KG
11366
143

No. 2.

MISCELLANEOUS MEMORANDA

E. C. P.

Sept.30,1888,-May 28,1895.

KG 1136. 143

KG 1366.143

HARVARD
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JUL 17 1956

Comparison of Height and Clear Lens

Date.	H. M.		Sid. Time.		Cont.			Magn.		Corr. Diff.	Desc.	Obs.
		+7	26									
July 13	8	43	16h	09m	4020	1	2766	3.1	2.8	-.2	Ap4 Col. Spec.	P
	8	58	16	24	2696	0	4080	4.2	2.6	+1.6		P
	9	02	16	28	4080	2	3003	2.6	3.9	+1.1		P
	9	05	16	31	5	1	2696	2.1	4.2	+1.0		P
	9	09	16	35	2569	2	5	3.4	2.1	+1.5		P
	9	12	16	38	5	0	2696	2.1	4.2	+2.1		B
	9	18	16	44	483	2	2945	3.1	4.1	+.8		P
	9	18	16	44	443	0	2696	3.9	4.2	+.3		B
	9	26	16	52	429	0	2975	4.2	5.8	+1.6		P
	9	30	16	56	2865	0	454	5.2	4.0	+1.2		P
		+7	50									
July 19	9	25	17	15.	3723	1	1641	4.6	4.2	+0.5	A.P.9	P
	9	27	17	17	3818	2	1641	3.8.	4.2	-0.2		B
	9	39	17	29	1969	1	2813	4.0	5.0	+ 0.9		P
	9	42	17	32	2019	0	2955	4.2	5.3	+ 1.1		B
	9	47	17	37	1951	0	2985-6	3.5	4.5	+ 1.0		P
	9	49	17	39	1951	1	2813	3.5	5.0	+ 1.4		P
	9	50	17	40	1951	0	3077	3.5	4.8 3	+ 1.8		B
	9	51	17	41	1951	0	2813	3.5	5.0	+ 1.5		P
	9	57	17	47	1645	0	2945	3.7	4.9	+ 1.2		P
	10	1	17	51	1636	1	2696	3.2	4.2	+ 0.9		B
	10	1	17	51	1870	1	1645	5.2	3.7	+ 1.6		B
	10	5	17	55	1636	0	3003	3.2	3.9	+ 0.7		B
	10	6	17	56	1949	2	3003	2.8	3.9	+ 0.9		P
	10	15	18	05	2937	1	2025	3.0	2.2	+ 0.9		P
	10	18	18	08	2937	0	2025	3.0	2.2	+ 0.8		B.
		+8	02									
July 22	8	35	16	37	5	1	2696	2.1	4.2	+ 2.0	A P14	P
	8	53	16	55	483	2	2696	3.1	4.2	+ 0.9		P.

R.A.		Dec.	H.A.			a
h	m		h	m		
22	37.4	+29.6	E 6	28		13°.5
22	58.8	+14.6	E 6	35		02.7
22	58.8	+14.6	E 6	31		03.5
0	2.2	+28.4	E 7	31		02.5
0	2.2	+28.4	7	27		03.1
0	2.2	+28.4	7	24		03.6
2	56.1	+53.0	10	12		05.7
2	42.0	+55.4	9	58		08.7
2	36.0	+48.7	9	44		03.5
2	45.8	+52.3	9	50		06.4
8	52.8	+42.2	8 ~~15~~	22 ~~38~~	✓	× 00.5
8	52.8	+42.2	8 ~~15~~	24 ~~36~~	✓	× 00.3
11	17.7	+11.2	6 ~~17~~	11 ~~49~~		05.1
11	39.7	+7.2	6 ~~18~~	52 ~~8~~		05.2
11	7.9	+16.1	6 ~~17~~	29 ~~31~~		04.9
11	7.9	+16.1	6 ~~17~~	31 ~~29~~		04.5
11	7.9	+16.1	6 ~~17~~	32 ~~28~~		04.3
11	7.9	+16.1	6 ~~17~~	33 ~~27~~		04.1
8	55.4	+47.6	8 ~~15~~	52 ~~8~~		06.9
8	57.0	+48.5	9 ~~15~~	0		06.9
8	55.4	+47.6	8 ~~15~~	56 ~~4~~		06.5
8	57.0	+48.5	9	54		? 02.7
11	7.7	+21.2	6	48		04.7
11	42.9	+15.2	6	22		05.5
11	42.9	+15.2	6	25		05.5
0	2.2	+28.4	7	25		03.4
2	56.1	+53.0	10	1		06.3

Date	h	m	Sid time					Mag.		Diff		
			h	m								
July 22d	8	56	16	58	454	1	2813	4.0	5.0	+0.9	A 14	P
	8	58	17	00	443	0	2945	3.9	4.9	+1.0		P
	9	01	17	03	1821	1	2696	5.0	4.2	−0.7		P
	9	05	17	07	1811-12	1	2644	3.6	5.2	+1.5		P
	9	11	17	13	3032	1	1811–12	6.4	3.6	+2.9		B
	9	18	17	20	2696	1	1951	4.2	3.5	+0.8		C
	9	18	17	20	2696	1	1951	4.2	3.5	+0.8		P
	9	22	17	24	2644	2	1969	5.2	4.0	+1.4		P
	9	23	17	25	2644	2	1969	5.2	4.0	+1.4		B
	9	24	17	26	2644	1	1969	5.2	4.0	+1.3		C
	9	30	17	32	185	2	2766	2.2	2.8	+0.4		C
	9	30	17	32	185	2	2766	2.2	2.8	+0.4		B
	9	39	17	41	2696	1	1951	4.2	35	+0.8		C.
	9	34	17	36	1951	2	2644	35	5.2	+1.5	A 15	P
	9	35	17	37	1951	1	2644	3.5	5.2	+1.6		(B)
	9	48	17	50	1645	1	2696	3.7	4.2	+0.4		P
	9	52	17	54	1636	1	3003	3.2	3.9	+0.6		P
	9	54	17	56	1951	0	2937	3.5	3.0	−0.5		B
	9	55	17	57	1951	2	2959	3.5	3.9	+0.2		P
	9	55	17	57	2569	1	1951	3.4	3.5	. 0.0		C
	9	56	17	58	1951	1	2945	3.5	4.9	+1.3		B
		8 05										
July 23	8	40	16	45.	5	0	~~1636~~ 3003	2.1	3.9	+1.8	A 19	P
	8	42	16	47	5	1	2569	2.1	3.4	+1.2		P
	8	45	16	~~47~~ 50	2945	1	483	4.9	3.1	+1.9		P
	8	51	16	56	2644	1	454	5.2	4.0	+1.3		P
	9	03	17	08	541	1	~~1636~~ 3003	1.9	3.9	+1.9		P
	9	07	17	12	541	2	2696	1.9	4.2	+2.3		P

	R.A.		Dec.	H.A.		
	h	m	°	h	m	
	2	45.8	+52.3	9	48	6.4
	2	42.0	+55.4	9	42	9.7
	10	13.3	+20.1	6	50	3.6 ~~39.7~~
P	10	10.0	+24.1	6 ~~7~~	57	5.1 ~~4.5~~
B	10	10.0	+24.1	7	3	4.1
C	11	7.9	+16.1	6	12	8.0
P	11	7.9	+16.1	6	12	8.0
P	11	17.7	+11.2	6	6	6.0
B	11	17.7	+11.2	6	7	5.8
C	11	17.7	+11.2	6	8	5.6
C	1	3.0	+35.0	7	31	7.2
B	1	3.0	+35.0	7	31	7.2
C.	11	7.9	+16.1	6	33	4.1
P	11	7.9	+16.1	6	28	5.0
(B)	11	7.9	+16.1	6	29	4.9
P	8	55.4	+47.6	8	55	6.6
P	8	51.0	+48.5	9	3	6.6
B	11	7.9	+16.1	6	48	× 1.4
P	11	7.9	+16.1	6	49	× 1.2
C	11	7.9	+16.1	6	49	× 1.2
B	11	7.9	+16.1	6	50	× 1.0
P	0	2.2	+28.4	7 ~~8~~	17	4.7 ~~5.46~~
P	0	2.2	+28.4	7 ~~8~~	15	5.0 ~~60.7~~
P	2	56.1	+53.0	10	6	6.0
P	2	57.3	+63.6	10	1	6.0
P	3	15.8 ~~28.6~~	+49.4 ~~-22.0~~	10	8 ~~20~~	2.8
P	3	15.8 28.5	+49.4 ~~-22.0~~	10	4 ~~16~~	2.8

Date	h	m.	Sid. Time h	m	~~324-5~~	∂		Mag.		Diff		
			8	05								
July 23	9	12	17	17	324-5	0	2696	2.1	4.2	+ 2.1	A.19	P
	9	18	17	23	2766	2	185	2.8	2.2	+ 0.8		P
	9	22	17	27	1636	2	3003	3.2	3.9	+ 0.5		P
	9	25	17	30	1645	1	2696	3.7	4.2	+ 0.4		P
	10	28	18	33	591	2	2644	3.2	5.2	+ 1.8	A.20	
	10	33	18	38	591	1	~~71~~ 2696	3.2	4.2	+0.9		
	10	35	18	40	591	2	~~71~~ 2696	3.2	4.2	+ 0.8		
			8	21								
July 27	9	14	17	35	1951	0	2644	3.5	5.2	+ 1.7	A.36	
	9	18	17	39	2878	2	1949	3.3	2.8	+ 0.7		
	9	20	17	41	1949	1	2945	2.8	4.9	+ 2.0		B
	9	24	17	45	541	1	2569	1.9	3.4	+ 1.4		
	9	27	17	48	1636	1	3003	3.2	3.9	+ 0.6		
	9	28	17	49	541	0	~~71~~ 2696	1.9	4.2	+ 2.3		B
	9	31	17	52	1645	0	2865-6	3.7	5.2	+ 1.5		
	9	33	17	54	1949	0	~~69~~ 2569	2.8	3.4	+ 0.6		
	9	35	17	56	2878	2	23	3.3	3.0	+ 0.5		
	9	37	17	58	~~71~~ 2696	1	1949	4.2	2.8	+ 1.5		P
	9	36	17	57	2945	2	23	4.9	3.0	+ 2.1		B
	9	39	18	0	2025	2	~~69~~ 2569	2.2	3.4	+ 1.0		
	9	~~39~~ 40	18	1	2766	0	324-5	2.8	2.1	+ 0.7		B
	9	40	18	1	3009	1	2025	2.4	2.2	+ 0.3		B
	10	05	18	26	~~71~~ 2696	2	1827	4.2	~~4.2~~ 3.1	+ 1.3		B
	10	14	18	35	2945	1	336	4.9	3.1	+ 1.9		B
			8	25								
July 28	10	45	19	10	333	0	2937	2.0	3.0	+ 1.0	A.42	
	10	51	19	16	~~318~~ 295	0	2878	~~4.9~~ 2.8	3.3	~~+1.6~~ +.5		
	11	02	19	27	2813	0	1558	5.0	3.4	+ 1.6		B
	(11	03)	19	28	3122	1	1558	3.7	3.4	+ 0.4		

	R.A		Dec.	H.A.		
	h	m	°	h	m	
	1	56.5	+41.8	8	39	3.5
P	1	3.0	+35.0	7	40	5.8
P	8	51.0	+48.5	8	36	9.2
P	8	55.4	+47.6	9	35	× 3.2
	3	34.4	+47.4	9 ~~8~~	1 ~~59~~	5.8
	3	34.4	+47.4	9	56	6.3
	3	34.4	+47.4	8	54	6.6
	11	7.9	+16.1	6	27	5.2
	11	7.7	+21.2	6	31	7.8
B	11	7.7	+21.2	6	33	7.4
	3	15.8	+49.4	9	31	5.0
	8	51.0	+48.5	8	57	7.2
B	3	15.8	+49.4	9	27	5.4
	8	55.4	+47.6	8	57	6.4
	11	7.7	+21.2	6	46	5.1
	0	7.1	+14.5	6	11	7.2
P	11	7.7	+21.2	6	50	4.4
B	0	7.1	+14.5	6	10	7.3
	11	42.9	+15.2	6	17	6.5
B	1	56.5	+41.8	7	55	8.7
B	11	42.9	+15.2	6	18	6.3
B	10	15.2	+42.1	8	11	7.0
B	2	2.4	+35.4	7	27	8.0
	2	0.4	+22.9	6	50	5.5
	1	68.0	+20.2	6	32	
	~~3~~	~~8.0~~	~~+20.6~~	~~7~~	~~52~~	7.0
B	8	20.3	+61.1	11	7	11.5
	8	20.3	+61.1	11	8	11.4

