1/5	+ 8'7	- 5'4	+ 10'8	
23. 28	M	,,	96	F	0'168	+0'085	+ 2/5	+ 8'7	+ 17'1	+ 30'4	
23. 36	M	,,	6	F	0'168	-0'102	- 2/5	+ 8'7	- 39'7	- 57'6	
23. 38	M	,,	6	F	0'168	-0'129	- 3/5	+ 8'7	- 47'8	- 57'6	
23. 47	M	,,	276	F	0'168	-0'124	- 3/5	+ 8'7	- 46'4	- 47'8	
23. 51	M	,,	276	F	0'168	-0'102	- 3/5	+ 8'7	- 39'7	- 57'6	
13. 0. 0	M	,,	186	F	0'168	+0'081	+ 1/4	+ 8'7	+ 15'9	+ 15'8	Spectrum bright ; rather tremulous. Definition fair.
0. 3	M	,,	186	F	0'168	+0'089	+ 1/4	+ 8'7	+ 18'3	+ 15'8	
Oct. 16. 21. 22	M	Altair	96	F	0'182	+0'074	+ 1/4	+ 16'0	+ 6'5	+ 5'6	Cloud passing.
21. 26	M	,,	96	F	0'182	-0'090	- 1/4	+ 16'0	- 43'3	- 37'6	
21. 31	M	,,	6	F	0'182	-0'267	- 3/4	+ 16'0	- 97'1	- 67'7	
21. 33	M	,,	6	F	0'182	-0'197	- 3/5	+ 16'0	- 75'8	- 67'7	
21. 50	M	,,	276	F	0'182	-0'171	- 3/5	+ 16'0	- 68'0	- 59'1	
21. 52	M	,,	276	F	0'182	-0'042	- 1/4	+ 16'0	- 28'7	- 37'6	

COLLECTED RESULTS for MOTIONS of STARS in the line of Sight, from SPECTROSCOPIC OBSERVATIONS
made at the ROYAL OBSERVATORY, GREENWICH, in the Year 1891.

(F for the Star or Moon is compared with H β of Hydrogen.)

(+ denotes Recession ; - Approach.)

