DOUBLE-STAR OBSERVATIONS,

MADE WITH THE 16-INCH REFRACTOR AND FILAR MICROMETER OF GOODSELL OBSERVATORY, NORTHFIELD, MINN.,

By F. P. LEAVENWORTH.

[Communicated by the Director, W. W. PAYNE.]

The following observations of double stars were made by Professor F. P. LEAVENWORTH of the State University of Minnesota (formerly Director of Haverford College Observatory), while spending a part of the summer vacation of 1893 at Northfield. The observations were made in the same manner as those by the same observer at Haverford and at the Leander McCormick Observatory, which have been published. Generally four measures of position-angle and two measures of double distance were taken on each night. The eyes were placed either parallel or normal to the line joining the stars. The magnitudes of the stars were estimated independently on each night.

The defining power of the 16-inch telescope is most excellent, so that on a fairly good night, stars of 0″.5 distance are easy objects, and on the best nights the diffraction discs of stars of 0″.3 distance are clearly separated. A magnifying power of 600 was used in all the measures.

Most of the stars are from a list, furnished by Mr. S. W. BURNHAM, of his own stars, which had been measured but once or not at all before, or had been found to give evidence of motion. A few of the Struve stars were observed to fill up the time. The aim was to observe each star on three nights, but as Mr. H. C. WILSON was working on the same list, in many cases the two observers measured the same star, each on two different nights. Mr. WILSON's results will be published later.

Star's name	R.A. 1900 h m	Decl. 1900 ° ′	Year	Position angle °	Distance ″	No. obs.	Magnitudes M	M
Σ1820	14 10	+55 48	1893.519	72.4	2.19	2	8.0	8.3
β 238	14 28	−20 36	.475	90.6	6.94	1	. .	. .
Σ1865	14 36	+14 9	.528	277.5	0.34	2	4.0	4.1
OΣ 285	14 42	+42 48	.518	332.3	0.29	2	Equal	
Σ1932	15 14	+27 12	.541	320.2	0.81	2	6.0	6.1
Σ1937	15 19	+30 39	.502	242.8	0.50	3	6.0	6.1
Σ1998 AB	15 59	−11 6	.510	210.9	0.88	2	5.0	5.2
AB–C	. .	. .	.510	67.2	7.43	2	. .	7.0
Σ2032	16 11	+34 7	.489	210.4	4.09	1	6.0	7.5
Σ2055	16 26	+ 2 12	.534	48.8	1.43	2	4.0	5.2
Δ 15	16 41	+43 40	.542	347.6	0.44	2	8.0	8.4
β1117	16 51	−22 59	.504	270.6	0.56	2	6.1	6.4
Σ3107	16 54	+ 4 6	.522	97.0	1.32	2	8.0	8.3
Σ2130	17 3	+54 36	.534	335.2	2.32	2	5.0	5.1
H.C.W. AB	17 13	+26 41	.489	40.8	0.60	1	8.0	9.5
Σ2173	17 25	− 0 59	.546	157.4	1.14	1	. .	. .
β 826	18 3	+ 9 45	.520	333.2	0.59	2	9.8	9.9
β 638 AB	18 5	+ 2 34	.513	152.1	21.86	3	8.4	9.2
BC	. .	. .	.505	5.5	1.48	4	. .	12.2
β 285 AB	18 11	−25 2	.549	319.1	1.57	1	7.5	9.8
β 135	18 32	−14 6	.539	187.6	2.24	2	7.0	12.5
β 967	18 35	−14 36	.541	191.1	2.33	3	7.8	11.8
β 971	18 45	+49 19	.518	107.0	0.25 est.	2	. .	. .
β 421 AB	18 49	+43 16	.494	288.5	0.90	2	9.0	9.2
β 972 AB	18 51	− 0 42	.496	5.4	0.94	2	8.6	9.4
AB–C	. .	. .	.496	14.2	73.48	2	. .	9.0
β 648	18 53	+32 47	.490	240.2	1.40	2	6.0	8.8
β 142	19 23	−12 21	.489	330.8	1.53	3	7.4	7.9
β 143	19 27	+49 18	.512	192.9	2.15	3	7.8	8.7
β 147	19 42	+31 52	.541	297.6	8.86	3	8.3	9.3
β 979	19 48	+23 1	.536	335.9	2.25	4	8.1	11.5
β 149 AB	19 54	+16 13	.546	278.6	126.57	3	6.5	9.9
BC	. .	. .	.544	199.8	8.32	4	. .	12.5
β 426	20 1	+54 22	.496	310.1	5.71	3	8.1	10.7
β 427	20 1	+54 24	.496	335.7	2.93	3	8.3	10.4
β 150 BC	20 7	+33 20	.515	187.7	1.85	3	8.0	9.8
β 430 AB	20 8	+35 32	.516	21.1	0.98	3	8.9	10.0
AC	. .	. .	.549	52.5	17.15	1	. .	9.3
β 982	20 8	+26 4	.515	50.1	0.81	3	9.1	10.3
β 441	20 13	+28 50	.515	65.6	5.93	3	6.3	11.5
β 670	20 28	+13 36	1893.515	47.3	0.53	3	8.5	8.9