Date	h	m		Sid. Time					Mag.		Diff.		
				h	m								
July 28	11	06	+8 25	19	31	1558	2	3003	3.4	3.9	+0.3	A.42	
	11	07		19	32	291-2	1	2865-6	4.3	5.2	+0.8		
	11	08		19	33	2813	2	291-2	5.0	4.3	+0.9		B
Aug 18	8	52	+9 48	18	40	541	0	3003	1.9	3.9	+2.0	B.70	
	9	00		18	48	591	1	2945	3.2	4.9	+1.6		
	9	00		18	48	3003	1	591	3.9	3.2	+0.8		C
	9	03		18	51	336	0	3003	3.1	3.9	+0.8		
	9	03		18	51	336	1	3003	3.1	3.9	+0.7		C
	9	06		18	54	2945	1	360	4.9	5.0	0.0		C
	9	38		19	26	2865-6	2	2208	5.2	3.0	+2.4		
	9	42		19	30	2813	2	2226-7	5.0	4.4	+0.8		
Aug 27	9	45	+10 23	20	08	2360	0	3564	2.9	2.3	-0.6	B.95	B
	9	45		20	08	2360	1	3419	2.9	3.0	0.0		C
	9	50		20	13	3631	1	1926	1.5	2.0	-0.4		
	10	00		20	23	333	0	3631	2.0	1.5	-0.5	B.96	C
	10	00		20	23	3631	1	333	1.5	2.0	-0.4	B.96	B
	10	05		20	28	3365	0	591	3.9	3.2	+0.7		B
	10	05		20	28	3419	1	591	3.0	3.2	-0.1		C
	10	10		20	33	3429	2	2764	1.0	1.1	+0.1		B
	10	10		20	33	541	0	3631	1.9	1.5	-0.4		C
Aug 28	8	04	+10 27	18	31	185	1	3009	2.2	2.4	+0.1	B.98	C
	8	04		18	31	185	2	3009	2.2	2.4	0.0	" "	B
	8	10 P.M.		18	37	92	0	3003	3.4	3.9	+0.5	B.99	C
	8	12		18	39	92	1	3003	3.4	3.9	+0.4	" "	B
	9	42		20	9	333	2	3564	2.0	2.3	+0.1	" 100	B
	9	41		20	8	291-2	1	2945	4.3	4.9	+0.5	"	C
	9	40		20	7	3419	1	591	3.0	3.2	-0.1	"	B

	R.A		Dec.	H.a.		
	h	m	°	h	m	
	8	20.3	+61.1	11	11	11.4
	1	46.9	+18.7	6	15	9.1
B	1	46.9	+18.7	6	14	9.3
	3	15.8	+49.4	8	36	9.9
	3	34.4	+47.4	8	46	7.3
C	3	34.4	+47.4	8	46	7.3
	2	2.4	+34.4	7	11	9.7
C	2	2.4	+34.4	7	11	9.7
C	2	9.9	+33.7	7	16	8.4
	12	56.2	+11.6	6	30	1.8
	13	4.2	+18.2	6	26	6.7
B	13	49.0	+19.0	6	19	8.5
C	13	49.0	+19.0	6	19	8.5
	10	56.3	+62.4	9	17	17.3
C	2	0.4	+22.9	5	37	18.7
B	2	0.4	+22.9	5	37	18.7
B	3	34.4	+47.4 .	7	6	18.9
C	3	34.4	+47.4	7	6	18.9
B	16	22.0	-26.2	4	11	19.4
C	3	15.8	+49.4	6	43	23.2
C	1	3.0	+35.0	6	32	16.3
B	1	3.0	+35.0	6	32	16.3
C	0	32.9	+30.2	5	56	19.5
B	0	32.9	+30.2	5	54	19.9
B	2	0.4	+22.9	5	51	16.1
C	1	46.9	+18.7	5	39	15.8
B	3	34.4	+47.4	7	27	16.2

Date	h	m		sid. time					Mag.		Diff		
aug 28	9	39	+10 27	20	6	295	0	3564	2.8	2.3	+0.5	B. 100	C
	9	38		20	5	333	2	3564	2.0	2.3	+0.1		C
	9	38		20	5	3648	1	295	2.7	2.8	0.0		B
	9	37		20	4	3419	0	591	3.0	3.2	-0.2		C
	9	35		20	2	1926	0	3631	2.0	1.5	-0.5		B
	8	40		19	7	1923	0	3564	2.6	2.3	-0.3		B
	8	35		19	2	324-5	1	3564	2.1	2.3	+0.1		B
	8	14	P.M.	18	41	23	0	3009	3.0	2.4	-0.6		B
	8	15		18	42	2937	2	23	3.0	3.0	+0.2		C
aug 30	8	34	10 35	19	9	324-5	2	3564	2.1	2.3	0.0	B. 110	
	8	40		19	15	2480	2	3365	3.0	3.9	+0.7		
	8	45		19	20	1926	0	3631	2.0	1.5	-0.5		
	9	05		19	40	3631	2	541	1.5	1.9	-0.2		
	10	30		21	5	3631	2	2191	1.5	1.8	-0.1		
	10	33		21	8	3419	2	649	3.0	3.0	+0.2		
aug 31	9	25	10 39 11 26	20	4	3365	1	2539	3.9	2.7	+1.3	B. 112	
Sept 12.	7	55		19	21	333	2	3419	2.0	3.0	+0.8	" 122	B
	8	00		19	26	3393	2	649	4.6	3.0	+1.8		B
	8	05		19	31	295	0	3419	2.8	3.0	+0.2		B
	8	20		19	46	2457	0	3393	3.9	4.6	+0.7		B
	8	25		19	51	932.	1	3631	0.2	1.5	+1.2		B
	8	42		~~19~~ 20	~~1~~8	2738	1	3564	3.0	2.3	-0.6		B
	8	45		20	11	2764	2	3631	1.1	1.5	+0.2		B
	8	50		20	16	2690	1	3564	2.9	2.3	-0.5		B
	9	35		21	1	3429	2	2400	1.0	0.0	+1.2		B
	9	37		21	3	1100	0	3564	2.1	2.3	+0.2		B
	9	57		21	23	2726	2	3419	2.8	3.0	+0.0		B

	R.a		Dec.	H.a		
	h	m	°	h.	m.	
C	1	48.0	+20.2	5	42	16.1
C	2	0.4	+22.9	5	5	24.7
B	1	48.0	+20.2	5	43	16.0
C	3	34.4	+47.4	7	30	15.8
B	10	56.3	+62.4	9	6	18.0
B	10	54.6	+57.0	8	12	18.1
B	1	56.5	+41.8	6	54	17.1
B	0	7.1	+14.5	5	26	15.7
C	0	7.1	+14.5	5	25	15.9
	1	56.5	+41.8	6	47	18.0
	14	44.3	-15.6	4	31	6.2
	10	56.3	+62.4	8	24	21.0
	3	15.8	+49.4	7	36	16.4
	12	48.7	+56.6	8	16	12.9
	3	49.8	+39.7	6	42	17.6
	15	10.5	-8.9	4	54	6.7
B	2	0.4	+22.9	6	39	7.4
B	3	49.8	+39.7	8	24	3.5
B	1	48.0	+20.2	6	17	9.6
B	14	36.7	-5.1	5	9	6.3
B	5	7.8	+45.9	9	17	3.1
B	16	13.9	-25.3	3	54	5.1 ~~61.9~~
B	16	22.0	-26.2	3	49	5.1 ~~63.0~~
B	15	58.5	-19.5	4	18	5.6
B	14	10.2	+19.8	6	51	3.2
B	5	50.7	+44.9	8	48	5.1
B	16	8.1	-3.4	5	15	6.4

Date	h	m	Sid. Time					Mag.		Diff.		
Sept 12	9	55	+11 26 21	21	2726	1	3732	2.8	3.5	+0.6	B. 124	C
	10	00	21	26	2627	0	3564	2.7	2.3	-0.4		B
	10	00	21	26	2627	1	3419	2.7	3.0	+0.2	B. 125	C
	10	40	22	6	3564	2	2036	2.3	2.6	-0.1	" "	C
	10	27	21	53	978	1	3419	1.9	3.0	+1.0	" 126	C
	10	30	21	56	1104	0	3732	2.7	3.5	+0.8	" "	C
	10	40	22	6	2036	0	3564	2.6	2.3	- 0.3	" 127	B
	10	35	22	1	978	0	3564	1.9	2.3	+ 0.4		B
	10	30	21	56	797	2	3631	1.0	1.5	+ 0.3		B
	10	30	21	56	797	2	3631	1.0	1.5	+ 0.3		C
July 23	9	12	+8 05 17	17	541	1	2696	1.9	4.2	+ 22	C. 58	
	9	22	17	27	324-5	0	3003	2.1	3.9	+ 1.8		
	9	26	17	31	454	1	2644	4.0	5.2	+ 1.1		
	9	49	17	54	2569	0	2155-6	3.4	2.8	+ 0.6		
July 27	9	31	+8 21 17	52	2569	1	1949	3.4	2.8	+ 0.7	C. 70	
	9	34	17	55	541	1	3009	1.9	2.4	+0.4		
	9	38	17	59	2023	1	3003	3.0	3.9	+ 0.8		
	9	39	18	00	2025	0	3009	2.2	2.4	+ 0.2		
	10	05	18	26	336	1	3003	3.1	3.9	+ 0.7		
July 28	10	36	+8 25 19	01	333	0	2696	2.0	4.2	+ 2.2	C. 75	B
	10	38	~~21~~ 19	03	333	0	3009	2.0	2.4	+ 0.4		C
	10	43	19	08	295	1	3003	2.8	3.9	+ 1.0		C
	10	43	19	08	295	0	2945	2.8	4.9	+ 2.1		B
	10	52	19	17	2569	1	336	3.4	3.1	+ 0.4		C
	10	53	19	18	336	2	2945	3.1	4.9	+ 1.6		B

	R.a		Dec.	H.a		
	h	m	°	h	m	
C	16	8.1	-3.4	5	13	6.8
B	15	38.4	+6.8	5	48	6.7
C	15	38.4	+6.8	5	48	6.7
C	11 ~~20~~	47.5 ~~17.9~~	+51.4 ~~+39.9~~	10	19	6.7
C	5	18.7	+28.5	7	26	3.4
C	5	51.5	+37.2	7	56	5.3
B	11	47.5	+51.4	10	18	6.7
B	5	18.7	+28.5	7	18	4.6
B	4	29.0	+16.3	6	33	4.2
C	4	29.0	+16.3	6	33	4.2
	3	15.8	+49.4	9	59	3.1
	1	56.6	41.8 ~~+20.7~~	8	29	4.6
	2	45.8	+52.3	9	15	8.9
	12	35.6	-0.8	5	18	7.5
	11	7.7	+21.2	6	44	5.4
	3	15.8	+49.4	9	21	5.8
	0	7.1	+14.5	6	8	7.7
	11	42.9	+15.2	6	17	6.5
	2	2.4	+34.4	7	36	6.0
B	2	0.4	+22.9	6	59	3.9
C	2	0.4	+22.9	6	57	4.3
C	1	48.0	+20.2	6	40	5.5
B	1	48.0	+20.2	6	40	5.5
C	2	2.4	+34.4	6	45	13.8
B	2	2.4	+34.4	6	44	13.9

Black.	Reasonable, judicious.
Brown.	Undecided, tentative
Gray	Kindly, nervous. Intelligent, adroit.
White	Ardent. energetic. efficient.