Date, 1891.		Observer.	Number of Measures.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.	
									Measured.	Estimated.
α LYRÆ (<i>Vega</i>).										
Position-Circle Reading, 6°.										
June	d ^d h ^h m ^m 26. 23. 16	M	1	1	6°		F	— 1'3	— 20'9	— 30'3
July	2. 22. 24	M	2	1	6	0'210	F	— 0'4	— 19'5	— 23'3
	3. 0. 53	M	1	1	6	0'210	F	— 0'4	— 3'9	— 9'1
	10. 23. 21	M	2	1	6	0'168	F	+ 0'7	— 47'9	— 23'4
	11. 0. 31	M	2	1	6	0'168	F	+ 0'7	— 28'3	— 23'4
	14. 23. 1	M	2	1	6	0'208	F	+ 1'4	— 20'7	— 23'8
	22. 22. 28	M	2	1	6	0'208	F	+ 2'3	— 15'8	— 22'9
	24. 23. 35	M	2	1	6	0'212	F	+ 2'6	— 32'5	— 35'5
	27. 23. 51	M	2	1	6	0'176	F	+ 3'0	— 4'8	— 11'8
August	3. 22. 54	M	2	1	6	0'196	F	+ 3'9	— 22'8	— 23'3
	29. 21. 23	M	2	1	6	0'178	F	+ 6'8	— 58'4	— 33'8
September	4. 23. 8	M	2	1	6	0'178	F	+ 7'3	— 52'0	— 42'7
	9. 20. 23	M	2	1	6	0'178	F	+ 7'7	— 29'0	— 29'9
	16. 23. 4	M	2	1	6	0'216	F	+ 8'1	— 51'2	— 47'7
	25. 21. 28	M	2	1	6	0'195	F	+ 8'5	— 42'1	— 43'6
	25. 22. 33	M	2	1	6	0'195	F	+ 8'5	— 41'9	— 37'6
October	9. 21. 21	M	2	1	6	0'220	F	+ 8'7	— 62'5	— 57'2
	9. 22. 22	M	2	1	6	0'220	F	+ 8'7	— 53'2	— 57'2
	9. 22. 51	M	2	1	6	0'220	F	+ 8'7	— 38'5	— 37'8
	12. 23. 10	M	2	1	6	0'168	F	+ 8'7	— 34'4	— 49'5
	12. 23. 37	M	2	1	6	0'168	F	+ 8'7	— 43'8	— 57'6
Means ...									— 33'6	— 32'4
α LYRÆ (<i>Vega</i>).										
Position-Circle Reading, 96°.										
July	2. 22. 55	M	2	1	96°	0'210	F	— 0'4	— 7'5	+ 0'4
	3. 0. 46	M	2	1	96	0'210	F	— 0'4	— 40'9	— 28'0
	10. 22. 48	M	2	1	96	0'168	F	+ 0'7	— 50'4	— 38'5
	11. 0. 19	M	2	1	96	0'168	F	+ 0'7	— 39'8	— 23'4
	14. 22. 48	M	2	1	96	0'208	F	+ 1'4	+ 9'6	+ 8'9
	24. 23. 9	M	2	1	96	0'212	F	+ 2'6	— 37'1	— 44'8
	25. 0. 19	M	2	1	96	0'212	F	+ 2'6	— 7'6	— 11'0
	28. 0. 2	M	2	1	96	0'176	F	+ 3'0	+ 3'7	+ 1'4
August	29. 22. 45	M	2	1	96	0'176	F	+ 3'3	+ 21'3	+ 22'5
	3. 23. 11	M	2	1	96	0'196	F	+ 3'9	— 15'5	— 16'8
	29. 21. 0	M	2	1	96	0'178	F	+ 6'8	+ 36'5	+ 27'8
September	4. 22. 58	M	2	1	96	0'178	F	+ 7'3	— 35'1	— 37'8
	9. 20. 9	M	2	1	96	0'178	F	+ 7'7	+ 32'3	+ 27'0
	16. 22. 49	M	2	1	96	0'216	F	+ 8'1	+ 43'2	+ 31'5
	25. 21. 16	M	2	1	96	0'195	F	+ 8'5	— 8'2	— 6'2
	25. 22. 12	M	2	1	96	0'195	F	+ 8'5	— 16'6	— 15'6
	25. 23. 17	M	2	1	96	0'195	F	+ 8'5	— 35'8	— 24'1
October	9. 21. 9	M	2	1	96	0'220	F	+ 8'7	— 7'8	+ 2'9
	9. 22. 31	M	2	1	96	0'220	F	+ 8'7	— 16'0	— 14'5
	9. 22. 37	M	2	1	96	0'220	F	+ 8'7	— 1'4	+ 2'9
	12. 23. 20	M	2	1	96	0'168	F	+ 8'7	+ 5'6	+ 15'8
	12. 23. 27	M	2	1	96	0'168	F	+ 8'7	+ 5'9	+ 20'6
Means ...									— 7'3	— 4'5