Star's name	R.A. 1900 h m	Decl. 1900 ° ′	Year	Position angle °	Distance ″	No. obs.	Magnitudes M	M
β 151 AB	20 33	+14 15	1893.520	339.2	0.58	2	4.0	7.0
β 366 AB	20 45	+50 7	.550	127.5	1.24	2	8.2	8.5
CD	. .	. .	.549	1.2	1.35	1	10.0	11.0
β 473	21 2	−10 37	.536	114.9	1.88	2	8.5	10.0
β 74	21 31	+20 57	.533	319.9	1.32	3	7.3	8.9
β 374	21 40	+50 33	.541	141.3	1.86	3	8.3	10.5
β 989	21 40	+25 11	.513	121.0	0.29	3	4.0	4.1
β 476	22 10	+30 54	.543	92.5	2.57	4	9.4	10.0
β 991	22 10	+52 4	.548	143.4	0.57	2	8.0	8.2
β 477	22 11	+30 55	.543	43.5	6.48	4	9.0	9.8
β 277	22 35	+40 51	.546	201.9	0.49	1	8.0	8.4
β 450 AC	22 40	+38 57	.535	231.8	10.86	1	7.0	12.5
β 382	22 49	+44 13	.528	221.3	0.91	3	6.2	8.0
β 79	23 12	− 2 4	.546	87.7	0.86	1	8.0	9.0
β 80	23 14	+ 4 52	.546	328.0	0.81	1	8.4	9.0
β 1266 AB	23 25	+30 17	.546	65.9	0.23	1	Equal	
β 720	23 29	+30 47	.546	331.3	0.30	1	6.0	6.5
β 733	23 57	+26 34	1893.546	Not separated		1		

ON THE VARIATION OF THE PERSONAL EQUATION WITH THE MAGNITUDE OF THE STARS OBSERVED.

By JOHN T. HEDRICK, S.J., Assistant.

The following table may be of interest in connection with some estimates that have been published lately of the effect of the personal equation on the right-ascensions of stars of different magnitudes. The quantities contained in it are the corrections to the various catalogues mentioned, which were given by a series of photographic observations of transits, carried out at this Observatory by the Rev. Geo. A. Fargis, S.J., according to a method devised by him. It is copied from an account of the series about to be published. No corrections have been applied to these quantities on account of systematic differences depending on the right-ascension or declination, but except for first-magnitude stars, such corrections could make no essential change in them on account of the general uniformity of distribution of the stars.

The catalogues are: the Berlin *Jahrbuch*, the Greenwich Observations for 1889, the Greenwich Catalogue of Clock-Stars from 12-hour groups (from the introduction of the 10-year Catalogue), and the Madison Meridian-Circle Catalogue from observations in 1887–1892. The second column for each catalogue contains the number of common stars.

The Madison observations seem the best adapted to show the effect of personal equation, as they rest on the same fundamental right-ascensions as the photographic observations, namely, those of the *Jahrbuch*, and are the work of only three observers, and in great part of a single observer. The number of common stars is also greater for it. If the first-magnitude stars are neglected, the remaining mean corrections for Madison may be explained by a change in the personal equation of about $0^s.015$ for each whole magnitude, the brighter stars being observed visually too early relatively to the fainter ones.

Mag.	*Jahrbuch* s		Gr. 1889 s		Gr. Clock s		Madison s	
1	+0.007	13	−0.017	11	+0.034	11	+0.017	11
2.0	+0.008	25	−0.011	9	+0.019	12	+0.011	20
2.3	+0.006	19	+0.017	9	+0.018	10	+0.014	13
2.6	−0.015	14	+0.010	7	+0.013	7	+0.007	11
3.0	−0.012	31	−0.025	15	+0.010	11	−0.004	29
3.4	−0.005	37	+0.016	11	+0.031	10	−0.005	32

Georgetown College Observatory, 1896 *Aug.* 10.

NOTICE.

A few copies of the *Astronomische Nachrichten*, vols. 100 to 140 inclusive, forty-one volumes in all, may be obtained for $75.00 the set, on application to the Editor of this Journal, at Cambridge. The regular price is very much higher.

CONTENTS.

Published in Boston, tri-monthly, by B. A. Gould. Address, Cambridge, Mass. Price, $5.00 the Volume. Press of Thos. P. Nichols, Lynn, Mass.
Entered at the Post Office, at Boston, Mass., as second-class matter. *Closed August* 18.