NPD−φ	log Cos NPD−φ	log Cos Z.S.	N.P.D.	φ	NPD−φ	log Cos. NPD−φ	log $\frac{\text{Cos Z.P.}}{\text{Cos}\,\varphi}$	log Cos Z.S.	Z.S.		Z.S.
68.8°	9.5583	9.3695	60.4°	−8.4°	52.0°	9.7893	9.8112	9.6005.	66	31	76.5°
85.8	8.8647	8.6784	75.4	−10.4	65.0	9.6260	9.8137	9.4397	74	1	87.3
84.6	8.9736	8.7858	75.4	−9.2	66.2	9.6059	9.8122	9.4181	74	49	86.5
86.4	8.7857	8.6345	61.6	−24.8	36.8	9.9035	9.8488	9.7523	55	34	87.5
85.6	8.8849	8.7305	61.6	−24.0	37.6	9.8989	9.8456	9.7445	56	16	86.9
84.8	8.9573	8.8007	61.6	−23.2	38.4	9.8942	9.8434	9.7376	56	52	86.4
83.9	9.0264	8.9982	37.0	−46.9	−9.9	9.9935	9.9718	9.9653	22	36	84.3
80.5	9.2176	9.1818	34.6	−45.9	−11.3	9.9915	9.9642	9.9557	25	26	81.3
86.1	8.8326	8.7883	41.3	−44.8	−3.5	9.9992	9.9557	9.9549	25	39	86.5
83.0	9.0859	9.0453	37.7	−45.3	−7.6	9.9962	9.9594	9.9556	25	28	83.6
82.6 ~~90.6~~	9.1099 ~~8.0200~~	9.0023 ~~7.9608~~	47.8	−34.8 ~~−42.8~~	5.0	9.9983	9.8924 ~~9.9408~~	9.9391	29	38	84.2 ~~87.8~~
83.0 ~~90.8~~	9.0859 ~~8.1450~~	8.9800 ~~8.0373~~	47.8	−35.2 ~~−43.0~~	4.8	9.9985	9.8941 ~~9.9423~~	9.9408	29	14	84.5 ~~87.7~~
82.1	9.1381	8.9454	78.8	−3.3	75.5	9.3986	9.8073	9.2059	80	45	84.9
97.9	9.1381	8.9499	82.8	−15.1	67.7	9.5792	9.8118	9.3910	75	45	84.8
82.5	9.1157	8.9272	73.9	−8.6	65.3	9.6210	9.8115	9.4325	74	18	85.1
83.1	9.0797	8.8919	73.9	−9.2	64.7	9.6308	9.8122	9.4430	73	54	85.5
83.3	9.0670	8.8796	73.9	−9.4	64.5	9.6340	9.8126	9.4466	73	46	85.7
83.7	9.0403	8.8533	73.9	−9.8	64.1	9.6403	9.8129	9.4532	73	30	85.9
81.6	9.1646	9.0823	42.4	−39.2	3.2	9.9993	9.9177	9.9170	34	18	83.1
81.8	9.1542	9.0783	41.5	−40.3	1.2	9.9999	9.9241	9.9240	32	55	83.1
82.2	9.1326	9.0535	42.4	−39.8	2.6	9.9996	9.9209	9.9205	33	37	83.5
87.1	8.7041	8.6659	41.5	−45.6	−4.1	9.9989	9.9618	9.9607	24	0	87.3
82.8	9.0981	8.9177	68.8	−14.0	54.8	9.7608	9.8196	9.5804	67	38	85.3
81.4	9.1747	8.9841	74.8	−6.6	67.2	9.5883	9.8094	9.3977	75	32	84.5
82.3	9.1271	8.9374	74.8	−7.5	67.3	9.5865	9.8103	9.3968	75	34	85.0
85.1	8.9315	8.7756	61.6	−23.5	38.1	9.8959	9.8441	9.7400	56	40	86.6
83.2	9.0734	9.0393	37.0	−46.2	−9.2	9.9944	9.9659	9.9603	24	7	83.7

NPD-φ	log Cos NPD-φ	log Cos ZS.
82.9	9.0920	9.0502
79.2	9.2727	9.2272
84.5	8.9816	8 9.8023
82.3 ~~[illegible]~~	9.1271 ~~9.0334~~	8.9518 ~~8.8079~~
83.9	9.0264	8.8548
77.5	9.3353	9.1427
77.5	9.3353	9.1427
80.6	9.2131	9.0199
80.9	9.1991	9.0059
81.2	9.1847	8.9916
79.8	9.2482	9.0970
79.8	9.2482	9.0970
83.7	9.0403	8.8532
82.3	9.1271	8.9383
82.5	9.1157	8.9272
82.0	9.1436	3 9.0697
82.2	9.1326	9.0591
87.9	8.5640	8.3836
88.2	8.4971	8.3173
88.2	8.4971	8.3173
88.5	8.4179	8.2386
83.2 ~~95.6~~	9.0734 ~~8.9894~~	8.9115 ~~8.8774~~
82.7 ~~96.3~~	9.1040 ~~8.9655~~	8.9406 ~~8.8518~~
8 93.5	9.0539 ~~8.7857~~	9.0225 ~~8.7543~~
7 82.6	9.4757 ~~9.1099~~	9.4416 ~~9.0758~~
87.2 ~~159.4~~	8.6889 ~~9.9713~~	8.6586 ~~9.9471~~
87.0 ~~159.2~~	8.7188 ~~9.9707~~	8.6863 ~~9.9445~~

N.P.D.	φ	NPD-φ	log. Cos. NPD-φ	log $\frac{\cos ZP}{\cos \varphi}$	log Cos ZS	ZS.		Z.S.
37.7	-45.2	-7.5	9.9963	9.9582	9.9545	25	46	83.6
34.6	-44.6	-10.0	9.9934	9.9545	9.9479	27	30	80.3
69.9	-14.6	55.3	9.7553	9.8207	9.5760	67	52	86.4 ~~50.6~~
65.9	16.4 -~~30.0~~	35.6	9.9101	2 9.8549	9.7746	53	29	84.9 ~~80.5~~
65.9	-18.0	47.9	9.8264	9.8284	9.6548	63	9	85.9
73.9	-3.6	70.3	9.5278	9.8074	9.3352	77	30	82.0
73.9	-3.6	70.3	9.5278	9.8074	9.3352	77	30	82.0
78.8	-1.8	77.0	9.3521	9.8068	9.1589	81	43	84.0
78.8	-2.1	76.7	9.3618	9.8068	9.1686	81	31	84.2
78.8	-2.4	76.4	9.3713	9.8069	9.1782	81	20	84.4
55.0	-24.8	30.2	9.9366	9.8488	9.7854	52	24	82.8
55.0	-24.8	30.2	9.9366	9.8488	9.7854	52	24	82.8
73.9	-9.8	64.1	9.6403	9.8129	9.4532	73	30	85.9
73.9	-8.4	65.5	9.6177	9.8112	9.4289	74	26	85.0
73.9	-8.6	65.3	9.6210	9.8115	9.4325	74	18	85.1
42.4	-39.6	2.8	9.9995	9.9201	9.9196	33	48	83.4
41.5	-40.7	0.8		9.9265				83.4
73.9	-14.0	59.9	9.7003	9.8196	9.5199			88.6
73.9	-14.3	59.6	9.7042	9.8202	9.5244			88.8
73.9	-14.3	59.6	9.7042	9.8202	9.5244			88.8
73.9	-14.6	59.3	9.7080	9.8207	9.5287			89.0
61.6	21.6 -~~34.0~~	27.6	9.9475	3 1 9.8888	9.8355			~~35.4~~ 85.3 ~~85.7~~
61.6	21.1 -~~33.7~~	27.9	9.9481	3 9.8866	9.8344			~~29.3~~ 85.0 ~~85.9~~
3 47.0	-46.5	0.5	9.	9.9686				4.0 ~~86.7~~
2 36.4	-46.2	9.8	9.9936	9.9659	9.9595			4.0 ~~83.2~~
40.6 ~~112.0~~	46.6 -~~47.4~~	64.6	9.6324	697 9.9~~758~~	9.6082			87.4 ~~27.7~~
40.6 ~~112.0~~	46.4 -~~47.2~~	64.8	9.6292	675 9.9~~738~~	9.6030			87.2 ~~28.4~~

N.P.D.−φ	log Cos N.P.D.−φ	log Cos Z.S.
85.7	8.8749	8.7818
81.9	9.1489	9.0051
78.5	9.2997	9.2041
86.4	8.7979	8.7478
83.1	9.0797	9.0046
82.4	9.1214	9.0423
82.1	9.1381	9.0574
82.0	9.1436	8.9545
78.0	9.3179	9.1301
78.6	9.2959	9.1088
84.3	8.9970	8.9442
81.4	9.1747	9.0966
83.9	9.0264	8.9708
82.3	9.1271	9.0488
82.3	9.1271	8.9457
78.8	9.2883	9.0956
83.4	9.0605	8.8812
78.5	9.2997	9.1069
79.9	9.2439	9.0522
78.2	9.3107	9.1796
80.2	9.2310	9.0395
80.8	9.2038	9.0866
78.6	9.2959	9.1415
81.7	9.1594	8.9801
79.2	9.2727	9.0853
78.3	9.3070	9.3001
78.4	9.3034	9.2968

N.P.D.	φ	N.P.D.−φ	log Cos. N.P.D.−φ	log $\frac{\cos ZP}{\cos \varphi}$	log Cos Z.S.	Z.S.
48.2	−37.5	10.7	9.9924	9.9069	9.8993	86.5
55.0	−26.9	28.1	9.9455	9.8562	9.8017	84.2
41.5	−37.0	4.5	9.9987	9.9044	9.9031	80.8
42.4	−44.0	−1.6	9.9998	9.9499	9.9497	86.8
42.6	−40.5	2.1	9.9997	9.9249	9.9246	84.2
42.6	−39.8	2.8	9.9995	9.9209	9.9204	83.7
42.6	−39.5	3.1	9.9994	9.9193	9.9187	83.4
73.9	−8.1	65.8	9.6127	9.8109	9.4236	84.8
68.8	−9.2	59.6	9.7042	9.8122	9.5164	82.2
68.8	−9.8	59.0	9.7118	9.8129	9.5247	82.6
40.6	−43.7	−3.1	9.9994	9.9472	9.9466	85.0
41.5	−39.9	1.6	9.9998	9.9219	9.9217	82.8
40.6	−43.3	−2.7	9.9995	9.9444	9.9439	84.6
42.4	−39.9	2.5	9.9996	9.9217	9.9213	83.6
68.8	−13.5	55.3	9.7553	9.8186	9.5739	84.9
75.5	−3.3	72.2	9.4853	9.8073	9.2926	82.8
68.8	−14.6	54.2	9.7671	9.8207	9.5878	85.6
75.5	−3.0	72.5	9.4781	9.8072	9.2853	82.7
74.8	−5.1	69.7	9.5402	9.8083	9.3485	83.5
48.2	−30.0	18.2	9.9777	9.8689	9.8466	81.3
74.8	−5.4	69.4	9.5464	9.8085	9.3549	83.7
47.9	−32.9	15.0	9.9849	9.8828	9.8677	83.0
54.6	−24.0	30.6	9.9349	9.8456	9.7805	82.0
67.1	−14.6	52.5	9.7844	9.8207	9.6051	84.5
69.8	−9.4	60.4	9.6937	9.8126	9.5063	83.0
28.9	−49.4	−20.5	9.9716	9.9931	9.9647	78.5
28.9	−49.5	−20.6	9.9713	9.9934	9.9647	78.6