10 COLLECTED RESULTS FOR MOTIONS OF STARS IN THE LINE OF SIGHT, FROM SPECTROSCOPIC OBSERVATIONS

Date, 1891.	Observer.	Number of Measures.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		
								Measured.	Estimated.	
α LYRÆ (<i>Vega</i>). Position-Circle Reading, 186°.										
July	d h m 11. 0. 9	M	2	1	186°	0.168	F	+ 0.7	— 29.9	— 46.1
	d h m 11. 0. 51	M	2	1	186	0.168	F	+ 0.7	— 55.5	— 42.3
	d h m 24. 22. 54	M	2	1	186	0.212	F	+ 2.6	— 35.1	— 26.6
	d h m 25. 0. 5	M	2	1	186	0.212	F	+ 2.6	— 18.8	— 16.7
	d h m 27. 23. 32	M	2	1	186	0.176	F	+ 3.0	— 22.1	— 22.9
August	d h m 3. 22. 28	M	2	1	186	0.196	F	+ 3.9	— 43.1	— 29.7
	d h m 29. 22. 2	M	2	1	186	0.178	F	+ 6.8	— 56.2	— 48.3
September	d h m 9. 20. 59	M	2	1	186	0.178	F	+ 7.7	— 63.1	— 49.3
	d h m 10. 23. 10	M	2	1	186	0.216	F	+ 7.8	— 11.1	— 7.8
	d h m 25. 21. 59	M	2	1	186	0.195	F	+ 8.5	+ 14.4	+ 12.6
	d h m 25. 22. 54	M	2	1	186	0.195	F	+ 8.5	— 62.7	— 39.7
	d h m 25. 23. 5	M	2	1	186	0.195	F	+ 8.5	— 1.4	+ 3.2
October	d h m 7. 21. 23	M	2	1	186	0.232	F	+ 8.7	+ 40.4	+ 32.0
	d h m 9. 21. 48	M	2	1	186	0.220	F	+ 8.7	+ 11.4	+ 32.0
	d h m 9. 21. 56	M	2	1	186	0.220	F	+ 8.7	— 17.2	— 14.5
	d h m 9. 23. 31	M	2	1	186	0.220	F	+ 8.7	+ 2.0	— 2.9
	d h m 12. 22. 42	M	2	1	186	0.168	F	+ 8.7	— 4.5	— 4.7
	d h m 13. 0. 2	M	2	1	186	0.168	F	+ 8.7	+ 17.1	+ 15.8
Means ...								— 18.6	— 14.2	
α LYRÆ (<i>Vega</i>). Position-Circle Reading, 276°.										
July	d h m 10. 23. 49	M	2	1	276°	0.168	F	+ 0.7	— 36.7	— 38.5
	d h m 11. 0. 42	M	2	1	276	0.168	F	+ 0.7	— 58.5	— 46.1
	d h m 14. 23. 28	M	1	1	276	0.208	F	+ 1.4	— 55.5	— 63.4
	d h m 22. 22. 48	M	2	1	276	0.208	F	+ 2.3	— 74.8	— 79.7
	d h m 24. 23. 51	M	2	1	276	0.212	F	+ 2.6	— 67.3	— 68.4
	d h m 25. 0. 13	M	1	1	276	0.212	F	+ 2.6	— 23.9	— 30.7
	d h m 27. 23. 42	M	2	1	276	0.176	F	+ 3.0	— 15.2	— 32.5
August	d h m 3. 22. 41	M	2	1	276	0.196	F	+ 3.9	— 18.0	— 24.6
	d h m 29. 21. 46	M	2	1	276	0.178	F	+ 6.8	— 33.0	— 34.4
September	d h m 9. 20. 36	M	2	1	276	0.178	F	+ 7.7	— 22.9	— 34.8
	d h m 10. 22. 36	M	2	1	276	0.216	F	+ 7.8	— 32.3	— 38.6
	d h m 16. 23. 24	M	2	1	276	0.216	F	+ 8.1	— 13.5	— 25.7
	d h m 25. 21. 37	M	2	1	276	0.195	F	+ 8.5	— 33.3	— 47.5
	d h m 25. 22. 44	M	2	1	276	0.195	F	+ 8.5	— 14.3	— 20.2
October	d h m 7. 21. 34	M	2	1	276	0.232	F	+ 8.7	— 30.8	— 30.1
	d h m 9. 21. 33	M	2	1	276	0.220	F	+ 8.7	— 22.8	— 32.0
	d h m 9. 22. 10	M	2	1	276	0.220	F	+ 8.7	— 13.6	— 20.3
	d h m 9. 23. 7	M	2	1	276	0.220	F	+ 8.7	— 45.6	— 52.4
	d h m 12. 22. 56	M	2	1	276	0.168	F	+ 8.7	— 10.5	— 16.1
	d h m 12. 23. 49	M	2	1	276	0.168	F	+ 8.7	— 43.1	— 52.7
Means ...								— 31.8	— 38.0	

Date, 1891.		Observer.	Number of Measures.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.	
									Measured.	Estimated.
α AQUILÆ (<i>Altair</i>).										
Position-Circle Reading, 6°.										
July	a h m									
	2. 23. 44	M	2	1	6°	0.210	F	— 5.2	— 3.8	— 4.3
	6. 22. 32	M	2	1	6	0.192	F	— 4.2	— 44.5	— 36.8
	6. 23. 41	M	2	1	6	0.192	F	— 4.2	— 56.0	— 45.9
	8. 22. 38	M	2	1	6	0.192	F	— 3.7	— 43.4	— 31.3
	27. 22. 40	M	2	1	6	0.176	F	+ 1.2	— 54.3	— 52.8
28. 0. 26	M	2	1	6	0.176	F	+ 1.2	— 74.4	— 56.5	
August	3. 23. 49	M	2	1	6	0.196	F	+ 3.0	— 25.3	— 26.3
	29. 23. 2	M	2	1	6	0.178	F	+ 9.2	— 35.0	— 39.6
September	9. 21. 45	M	2	1	6	0.178	F	+ 11.5	— 48.8	— 53.1
	9. 22. 28	M	2	1	6	0.178	F	+ 11.5	— 72.6	— 57.3
	11. 0. 11	M	2	1	6	0.216	F	+ 11.7	— 67.4	— 59.3
	28. 21. 12	M	2	1	6	0.243	F	+ 14.5	— 54.3	— 42.9
	28. 21. 56	M	2	1	6	0.243	F	+ 14.5	— 32.0	— 39.2
October	2. 21. 58	M	2	1	6	0.243	F	+ 15.0	— 74.7	— 58.3
	2. 22. 34	M	2	1	6	0.243	F	+ 15.0	— 65.0	— 48.9
	16. 21. 32	M	2	1	6	0.182	F	+ 16.0	— 86.5	— 67.7
Means ...									— 52.4	— 45.0
α AQUILÆ (<i>Altair</i>).										
Position-Circle Reading, 96°.										
July	2. 23. 28	M	2	1	96°	0.210	F	— 5.2	— 6.8	— 10.6
	6. 23. 29	M	2	1	96	0.192	F	— 4.2	— 4.9	— 4.9
	7. 0. 29	M	2	1	96	0.192	F	— 4.2	— 28.2	— 25.4
	8. 22. 41	M	2	1	96	0.192	F	— 3.7	— 41.0	— 39.3
	27. 22. 29	M	2	1	96	0.176	F	+ 1.2	— 7.1	+ 5.5
	28. 0. 16	M	2	1	96	0.176	F	+ 1.2	— 6.4	— 10.1
August	3. 23. 35	M	2	1	96	0.196	F	+ 3.0	— 1.7	— 3.0
	29. 23. 14	M	2	1	96	0.178	F	+ 9.2	+ 11.3	+ 4.6
September	9. 21. 56	M	2	1	96	0.178	F	+ 11.5	— 16.8	— 3.2
	9. 22. 38	M	2	1	96	0.178	F	+ 11.5	— 6.0	+ 1.0
	11. 0. 25	M	2	1	96	0.216	F	+ 11.7	+ 11.1	+ 4.3
	28. 20. 56	M	2	1	96	0.243	F	+ 14.5	+ 12.7	+ 4.5
	28. 21. 47	M	2	1	96	0.243	F	+ 14.5	— 11.7	— 5.1
October	2. 22. 5	M	2	1	96	0.243	F	+ 15.0	+ 58.2	+ 30.8
	2. 22. 17	M	2	1	96	0.243	F	+ 15.0	— 11.1	— 9.9
	16. 21. 24	M	2	1	96	0.182	F	+ 16.0	— 18.4	— 16.0
Means ...									— 4.2	— 4.8