NPD-φ	log Cos NPD-φ	log Cos. Z.S.	N.P.D.	φ	NPD-φ	log Cos NPD-φ	log $\frac{\text{Cos.ZP}}{\cos\varphi}$	log Cos. Z.S.	Z.S.
78.4	9.3034	9.2971	28.9	-49.5	-20.6	9.9713	9.9941	9.9654	78.6
75.8	9.3897	9.1976	71.3	-4.5	66.8	9.5954	9.8079	9.4033	80.9
75.5	9.3986	9.2063	71.3	-4.2	67.1	9.5901	9.8077	9.3978	80.7
77.6	9.3319	9.2363	40.6	-37.0	3.6	9.9991	9.9044	9.9035	80.1
81.1	9.1895	9.1023	42.6	-38.5	4.1	9.9989	9.9128	9.9117	82.7
81.1	9.1895	9.1023	42.6	-38.5	4.1	9.9989	9.9128	9.9117	82.7
75.7	9.3927	9.2265	55.6	-20.1	35.5	9.9107	9.8338	9.7445	80.3
75.7	9.3927	9.2265	55.6	-20.1	35.5	9.9107	9.8338	9.7445	80.3
77.7	9.3284	9.1658	56.3	-21.4	34.9	9.9139	9.8374	9.7513	81.6
87.3	8.6731	8.4849	78.4	-8.9	69.5	9.5443	9.8118	9.3561	88.2
77.6	9.2565	9.0671	71.8	-7.8	64.0	9.6418	9.8106	9.4524	83.3
76.7	9.3618	9.1705	71.0	-5.7	65.3	9.6210	9.8087	9.4297	81.5
76.7	9.3618	9.1705	71.0	-5.7	65.3	9.6210	9.8087	9.4297	81.5
69.9	9.5361	9.4733	27.6	-42.3	-14.7	9.9856	9.9372	9.9228	72.7
			67.1	+6.9	60.2	9.6963	9.8097	9.5060 stet	71.3
			67.1	+6.9	60.2	9.6963	9.8097	9.5060 stet	71.3
61.4	9.6801	9.5105	42.6	-18.8	23.8	9.9614	9.8304	9.7918	71.1
61.4	9.6801	9.5105	42.6	-18.8	23.8	9.9614	9.8304	9.7918	71.1
			116.2	+28.8	87.4	8.6567	9.8637	9.5204 stet	70.6
53.2	9.7774	9.5946	40.6	-12.6	28.0	9.9459	9.8172	9.7631	66.8
64.4	9.6356	9.4482	55.0	-9.4	45.6	9.8449	9.8126	9.6575	73.7
64.4	9.6356	9.4482	55.0	-9.4	45.6	9.8449	9.8126	9.6575	73.7
			59.8	+1.2	58.6	9.7168	9.8067	9.5235 stet	70.5
			59.8	+1.8	58.0	9.7242	9.8068	9.5310 stet	70.1
			67.1	+2.7	64.4	9.6356	9.8070	9.4426 stet	73.9
			71.3	+6.3	65.0	9.6260	9.8092	9.4352 stet	74.2
66.6	9.5990	$9.\overset{4}{3}446$	42.6	-24.0	18.6	9.9767	9.8456	9.8223	73.8

NPD-φ	log Cos NPD-φ	log Cos Z.S.	N.P.D.	φ	NPD-φ	log Cos N.P.D.-φ	log $\frac{\text{Cos Z.P.}}{\text{Cos }\varphi}$	log Cos. Z.S.	Z.S.
			69.8	+5.4	64.4	9.6356	9.8085	9.4441	73.9
			67.1	+15.9	51.2	9.7970	9.8235	9.6205	65.3
			69.8	+5.1	64.7	9.6308	9.8083	9.4391	74.0
67.2	9.5883	9.4363	42.6	-24.6	18.0	9.9782	9.8480	9.8262	74.2
68.7	9.5602	9.4890	27.6	-41.1	-13.5	9.9878	9.9288	9.9166	72.0
66.1	9.6076	9.4913	33.0	-33.1	-0.1	0.0000	9.8837	9.8837	71.9
63.8	9.6449	9.4678	48.2	-15.6	32.6	9.9256	9.8229	9.7485	72.9
			75.5	+10.0	65.5	9.6177	9.8133	9.4310	74.3
			75.5	+10.4	65.1	9.6243	9.8137	9.4380	74.1
62.0	9.6716	9.4907	48.2	-13.8	34.4	9.9165	9.8191	9.7356	72.0
			105.6	+24.4	81.2	9.1846	9.8472	9.0318	83.8
62.8	9.6600	9.5541	27.6	-35.2	-7.6	9.9962	9.8941	9.8903	69.0
66.6	9.5990	9.4519	40.6	-26.0	14.6	9.9857	9.8529	9.8386	73.6
73.2	9.4609	9.3481	39.4	-33.8	5.6	9.9979	9.8872	9.8851	77.1
62.6	9.6629	9.4796	50.3	-12.3	38.0	9.8965	9.8167	9.7132	72.4
			98.9	+18.8	80.1	9.2354	9.8304	9.0658	83.3
78.6	9.2959	9.1113	67.1	-11.5	55.6	9.7520	9.8154	9.5674	82.6
85.5	8.8946	8.7887	50.3	-35.2	15.1	9.9847	9.8941	9.8788	86.5
74.9	9.4158	9.2241	69.8	-5.1	64.7	9.6308	9.8083	9.4391	80.4
			95.1	+14.8	80.3	9.2266	9.8112	9.0378	83.7
86.4	8.7979	8.~~8~~7351	44.1	-42.3	1.8	9.9998	9.9372	9.9370	86.9
			115.3	+32.0	83.3	9.0670	9.8784	8.9454	~~78.1~~ 84.9
			116.2	+32.9	83.3	9.0670	9.8828	8.9498	~~87.0~~ 84.9
			109.5	+27.3	82.2	9.1326	9.8578	8.9904	84.4
85.0	8.9403	8.7515	70.2	-14.8	55.4	9.7542	9.8112	9.5654	86.8
83.8	9.0334	8.9448	45.1	-38.7	6.4	9.9973	9.9114	9.9087	84.9
			93.4	+13.2	80.2	9.2310	9.8181	9.0491	83.6

NPD-φ	log Cos NPD-φ	log Cos Z.S.	N.P.D.	φ	NPD-φ	log Cos NPD-φ	log $\frac{\text{Cos Z.P.}}{\text{Cos } \varphi}$	log Cos Z.S.	Z.S.
			93.4	+13.8	79.6	9.2565	9.8191	9.0756	83.2
			83.2	+3.6	79.6	9.2565	9.8074	9.0639	83.3
			83.2	+3.6	79.6	9.2565	9.8074	9.0639	83.3
82.9	9.0920	9.0673	35.6	-47.3	-11.7	9.9909	9.9753	9.9662	83.3
85.2	8.9226	8.7675	61.5	-23.7	37.8	9.8977	9.8449	9.7426	86.6
82.9	9.0920	8.9617	52.8	-30.1	22.7	9.9650	9.8697	9.8347	84.7
82.9	9.0920	9.0668	35.6	-47.3	-11.7	9.9909	9.9748	9.9657	83.3
83.3	9.0670	8.9058	61.5	-21.8	39.7	9.8862	9.8388	9.7260	85.4
83.5	9.0539	8.8668	73.7	-9.8	63.9	9.6434	9.8129	9.4563	85.8
83.5	9.0539	8.8668	73.7	-9.8	63.9	9.6434	9.8129	9.4563	85.8
86.6	8.7731	8.7378	40.6	-46.0	-5.4	9.9981	9.9647	9.9628	86.9
84.2	9.0046	8.9030	48.2	-36.0	12.2	9.9901	9.8984	9.8885	85.4
79.7	9.2524	9.1881	37.7	-42.0	-4.3	9.9988	9.9357	9.9345	81.1
			90.8	+12.3	78.5	9.2997	9.8167	9.1164	82.5
81.7	9.1594	8.9771	68.8	-12.9	55.9	9.7487	9.8177	9.5664	84.6
83.3	9.0670	9.0071	40.6	-42.7	-2.1	9.9997	9.9401	9.9398	84.2
77.9	9.3214	9.1283	75.5	-2.4	73.1	9.4634	9.8069	9.2703	82.3
79.9	9.2439	9.0522	74.8	-5.1	69.7	9.5402	9.8083	9.3485	83.5
81.6	9.1646	9.0175	55.6	-26.0	29.6	9.9514	9.8529	9.8043	84.0
84.1	9.0120	8.8379	67.1	-17.0	50.1	9.8072	9.8259	9.6331	86.1
83.5	9.0539	8.8786	67.1	-16.4	50.7	9.8017	9.8247	9.6264	85.7
81.6	9.1646	8.9804	69.8	-11.8	58.0	9.7242	9.8158	9.5400	84.5
81.6	9.1646	8.9804	69.8	-11.8	58.0	9.7242	9.8158	9.5400	84.5
68.8	9.5583	9.3764	55.6	-13.2	42.4	9.8683	9.8181	9.6864	76.2
68.5	9.5641	9.3818	55.6	-12.9	42.7	9.8662	9.8177	9.6839	76.1

Miscellaneous Information relating to the Observatory
Sept. 30, 1888.

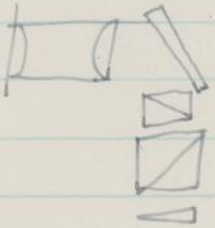
Expenses 1 observer 2 yrs in Peru.

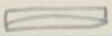
Fare N.Y. to Callao	230
return	230
$15 a week	1500
	$2000

Mr. Clark.

Cutting 8 inch Bache telescope Sent. 11.
Clock for " "
Duplicate regulator.
4 inch lens. meridian photometer.
Tip reading lens. dec. circle.
Cutting 11 inch telescope.

Eyepiece. Horiz. telescope.





Oct. 13. 1888.

Nos. of stars to be observed with Merid. Phot. c̄ Pol.

h.	ZC.	AGC	SHP.
0	91	29	45
1	116	20	45
2	136	21	49
3	114	51	44
4	154	29	37
5	209	33	56
6	247	57	68
7	352	59	95
8	380	37	82
9	324	33	63
10	312	41	65
11	305	54	64
12	244	29	65
13	268	29	51
14	252	36	60
15	269	48	66
16	265	45	62
17	334	53	48
18	230*	43	71
19	176	42	44
20	129	28	43
21	138	28	39
22	132	28	54
23	115	27	53

h.	Z.C.	A.G.C.	SHP	Pol.
0-5	820	183	276	76
6-11	1920	281	437	92
12-17	1632	240	352	60
18-23	920	185	304	112
0-23	5292	890	1369	340
				7891

Oct. 27. 1888.

H	Carb Cal.	7	
0	158	15	143
1	158	30	128
2	169	21	148
3	187	18	169
4	202	32	170
5	248	52	196
6	324	55	269
7	432	85	347
8	437	105	332
9	386	93	293
10	384	98	286
11	379	96	283
12	290	66	224
13	313	71	242
14	305	72	233
15	331	60	271
16	329	69	260
17	407	83	324
18	290	53	237
19	230	41	189
20	186	26	160
21	197	38	159
22	191	27	164
23	105	23	82
		1325	

Oct 28, 1888.

Correction in altitude for hour angle of stars near lower culmination.

Dec.	H.A. +1h	H.A. −1h	H.A. 0h	
85°	37°.4	37.4	37.4	0.0
80°	32.6	32.6	32.4	0.2
75	27.8	27.8	27.4	0.4
70	22.9	22.9	22.4	0.5
65	18.0	18.0	17.4	0.6
60	13.1	13.0	12.4	0.7
55	8.2	8.2	7.4	0.8
50	3.3	3.3	2.4	0.9
47.6			0.0	1.0

Hence if star is 1h from meridian greatest error will not exceed 1°. Since this error will be prop. to square of time. Error at 20m will be only 0°.1

Region north of 45° = 0.3 of a hemisphere or about 900 stars & H.R. = 37.5 per hour. at upper and an equal number after the culmination.

Dec 3, 1888

Boyden Lenses

Design.	Begun.	Ended.	No. Plates	
M	Nov 1 '87	Mar. 5 '88	16	
C	Oct 17 "	Nov 1	575	
I	Oct. 15 "	Aug 10	256	
W	Oct. 15 "	Nov. 1 [Evidently plates all indexed]	195	
L	Nov 1 "	Nov. 1	425	
R	Oct 20 "	Aug 10	780	
S	Apr. 18 "	July 15	23	
Y	Feb 2 '88	Oct 8	1141	Birch refractor.
			3527	

Dec. 30, 1888

Plan for comparing photographic brightness of stars in different portions of the sky.

Make a series of exposures about 1° square for 5m each on 5×8 plates. 4 rows of 6 each on a plate. Drive telescope by clock ~~and begin at 20m preceding meridian~~ Make exposures as follows in 60° h.a. 90° ~~on meridian. Let stars 20m east of dec.~~ −30°, −25, −20, −15, −10, −5, 0, +5, +10, +15, +20, +25°, +30, +35, +40, +45, +50, +55, +60, ~~beginning to meridian and set~~ at 90° and −60°. 23 settings in all, leaving one blank in case of error. Repeat for every 20m in R.A. that is at 0h0m, 0h20m, &c. Note carefully time of beginning and ending each exposure, always ~~go~~ beginning on an exact minute.

The 60 exposures serve to correct for atmospheric absorption the 90° to reduce all to uniform system. Any irregular change in clearness of the air being indicated by the two exposures.

To connect these 72 plates, expose as shown on page 41. Six plates are to be taken all having the same ~~H.A.~~ Dec. and H.A. as shown in 1st and 2d columns. The R.A. for dec. 0° will be 12h00m 0h00m, 16h20m, 4h20m, 19h40m and 7h40m. Each of 72 plates will appear in two of these.

We thus cover region from −30° to +60° with plates 1° square at intervals of 5°.

Measure brightness of all stars discernible with meridian phot. in vicinity of them and select from each square 5 or 10 of magn. about 9.5 measure these also. Measuring these also in plates having exposure of 60s serves to reduce all to a uniform scale.

Dec 30, 1888.

Dec	H.A.	R.A.	S.T.	H.A.	R.A.	S.T.	H.A.	R.A.	S.T.
90	8h 3m W	3h 00	11 3		7 30	15 33		10 40	18 43
80	7 9	4	11 9		8 20			11 40	
70	6 15	5	11 15		9 20			12 40	
60	5 21	6	11 21		10 20			13 40	
50	4 27	7	11 27		l			l	
40	3 33	8	11 33						
30	2 39	9	11 39						
20	1 45	10	11 45						
10	0 57	11	11 57						
0	0 3 E	12 00	11 57						
10	0 57	13	12 3						
20	1 57	14	12 9						
30	2 45	15	12 15						
40	3 39	16	12 21						
50	4 33	17	12 27						
60	5 27	18	12 33						
70	6 21	19	12 39						
80	7 15	20	12 45						
90	8 9	21	12 57						

Jan. 21, 1889.

Attaching a camera with $\frac{1}{5}$ focal length a second set may be taken without much extra labor. This will give 5° square on each exposure. These plates will have 25 times the area of other set. Hence they will cover the ~~same area~~ entire sky, and will give all stars to 7 or 8 magn.

Plan for Southern Chart-a-Plan

+60	-50	-90	-50
-90	-55	-30	-55
-30	-60	-35	-60
-35	x	-40	A
-40	-90	-45	B
+45	+60	+60	-90

R.A.	A	B
$0^{h}.0$	65°	75°
0.3	70	80
0.7	65	85
1.0	70	75
1.3	65	80
1.7	70	85
2.0	65	75
2.3	70	80
2.7	65	85
3.0	70	75

Convert plates as on p 41. Cut 8×10 plates into 4 of 4×5. develop all 4 together.

References

Bulletin Astron V, 553. Nov. XVIII III, IV. V

The Observatory No. 145 p 83 by A. A. Common.

Nature. Eclipse of Jan 1, 1889. XXXIX 249

Eng Mech. XVIII. 6   v 48. p 396

Nature. XVIII 6   v 39 p 282.

Feb. 24, 1889.

Foci of photog. doublets.

6715	.32	.32
6706	.55	.55
Dallmeyer 3 in	.33	.33
~~[illegible]~~		
Voigtländer 4 in	.57	(Nov. 9. 1889)

Feb 26 1889

		Cent.	B_1		B_2			α_1		α_2	
.00	12	0.0	6867.4	67.4	68			6277.4		6276.8	
.12	36	0.1									
.48	60	0.5	67.8	67.3	6.67.8		67.3				
1.08	84	1.1	68.3	67.2	~~68.7~~			77.7			
1.92	108	1.9	69.2	67.3	68.7	5	66.8	78.3			
3.00	132	3.0	70.2	67.2	69.3	20	66.3	79.1			
4.32	156	4.3	71.5	67.2	71.3	12	67.0	80.0	75.7	80.6	76.3
5.88	180	5.9	73.1	67.2	72.5	15	66.6	81.4	75.5	82.2	76.3
7.68	204	7.7	74.9	67.2	74.0	18	66.3	82.9	75.2	84.0	76.3
9.72	228	9.7	77.0	67.3	75.8	20	66.1	84.7	75.0	(85.7)	76.0
12.00	252	12.0	79.3	67.3	77.8	24	65.8	(87.0)	75.0	87.9	75.9
14.~~48~~52 28	276	14.5	(81.6)	67.1	80.2	28	65.7	89.6	75.1	90.4	75.9
17.~~7~~6	300	17.3	84.1	66.8	(83.0)	30	65.7	92.4	75.1	93.2	75.9
20.28	324	20.3	87.0	66.7	86.0	32	65.7	95.4	75.1	96.2	75.9
23.52	348	23.5	90.2	66.7	89.2	34	65.7	98.6	75.1	99.4	75.9
27.00	372	27.0	93.6	66.6	92.6	38	65.6	02.2	75.2	02.9	75.9
30.72	396	30.7	97.3	66.6	96.4	39	65.7	06.0	75.3	06.7	76.0
34.68	420	34.7	1.2	66.5	00.3	41	65.6	10.0	75.3	10.8	76.1
38.88	444	38.9	5.3	66.4	04.4	43	65.5	14.4	75.5	15.2	76.3
43.32	468	43.3	9.6	66.3	08.7	48	65.4	(18.9)	75.6	19.7	76.4
48.00	492	48.0	14.4	66.4	13.5	49	65.5	23.8	75.8	24.6	76.6
52.92	516	52.9	19.3	66.4	18.4	51	65.5	29.2	76.3	29.6	76.7
58.08	540	58.1	24.4	66.3	23.5	55	65.4				
63.48	564	63.5	29.7	66.2	29.0	56	65.5				
69.12	588	69.1	35.5	66.4	34.6	60	65.6				
75.00	612	75.0	41.4	66.4	40.6		65.6				
81.12	636										
87.48	660										
94.08	684										
100.92	708										
108.00											

A Cornu	Abny.	C-A
7593.0	7593.6	-6
3.6 f	3.9	-3
4.4	5.1	-7
5.0 f	6.0	-10
5.6	6.5	-9
6.7	7.4	-7
8.2	8.5	-3
8.3		
9.4		
9.8	— 0.1	-3
76009	1.6	-1
1.5	3.1	-4
2.7	4.0	-4
3.6	5.2	-4
4.8	6.2	-2
6.0	07.6	-4
7.2	09.1	-6
8.5	10.1	-4
9.7	11.9.	-7
7611.2	12.8	-4
2.4	14.8	-5
4.3	15.7	-3
5.4	16.2	
7620.2	20.6	-4
2.4	22.8	-4
3.6	23.8	-2
6.2	26.5	-3
7.4.	27.4	0

7630.4	30.2	+2
1.6	1.3	+3
4.8	4.3	+5
5.9	5.3	+6
9.0	8.6	+4
7640.2	9.5	+7
3.5	43.1	+4
4.7	3.9	+8
8.5	7.8	+7
9.7	8.7	+10
7653.6	52.8	+8
4.8	3.7	+11
7.5 f	6.4	+11
8.9	8.0	+9
7660.1	8.9	+12
4.5	63.4	+11
5.6	64.4	+12
7670.3	69.1	+12
1.5	70.0	+15
6.5	75.2	+13
7.7	76.1	+16
7680.2 f	78.6	+16
2.6	81.2	+14
3.8	82.2	+16
	85.6	
89.2	89.7	
7690.5	8	
1.8 f		
5.6	94.0	
6.8		
9.4 f		

7592.0					3.0	30	18	42	0.0
7593.6					3.6	3.7	25	49	0.1
4.4					4.0	4.5	33	57	0.5
56					4.5	5.6	44	68	1.1
67		56			4.9	6.8	56	80	1.9
83		8.2?	5.2		5.3	83	71	9.5	3.0
7599.8	7595.5	9.4	5.1		5.6	9.9	87	1.1	4.3
760 15	56	0.9	5.0	6					5.9
36	5.9	27	5.0	9					7.7
60	6.3	48	5.1	12					9.7
85	6.5	72	5.2	13					12.0
761 12	6.7	94	4.9	18					14.5
43	7.0	24	5.1	19					17.3
(70)	6.7	54	5.1	16					20.3
762 02	67	88	5.3	14					23.5
36	6.6	24	5.4	12					27.0
74	6.7	62	5.5	12					30.7
763 16	6.9	04	5.7	12					34.7
59	7.0	48	5.9	11					38.9
764 02	69	90	5.7	12					43.3
47	6.7	35	5.5	12					48.0
9.7	6.8	85	5.6	12					52.9
765 48	6.7	36	5.5	12					58.1
766 0.1	6.6	89	5.4	12					63.5
5.6	6.5	45	5.4	11					69.1
767 1.5	6.5	03	5.3	12					75.0
7.7	6.6	65	5.4	12					81.1
768 3.8	6.3	2.6	5.1	12					87.5
769 05	6.4	9.0	4.9	15					94.1
68	59	5.6	4.7	12					100.9 108.0

	Müller + Kupf.	R – Com Corr.	mal Kupf	K Comds – Com Corr.	Corm.+	Corm – Corf	Map Rur.	(Corm – Corntor / 6000	↓)	Ad.?
C	656.314	+.01	+.02	-11	656.21	-08	656.30	+3	656.32	656.30
	486.164	+04	+.02	-10	486.07	-07	486.14	+1	486.15	486.14
	434.071		+.02	-07	433.95	-10	434.06	-3	434.02	434.06
	410.198	-.01	+.02	-07	410.12	-06	410.17	+1	410.19	410.18
	396.879	+.04	-.14	-05	396.92	-10	397.06?	-3	396.99	397.02
		+.03		-06	388.81	-09	388.93	-3	388.87	388.90
		+.02 ~~+10~~		-06	383.49	-05	383.56 ~~383.49~~	+1	383.55	383.55
		+07 ~~+18~~		-06	379.73	-06	379.86 ~~379.77~~	0	379.79	379.79
		00		-06	376.99	-.07	377.06	-1	377.05	377.06
		-.06		-06	375.02	00	374.96	+6	375.08	375.02
		-.10 ~~+05~~		-06	373.41	-.03	~~373.54~~ ~~373.49~~	+3	373.47	373.48
		-19		-06	372.11	-.09	372.01	-3	372.17	
		-27		-06	371.12	-.08	370.93	-2	371.18	

+ AN cxvii, p.337.

Oct 25 1889

Wave lengths of H. lines See page 83

	Cornu Ames. + Ak cxviii, 337	Comm. − Cont.	Rowland	Computed Cornu	d Corr. M.		Curve	O-C
C	656.18	+.03	6562.965	656.29	~~276.18~~ 276.18			
F	486.06	+.01	4861.428	486.14	~~212.75~~	276.18	485.91	+.25
G	433.98	−.03		434.05	212.75	212.75	436.90	−2.85
h	410.11	+.01		410.18	173.13	173.13	410.79	−.61
H	396.95	−.03		397.02	147.10 146.50	147.10 146.80	396.85 396.70	+0.15
K					160.79	139.21	393.73	
α	388.84	−.03		388.90	129.32	129.32	388.50	+0.40
β	383.48	+.01		383.54	116.87	116.87	383.22	+0.32
γ	379.73	.00		379.79	100.37	107.90	379.59	+0.20
δ	377.00	+.01		377.06	107.60	100.37	376.93	+0.13
ε	374.96	+.06		375.02	95.10	95.10	375.14 ~~373.67~~	−.12 ~~+1.55~~
ζ	373.38	+.03		373.44				
η	372.14	−.03		372.20				
θ	371.14	−.02		371.20				

1 Scale div. .467

0.1 " " .0467

A.D. measures .082 div. = .0336 .057 .05

Feb. 25. 1889.