12 COLLECTED RESULTS FOR MOTIONS OF STARS IN THE LINE OF SIGHT, FROM SPECTROSCOPIC OBSERVATIONS

Date, 1891.	Observer.	Number of Measures.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		
								Measured.	Estimated.	
α AQUILÆ (<i>Altair</i>). Position-Circle Reading, 186°.										
July	d h m 7. 0. 4 7. 0. 52 27. 23. 16 28. 0. 44	M M M M	2 2 2 2	1 1 1 1	186° 186 186 186	0.192 0.192 0.176 0.176	F F F F	- 4.2 - 4.2 + 1.2 + 1.2	- 40.9 - 18.5 - 52.4 - 20.6	- 33.8 - 22.4 - 33.6 - 18.9
August	4. 0. 10 29. 22. 39.	M M	2 2	1 1	186 186	0.196 0.178	F F	+ 3.0 + 9.2	- 8.3 - 23.5	- 14.7 - 17.5
September	9. 21. 15 9. 22. 6 10. 23. 32. 28. 21. 38 28. 22. 31	M M M M M	2 2 2 2 2	1 1 1 1 1	186 186 186 186 186	0.178 0.178 0.216 0.243 0.243	F F F F F	+ 11.5 + 11.5 + 11.7 + 14.5 + 14.5	- 7.9 - 30.3 - 62.9 - 30.9 - 46.7	- 11.5 + 1.0 - 54.0 - 28.7 - 39.2
October	2. 21. 23 2. 23. 12	M M	2 2	1 1	186 186	0.243 0.243	F F	+ 15.0 + 15.0	- 9.4 - 24.9	- 9.9 - 25.2
Means ...									- 29.0	- 23.7
α AQUILÆ (<i>Altair</i>). Position-Circle Reading, 276°.										
July	6. 22. 58 7. 0. 16 8. 23. 24 27. 22. 51 28. 0. 36	M M M M M	2 2 1 2 2	1 1 1 1 1	276° 276 276 276 276	0.192 0.192 0.192 0.176 0.176	F F F F F	- 4.2 - 4.2 - 3.7 + 1.2 + 1.2	- 51.7 - 27.0 - 96.5 - 64.7 - 24.0	- 52.8 - 32.2 - 91.6 - 49.1 - 27.7
August	4. 0. 2 29. 22. 53	M M	2 2	1 1	276 276	0.196 0.178	F F	+ 3.0 + 9.2	- 34.0 - 74.8	- 32.1 - 54.9
September	9. 21. 28 9. 22. 17 10. 23. 58 28. 21. 26 28. 22. 16	M M M M M	2 2 2 2 2	1 1 1 1 1	276 276 276 276 276	0.178 0.178 0.216 0.243 0.243	F F F F F	+ 11.5 + 11.5 + 11.7 + 14.5 + 14.5	- 51.9 - 16.2 - 41.9 - 35.6 - 60.5	- 42.7 - 32.3 - 43.4 - 48.6 - 51.4
October	2. 21. 40 2. 22. 52 16. 21. 51	M M M	2 2 2	1 1 1	276 276 276	0.243 0.243 0.182	F F F	+ 15.0 + 15.0 + 16.0	- 22.3 - 29.0 - 48.4	- 20.1 - 25.2 - 48.4
Means ...									- 43.5	- 41.8
α CYGNI. Position-Circle Reading, 6°.										
July	3. 0. 2	M	2	1	6°	0.210	F	- 7.1	- 11.7	- 21.3
α CYGNI. Position-Circle Reading, 96°.										
July	3. 0. 21	M	2	1	96	0.210	F	- 7.1	- 19.0	- 27.6

Date, 1891.	Observer.	Number of Measures.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		
								Measured.	Estimated.	
MOON.										
Position-Circle Reading, 6°.										
July	d h m 25. 0. 50	M	5	1	6°	0.212	F	...	+ 1.5	...
October	12. 21. 33	M	5	1	6	0.168	F	...	- 7.0	...
MOON.										
Position-Circle Reading, 96°.										
July	25. 0. 40	M	5	1	96°	0.212	F	...	- 15.2	...
October	12. 21. 43	M	5	1	96	0.168	F	...	+ 8.8	...
MOON.										
Position-Circle Reading, 186°.										
July	25. 1. 10	M	5	1	186°	0.212	F	...	+ 2.9	...
October	12. 22. 23	M	5	1	186	0.168	F	...	- 7.2	...
MOON.										
Position-Circle Reading, 276°.										
July	25. 0. 59	M	5	1	276°	0.212	F	...	- 13.5	...
October	12. 22. 9	M	5	1	276	0.168	F	...	- 0.5	...