Work to be done in reduction of Mt. W. obs.
Stars south of −30°.
Find zero 1 obs. among.

β 383.5

379.8 37

383.5 384

24

1 38.

2 390.9

3

379.8 380.

44

380

2 380.54 381

381

4 381.28 381

37

65 382

6 382.02 382

382

8 382.76 383

383

0 383.50 384

Oct 26. 1889.

	Obs.		Sm. Curve					
100	376.8	81	376.8	80	.0	376.8	77	0.0
120	384.9	90	3848	92	+.1	3845	89	+.4
140	3939	94	3940	104	-.1	3934	101	+.5
160	403.3	108	4044	116	-1.1	4035	113	-.2
180	414.1	116	4160	128	-1.9	4148	125	-.7
200	4257	132	4289	140	-3.1	4273	137	-1.6
220	4389	154	4428	152	-3.9	4410	149	-21
240	4543	170	4580	164	-3.7	4559	161	-1.6
260	4713	179	4744	176	-3.1	4720	173	-.7
280	4892		4920		-2.8	4893		-.1

100	376.80	36	376.8	36	) 78	·376.8	3.7
	380 40	42	3804	42		380.5	40
	384.60	48	3846	48		·3845	43
	385.08	54	3894	54	) 102	3888	46
	385.62	60	3948	60		·3934	49
	386.22	66		66	126	3983	52
	386.88					·4035	55
						4090	58
						·4148	61
						4209	64
						·4273	67
						4340	70
						·4410	73
						4483	76
						·4559	79
						4638	82
						·4720	85
						4805	88
						·4893	

Meridian Circle Zones.

	h. m. s.		m. s.		′ ″		h. m.		° ′ ″	
1868 Feb. 1	11 10 0	DM. + 29° 1308	+ 1 7.32	9	+ 7 21.4	5	6 34 4.84	9.261	+ 29 49 38.2	0.335

Draper Catalogue.

				m.	° ′								
12345	+15° 4327	24367	2641	29.7	+30 25	III.a	6.28	356 432	3226,3567,3765	3.5,3.8,4.1	βγδ	HH2	rn

Revision DM.

	h. m.	′															
4237	22 34.7	59	10.12	8.9	343,357,362	563	428	a b	4237	22 34.7	59	10.12	8.9	343,357,362	563	428	a b
									4237	34.7 + 22°59′		10.12				428	A

~~XIX~~ Table I.

1840	Sunrise	29.932	30.082	29.757	29.976	29.824	29.848	29.894	29.880	29.953	29.968	29.833	29.918	29.905

Feb. 28, 1889.

Adopted notation for spectra.

I	A	I.
I_b	B	
I_d	C	
I pec.	D	
II	E	II.
II_a	F	
II pec.	G	
III	H	
III_b	I	
III_{bc}	K	
III_{pec}	L	
III_{tun}	M	III.
IV	N	IV.
Br. lines	O	
Peculiar	P	

February 28, 1889.
Distances from Observatory

Front-Door	to Street		370	
"	"	Cor. Bond St.	620	250
"	"	" Arsenal.	1780	1160
"	"	" Wash. Elm	2655	875
"	"	" Cam. Com.	3565	910
"	"	" Square	4135	570
"	"	" " via Com.	4120	
"	"	N. Avenue via Garden St. ~~via Com.~~	2560	
"	"	N. Av. via Com.	3050	
Rear Door.		Concord Road.	490	
"	"	Craigie	1070	
"	"	Arsenal	1650 ~~1780~~	
"	"	Square	4105	
"	"	Craigie Bridge	1350	
		Brattle	1520	

March 1, 1889

Cost of reducing barograph sheets for 1888 of Blue Hill Meteor. Obser. 30h 15m @25 $7.56

Eclipse comp. work 7h @35 = 2.45. 41h @25 $10.25 = $12.70

~~Diurnal~~ Mean of hourly results for each month. 4½ 5 4h.

Merid. Phot. Obser.

Desig.	Kind.
A.	Uran. Argent. St.
B	B.A.C.
C	Comp. Stars Variables
H	H.P. repeated.
Ma	Miscell.
M.	Planet. Neb.
R	Red.
V	Sus. Variables
S	Spectrum Ser.
L	Lindemann. 86
I	IV Class.
l	Pritchard?

March 1. 1889.

Volumes of Annals still to be published

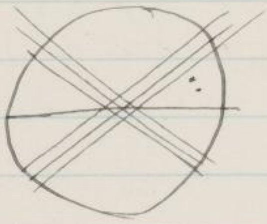
XVIII 7. Light of Stars by Photometry · c p.d. 119
8. Index Variables c. 215
9. Polar Stars. c? 25
10. Upper Limb Culmin.
XIX, I Meteor. Observ. 1840-89 c
II
XX, I Blue Hill 1887 c p d
II " " 1888. c.
III Discussion Cloud Observ.
XXI I N. E. Met. Soc. 1888 c
II " " " 1889 Eclipse '89 Actino. observ.
XXII Pikes Peak 1874-1888. c p

XXIII I Peruvian Meteor. Summary Series, U.S. Colum. Also Arequipa
II Diurnal var. here
XXIV. I. Revision Dur. Observ.
II. Discussion.
III. Gen. Catalogue
XXV Bache Telescope 1-3300
XXVI Draper Catalogue. E. F. E. 33 Draper, I Plates
XXVII Boyden Volume 34 " 11 inch Volume
XXVIII. S.H.P. 35 Zones 1870-1885
XXIX. Jupiter's Satellites. 36 Absolute Positions 1880-82
XXX. 2. Draper Catalogue. 37 Zone -10° to -14°
XXXI Photog. Photom. Stars Mag 7.0 38 Catal -10° to -14° 1959
XXXII Var. Stars. Class II. 39 Fundamental Stars, Zone Catalog

See page 110

March 1, 1889

Plan for reticule for
measuring double stars
photographed with 13 inch



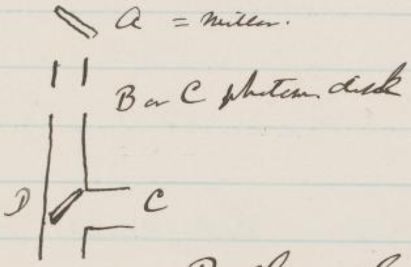
Object

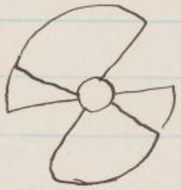
Σ 2432 A 1 26.742 B 1 26.876 B 2 29.315 A 2 29.468 40°

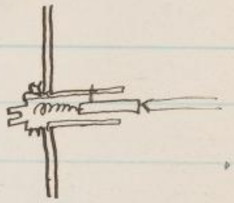
✓	XVIII	9. Polar Stars.	n	p		
		10.				
	XIX.	Met. Observ. '40 – '89	n	p	R–I	
✓	XX	R. I. Blue Hill '87	n	p		
✓	"	II " " '88	n	p		
✓	XXI.	I. N. E. Met. Soc. 1888	n	p		
		II " " " " '89				
✓	XXII.	Pickering's Scale	n	p	Boy.	
.	XXIII.	Meridian Phot. General.	.			
.	XXIV.	Revis. DM. Mer. Ph.	n		Star.	
.	XXV.	Bache Telescope 1 – 3300	.		Drap.	
.	XXVI.	Draper Catalogue	n		Drap.	
	XXVII.	Boyden Volume	.		Boy.	Enlargements.
	XXVIII.	1. Eclipse, 1889.				Meteors.
		2. U. S. Columbia.				Colorado.
		3. Wedge Phot.				California.
		4 Var Stars, Colour Stars				Sc. Light.
		5 Asteroids				Double Stars

March 5. 1889.

Plan for photometer with revolving disks from suggested by S. P. Langley







D plane glass ~~reflector~~ mirror reflecting into the [illegible] Telescopes may be used if preferred.

Causes for rejection of stars
One reading wrong.
Readings discordant.
Collimator wrong.
Clouds, noted.
Variability indicated

Bills paid for construction of building for 11-inch Draper telescope.

1886. Sept. 11.	Stetson & Dinsmore, on a/c	$200.00
Nov. 3	— " — balance	291.04
	M. E. Rideout	165.77
	G. O. Rollins	18.25
	J. Delaney	62.00
	Miller & Shaw	3.88
	W. B. Holt	72.60
		$813.54
Dec. 2	Howard F. Peak (roofing)	176.25
		$989.79

Bills paid for construction of building for Draper reflectors.

1887 Sept. 19.	Stetson & Dinsmore	$625.25
	Carl A. Corlin (roofing)	160.00
	G. O. Rollins	19.50
	F. J. O'Reilly	35.00
Oct. 26	W. B. Holt	50.00
		$889.75

March 6, 1889. Variable Stars of Short Period.

			Cl	Cl	Sp.	Period.	Max	Min.	Sp	
✓	4536	R Muscae	IV	IV	✓	0.89	6.6	7.4	—	
✓	2375	S Monoc.	IV	IV	✓	3.44	4.9	5.4	—	
	5465	R Tri. Aus.	IV?	IV	?✓	$3^d 9^h 35^m$	6.6	8.0	—	
	7483	T Vulpeculae	n	IV	✓	$4^d 10^h 29^m$	5.5	6.5	—	
	8073	δ Cephei	IV	IV	✓	$5^d 8^h 48^m$	3.7	4.9		
	6577	Y Sagittarii		IV	✓	5.7690	5.8	6.6		
	6806	S Cor. Aus.	IV?	IV?	H?✓	6	<9.5	13.0		
	6636	U Sagitt.	IV	IV	✓	6.74493	7.0	8.3		
	6368	X Sagitt.	IV	IV	✓	7.01185	4	6		
	6984	~~η Aquilae~~ U Aquilae	n	IV	✓	7.033	6.3	7.3		
	7124	~~W Sagittarii~~ η Aquilae	IV	IV	✓	$7^d 4^h 14^m$	3.5	4.7		
	~~70~~ 6472	W Sagittarii	IV	IV	✓	7.59445	5	6.5		
	7149	~~U Aquilae~~ S Sagittae	n	IV	✓	$8^d 9^h 11^m$	5.6	6.4		
	6760	κ Pavonis	IV	IV	✓	9.097	4.0	5.5		
✓	2509	ζ Gemin.	IV	~~IV~~ IV	✓	10.15	3.7	4.5	—	
	6758	β Lyrae	IV	IV	✓	$12^d 21^h 47^m$	3.4	4.5		
	7437	X Cygni	n	II?	?✓	$15^d 14^m 24^s$	6.4	7.2–7.7		
cont	4805	W Virginis	II?	II?	✓	17.27263	8.7–9.2	9.8–10.4	III?	
✓	2229	T Monoc.	IV ~~IV~~	II?	✓	27.0037	5.8–6.4	7.4–8.2	—	
cont	3495	l Carinae	"	II?	✓	31.0	3.7	5.2	—	
	6202	u Herculis	III	III	✓	40?	4.6	5.4		
✓	1072	ρ Persei	II? ~~III~~	III	✓	33?	3.4	4.2	III!	
✓	~~2229~~ 2676	U Monoc.	II? ~~III~~	II?	✓	45.2	5.9–7.3	6.6–8.0	—	Contrast with R Scuti
	6794	R Lyrae	II?	III	✓	46.0	4.0	4.7		
	6811	R Cor. Aus.	II?	II?	✓	30.5	9.8–11.5	13.2		
✓	100	T Ceti	" "	II?	✓	65?	5.1–5.3	6.4–7.0	—	[illegible] R S.
	7106	S Vulpec.	II?	II?	✓	67.80	8.4–8.9	9.0–10.0		
	7257	R Sagitt.	II?	II?	✓	70.43	8.5–8.7	9.8–10.4		
	6733	R Scuti	II	II?	✓	71.1	4.7–8.7	6.0–9.0		
	2815	U Gemin.	II? II?	II?	✓	86.3 irreg.	8.9–9.7	13.1	—	

March 6, 1889.

Variable Stars South of −30°

	No.	Name									
	494.	R Sculptoris	1^{h}	$22^{m}.4$	−33°4	5.8	7.8	207	II		
	1654	R Doradus.	4	35.6	−62°16	5.5	6.8	...	..	a
−	2583	L_2 Puppis	7	10.5	−44 29	3.5	6.3	136.0	II	a
	2783	S Puppis		43.8	−47 52	7.2	9	...	..	a
	3418	R Carinae	9	29.7	−62 21	4.3	10	312.1	II	a
−	3495	l Carinae		42.5	−62 3	3.7	5.2	31.0	II ?	a
	3633	R Antliae	10	5.5	−37 14	6.5	<8	..	..	
	3637	S Carinae		6.2	−61 4	6.2	9	..	..	a
✓	3847	η Argus		41.2	−59 10	7.1	7.4	Irr	II ?	a
−	4536	R Muscae	12	36.0	−68 57	6.6	7.4	0.89	IV	a
−	5095	R Centauri	14	9.4	−59 27	6.0	9.8	Irr.	II	a
−	5465	R Tri. Austr.	15	10.8	−66 8	6.6	8.0	3.4	IV	a
	5682	R Lupi	·	47.0	−36 0	9	<11	..	..	
	6760	κ Pavonis	18	46.6	−67 21	4.0	5.5	9.10	IV	a
	6806	S Cor. Aus.		54.4	−37 5	<9.5	13.0	6?		
	6811	R Cor. Aus.		55.2	−37 5	9.8	13.2	30.5?		
	6812	T Cor. Aus.		55.3	−37 5	<9.8	13.	..		
	7994	R Pis. Austr.	22	12.3	−30 6	5.7?	<11?	..		
	8093	R Indi		28.9	−67 48	9?	11?	..		
	8588	R Phoenicis	23	51.3	−50 21	8.5?	11?	..		

U.A.	p	Catl. p	
113	294	186	
9	261	146	
73	278	171	
–			τ Puppis foll $6^m.5$ pr 2'
145	257		
157	252		
50	295		
~~177~~	~~253~~	188	
177	253		
231	253	c.st.	
49	258	c.st.	
331	268	154	
6	260	c.st.	
–			
Pr 46	244		
–			
–			
–			
–			
–			
–			

March 7. 1889

Stars around η Carinae 8 a la Cat. XIV p 125

19	7	10h 36m	31s	−59°	1′	25″
46	6.5	37	51	58	33	39
65	8	38	39	59	40	36
69	5.2	38	47	59	54	43
79	69	39	5	59	27	44
80	7¼	39	8	58	53	28
101	6.8	39	34	59	20	14
109	7½	39	48	59	26	4
117	8	39	54	58	54	32
121	8	40	8	59	16	42
122	Var.	40	13	59	1	40
123	8½	40	15	59	0	40
124	9½	40	15	59	5	54
125	9¾	40	17	59	1	25
127						
128						
129						
130						
134						
138	7½	40	52	58	45	1
139	7½	40	58	58	49	52
148	7.0	41	29	59	56	42
174	7	42	52	59	12	56
177	6.7	43	12	59	15	34
186	7½	43	45	59	33	47
197	6.7	44	28	58	39	45
214	7¼	46	2	59	17	41

Clusters Class.

					Diam.
0h 23m	+59° 10'				15'–20'
0 37	+61 8				15'–20'
1 12	+58 9				
1 30	+15 10				3'
1 38	+60 38				15'
1 50	+37 5				30'
2 11	+56 36	Perseus			
2 21	−1 41	Plan. Neb.			3'–4'
2 35	+42 17				15'
3 7	+46 47				8'
3 23	+36 53		60 sec.		15'
3 40	+52 18		30 sec.		2'–3'

March 10, 1889

Photos. with Darlot-lens to supplement those taken by Mr. Bailey.

			0	2	4	6	8	10	12	14	16	18	20	22
+90°	1													
+60°	6			–		–		–		–		–		–
+30°	12		–											
±0°	12	10	–	–										–
−30°	12	8	–	–	–								–	–
	43	37												

March 16, 1889.

	No. Obs.	
α Cassiop.	4118	III.
ο Ceti	3407	II.
ρ Persei	4146	III.
α Orionis	2358	III.
R Leporis	1227	II
η Gemini.	2347	III.
ζ Gemini	5717	IV.
R Leonis	2033	II.
R Ursae Maj.	1211	II
R Coronae	3095	II.
g Herculis	2358	III.
α Herculis	5393	III.
u Herculis	2233	III.
W Sagittarii	2212	IV.
U Sagitt	2220	IV.
R Scuti	4408	II ?.
β Lyrae	8882	IV.
χ Cygni	2665	II.
η Aquilae	7047	IV.
δ Cephei	9695	IV.
β Pegasi	5197	III.

R Virginis	1388	II
R Hydrae	1166	II
δ Librae	1670	V
S Cancri	1503	II
T Coronae	1514	~~III~~ I
X Sagitt.	1539	IV
V Sagitt.	1207	III
T Cygni	1160	III

IV	
δ Cephei	9695
β Lyrae	8882
η Aquilae	7047
ζ Gemini	5717
U Sagitt	2220
W Sagitt.	2212

III	
α Herculis	5393
β Pegasi	5197
ρ Persei	4146
α Cassiop	4118
α Orionis	2358
g Herculis	"
η Gemini	2347
u Herculis	2233

R Scuti	4408
ο Ceti	3407
R Coronae	3095
χ Cygni	2665
R Leonis	2033

δ Cephei	9695	IV
β Lyrae	8882	IV
η Aquilae	7047	IV
α Hercules	5393	III
β Pegasi	5197	III —
ζ Gemini.	5717	IV
R Scuti	4408	II ?
ρ Persei	4146	III
α Cassiop	4118	III
ο Ceti	3407	II —
~~χ Cygni~~	~~2665~~	~~II~~
R Coronae	3095	II
χ Cygni	2665	II

57.4

March 19, 1889. Atmos Absorb.

Alt – 25 (csc z – 1)	1st Approx	2d Approx	Red. to Alt Circle		~~[illegible]~~		1st Appr. XIII	2d Approx		Log 2d Approx	Bailey	
0°	–	–	–	–			–	–		–		
1	–	–	–	–			–	–		–		
2	691	3.44	3.17	–	–			3.80	3.53		.548	2	+.25
3	4.53	2.96	2.80	–	–			3.26	3.10		.491	6	–.12
4	3.33	2.56	2.54	–	–			2.84	2.82		.450	6	–.23
5	2.62	2.20	2.21	–	–			2.42	2.43		.386	18	–.14
6	2.14	1.88	1.90	–	–			2.09	2.11		.324	8	–.16
7	1.80	1.61	1.56	–	–			1.79	1.74		.241	18	–.03
8	1.55	1.41	1.47	–	–			1.56	1.62		.210	7	–.14
9	1.35	1.25	1.28	–	–			1.39	1.42		.152	15	+.01
10	1.19	1.13	1.13	–	–			1.25	1.25		.097	32	–.01
11	1.06	1.03	1.04	1.17	1.17	1.08	+4	1.14	1.15	+2	.061	7	–.07
12	95	0.96	1.01	1.18	1.07	.99	–2	1.07	1.12	–5	.049	5	+.30
13	86	88	99	1.15	1.03	.95	–4	.97	1.08	–5	.033	3	+.23
14	78	82	91	1.01	.90	.83	–8	.91	1.00	–10	.000	4	–.20
15	72	76	77	.91	.81	.75	–2	.84	.85	–4	.929	6	+.17
16	66	70	77	.82	.81	.75	–2	.78	.85	–4	.929	16	+.12
17	60	65	65	.73	.70	.65	0	.72	.72	–2	.857	9	–.01
18	56	61	61	.77	.74	.68	+7	.68	.68	+6	.833	6	+.08
19	52	56	62	.73	.68	.63	+1	.62	.68	0	.833	4	–.08
20	48	52	58	.66	.62	.57	–1	.58	.64	–2	.806	9	+.03
21	45	48	47	.62	.54	.50	+3	.53	.52	+2	.716	4	.00
22	42	44	46	.55	.55	.51	+5	.49	.51	+4	.708	14	+.08
23	.39			.50	.43								
24	.36			.50	.45								
25	.34			.44	.40								
26	.32			.45	.42								
27	.30			.44	.38								

March 21, 1889.

α 6277.4
B 6867.4
A 7593.0

6867.4 | 6277
6277
59

6277	6867
628	687
6905	7554

~~6277.4~~	6277.4	6867.4	7593.0
~~.5~~	~~724.0~~	.3	5.1
~~9.1~~	+13.6	11.6	10.4
~~6287.0~~	6287.0	6879.3	7608.5
~~.5~~	40.8	3	5.1
	−40		
~~27.3~~		34.8	34.2
~~6314.8~~	6323.8	6914.4	~~7646.8~~
			76448

6277.4	6277.4	6867.4	75930
−4.0	−40	.0	+5.0
	14.0	12.0	10.0
-.4 −.1 +.5	6287.4	6879.4	7608.0
−1.6 −1.0 +1.7	−4.0	.0	+5.0
	42.0	36.0	30.0
	6325.4	6915.4	76430
	23.8	14.4	44.7

March 21. 1889

B

6867.4		
	2.8	
70.2		6.3
	9.1	
79.3		5.2
	14.3	
93.6		5.5
	20.8	
44A		6.2
41.4 ~~75.0~~	27.0	

α

6277.4 = A

6287.0 = A + 10 B + 100 C

6323.8 = A 20 B + 400 C

9.6 = 10 B + 100 C

36.8 = 10 B + 300 C

27.2 = 200 C ~~C = .091~~ ~~B = +.05~~

C .136 B = -0.4

α

6277.4		
	1.7	5.8
79.1		
	7.9	
(87.0)		7.3
	15.2	
02.2		6.4
	21.6	
23.8		

B

6867.4 11.9

6879.3 35.1

6914.4

23.2 = ~~300 C C = .077~~ ~~B = +.42~~

C = +.116 B = +0.3

A

7593.0		
	3.0	6.0
	9.0	6.1
08.5		
	15.1	6.0
23.6		
	21.1	
44.7		5.7
	26.8	
71.5		

A

7593.0 15.5

7608.5 36.2

7644.7

20.7 = ~~300 C C = .076 B = +.79~~

C = +.104 ~~B = +.47~~

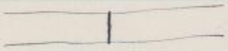
B +.51

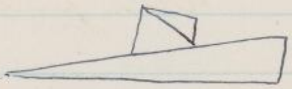
	A	B	C	
α	6277.4	-0.40	+.136	8
B.	6867.4	+0.03	+.116	9
A	7593.0	+0.51	+.104	12

March 22, 1889.

Plan for measuring approach and recession of the stars. Considered and abandoned formerly on account of effect from varying temperature.

Cement prism on large prism.
Used to form image of slit
on spectrum.





Unit 1 millinch 0.1 = unit approach or recession
= 0.1 cm. on Angström scale = 0.003 with 1 prism.

March 27. 1889.

Estimated cost of 24 inch telescope:–

Glass.	$8000	5000
Building	9000	12000
Mounting	6000	
10 inch finder	1300	
	24,300	

March 31 1889.

Eclipses of Jupiter IV.

1889

15.3	May	10	3 15				
14.2+	"	26	21 17				
12.9+	June	12	15 4 49,	15 33 16,	15 19 26	18 32 17	28 27
11.6	"	29	8 47 43,	9 54 55 ~~10 59 35~~	9 21 16 19 ~~9 53 39~~	19 30 43	67 12 ~~77 52~~
10.4	July	16	2 39 12,	4 9 31	3 24 22	18 4 49	90 19
9.2	Aug.	1	20 34 42	22 23 40	21 29 11	18 4 33	108 58
8.1+	"	18	14 31 16	16 36 12	15 33 44	18 5 14	124 56
7.0	Sept	4	8 29 36	10 48 21	9 38 58		128 45

18	1	
18	2	
18	2	17
18	3	3
18	4	49
18	4	33
18	5	14

April 8, 1889.

Observ. Sappho. (80)

	Hamb					Leipzig		
	Δα		Δδ			Δα		Δδ
1					2	+.02	2	~~+~~0.0
3					2	+.02	2	+0.6
					2	+.03	2	+0.9
					1	.00	1	−0.3
87	3	−.04	3	0.0 −9	6	+.04	6	−0.2
	2	−.01	2	+0.9 0	4	+.08	4	−0.3
	2	+.01	2	+0.1 −8	5	+.04	5	−0.4
	2	+.07	2	+0.9 0	6	+.06	6	+0.1
	1	−.07	1	+1.8 +9	5	−.01	5	−0.5
	2	−.07	2	+1.1 +2	6	+.03	6	−0.7
	1	+.01	1	+0.4 −5	5	.00	5	0.0
	2	−.01	2	+1.1 +2	8	+.02	8	+0.1
96	2	−.03	2	+0.6 −3				
	1	+.02	1	−0.3 −12				
	2	+.06	2	+2.5 +16				
	2	+.08	2	+0.9 0				
	1	+.09	1	+0.2 −7				
	3	~~+.09~~ +.11	3	+0.4 −5				
	1	+.08	1	+0.2 −7				
	2	+.15	2	+2.3 +14				
	3	−.06	3	+1.4 +5				

$\frac{68-29}{17}$ +.02 $\frac{149-3}{17}$ $\frac{48-56}{17}$

148 | 17
136 | 9
120

104 | 17
102 | 06

+0.6

Wed. April 10, 1889.
K line ζ Ursae Majoris.

March	25	'87	3
	29	"	4
	31	"	2
Apr.	5	"	0
	9	"	2
	20	"	3
	22	"	2.5
Feb	15	'88	3
Jan	29	'89	3
"	30	"	1.5
Feb	20	"	3.5

Three measures of interval 23.2 24.6 21.9 Mean 23.2
.023 0.4 = 1 div. .2 ∴ interval = 2 ten mill millim.
= $\frac{1}{2000}$ veloc. light = 90 miles per sec. Curve gives three hundred
50 days. 90 miles per sec. = 8,000,000 per day = $\underset{52}{4}00,000,000$ in
50 days. radius = 80,000,000 miles

April 10. 1889

Reduction of obs. Apr 9. 1889 with Harz tab.

1926.						
1955	3.6	s	6.0	2.4	0	2
	3.8			2.2	-2	
1967	30	s	57	2.1	-3	5
	2.5			2.6	+2	
1972	3.6	s	5.8	2.2	-2	1
	3.7			2.1	-3	
1980	2.9		5.2	2.3	-1	1
	2.8			2.4	0	
1990	0.5	as	6.1	(5.6)		3
	0.2			(5.9)		
	4.0			2.1	-3	1
	3.9			2.2	-2	
2018	1.1		3.9	2.8	+4	2
	1.0			2.9	+5	
	0.7			3.2	+8	
2034			6.4	(6.4)		
	.0.1			(6.3)		
	3.9			2.5	+1	3
	4.2			2.2	-2	
2057	2.5		5.7	2.6	+2	2
	2.7			2.4	0	

$\frac{22}{17}$ $\frac{22-18}{17}$ $\frac{20}{9}$

6.0 $40\,|\,17$ $.24$

$\frac{2.4}{3.6}$ $\frac{.22 \quad .7}{.15}$

April 17.1889.

References to derivations of hydrogen lines. See page 51

J. Balmer (Verh. d. natf. Ges. Basel $\overline{\text{VII}}$, 3. 1885).
quoted in A.N. CXVII, 337. Copied in Ann. der Phys. und Chem.
$\overline{\text{XXV}}$, p. 80. On p. 85 quotes Hagenbach $\lambda = \frac{m^2}{m^2-4} h$

Ency. Britt. $\overline{\text{XXII}}$, p. 379. A. Schuster quotes Balmer's relation.

April 26. 1889.

Classification of Double Stars according to W. Herschel
Phil. Trans. '82. Read Dec. 6. 1781

λ 100 – 10

Class I. Very diff

" II

III 5" to 15"

IV 15" to 30"

V 30" " 1'

VI 1' " 2' or more

Arg. Obs. VII XX. 'Herschels first classification into six orders.

	0^h	11^h
I	||||	卌 卌 |
II	卌 |||	卌 卌 ||
III		卌 |||
IV		||
dpl	||	
2ple	卌 |	卌 卌 卌 卌
	20	53

α			δ			Magn.	Cl.	Δα	Δδ	
11^h	59^m	$28^s.78$	49°	9'	26".4	9.7		1.16	+3.9	s.pr.
0	8	58.07	40	47	26.5	7.5, 10		.17	+15.2	
	15	32.91	23	41	55.1	8	II			s.pr.
	18	26.83	34	1	48.2	9	I			

May 2, 1889.

Name	Comm computed 1/6000	Meas Rowland	Comp Corrected	R – Comp.	Meas Rowland			
C	656.32	656.30	656.29	+.01	656.30	+01	30	+1
F	486.15	486.14	486.14	.00	486.14	00	15	-1
G	434.02	434.06	434.05	+.01	434.06	+01	07	-2
h	410.19	410.17	410.18	-.01	410.17	-01	19	-1
H	396.99	397.06?	397.02	+.04?	397.06?	+04?	02	0
α	388.87	388.81	388.90	-	388.93	+.03	90	0
β	383.55	383.49	383.54		383.56	+.02	56	-2
γ	379.79	379.73	379.79		379.86	+.07	80	-1
δ	377.05	376.99	377.06		377.06	.00	03	+3
ε	375.08	375.02	375.08		374.96	-.06	11	-9
ζ	373.47	373.41	373.44		373.49	+.05	42	+1
η	372.17	372.11	372.20		372.01	-.19	17	+3
θ	371.18	371.12	371.20		370.93	-.27	.19	+1

C	656.3042
F	486.1492
G	434.07
h	410.19
H	397.02
α	388.905
β	383.56
γ	379.805
δ	377.03-
ε	375.11
ζ	373.43
η	372.17
θ	371.19?

May 5, 1889.
Expenditures for Bache Fund.

1	Hilgard	500, 500. 500. 1000 .500, 1200. 1000. 500. 1000 .600. 50. 150	$7500
6	Winlock	400 .400 1200	2000
7	Rees	400 400 400 500	1700
	Meyer	250 500	750
2	Langley	500 500 1000 1500	3500
5	Gould	100 200 300 300 1000 1000	2900
	Pumpelly	500	50
	Willson	225	
	Waldo	100	
	Hein	150	
	Walton	1000	
	G. J. S.	60	
	Layman	500	
3	[illegible]	1200 2000	3200
9	Rockwell	1400	1400
	Holden	300 400 225	925
	Remsen	500	
	Hill	200	
	Hall	500	
	Davis	200 300	
	Michelson	283.95 500 500	1283.95
4	[illegible]	1000. 1000 1000	3000
	Y. Chs. Cola	300 300 300 300	1200
	Walker	250	
	Goodale	500 500	1000
	Rowland	1000	
	Mendenhall	100	
	Cope	600 600	1200
	Todd	125	

May 24, 1889

W. H. Attwill	1888 March 1
M. H. Bailey	1888 Sept.
S. I. Bailey	1887 Nov.
R. Black.	1888 Jan.
Miss S. C. Breed.	1879 Aug.
Miss F. Cushman	1888 Feb.
J. A. Dunne.	1888 March
J. R. Edmands	1880 Jan
Mrs. M. Fleming	1881 May
F. E. Fowle	1887 Dec.
W. P. Gerrish	1886 March
John Healy	1886 Jan.
J. A. Jennison	1887 Dec.
E. S. King	1887 Oct.
Miss A. C. Maury	1888 June
Miss H. E. Mitchell	1887 Nov.
W. H. Pickering	1887 Feb 28
J. Ritchie Jr.	1883 Feb. 14
Mrs. R. T. Rogers	1875 July
W. A. Rogers.	1870 Jan 28
A. Searle	1868 Apr.
Miss M. C. Stevens	1887 Nov.
Miss L. C. Stevens	1887 Feb
A. Tracy	1888 June
Miss L. D. Wells	1887 March
O. C. Wendell	1889 Jan
H. W. Winkley	1887 June
Miss A. Winlock	1875 Sept.
Miss L. Winlock	1886 May

A. L. Rotch.
H. H. Clayton.
Ferguson

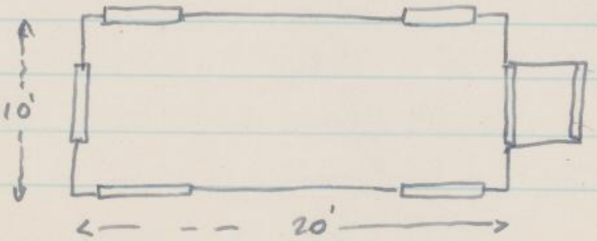
A. E. McCarthy
A. Caulfield.
P. Shea.

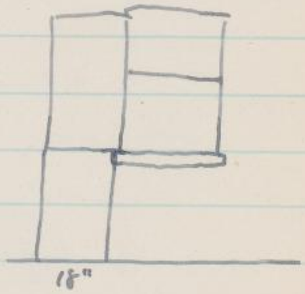
June 2, 1889.

Plan for plates of 24 inch.

Dec.	No.	R.A.	
90°−85°	6	$0^{h}.06$	$4^{h}.0$
85	12	0.0	2.0
80	18	0.0	1.5
75	24	0.0	1.0
70	36	0.0	0.7
65	"	0.0	0.7
60	48	0.0	0.5
55	"	0.0	0.5
50	"	0.0	0.5
45	72	0.0	0.3
40	"	0.0	0.3
35	"	0.0	0.3
30	"	0.0	0.3
25	"	0.0	0.3
20	"	0.0	0.3
15	"	0.0	0.3
10	"	0.0	0.3
5 − 0	"	0.0	0.3
	924		

Plans for holding plates



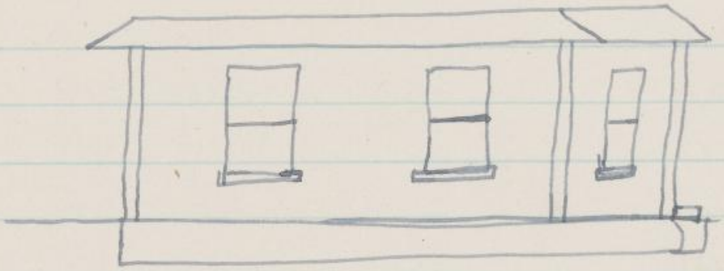


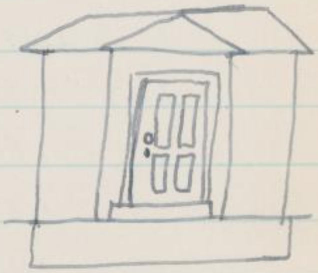
200 plates per 18" wall space ∴ 1000 plates per 7'.5

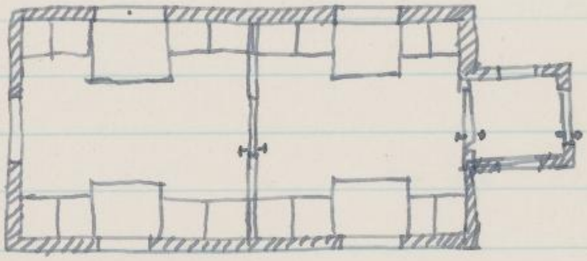
60 ft − 6×3 = 42 ft = 6000 plates.

June 2. 1889.

Plan for a building for holding the plates of 24 inch







Adv. project large altitude Grubb 6 a 26,000, Steinheil 8 a 32,000
Clark 12 a 50,000

June 18, 1889.
Bruce Telescope.

Leave Edge	Sec. V.								
0°.0	1.000	20.00²	20	72					
5	1.004	20.08	"	"					
10	1.015	20.30	"	"					
15	1.035	20.70	"	"					
20	1.064	21.28	"	"					
25	1.103	22.06	"	"					
30	1.155	23.10	"	"					
35	1.221	24.42	"	"					
40	1.305	26.10	"	"					
45	1.414	28.28	"	"	720 216				
50	1.556	31.12	30	48					
55	1.743	34.86	"	"					
60	2.000	40.00	40	36					
65	2.366	47.32	"	"					
70	2.924	58.48	" ~~60~~	" ~~24~~	36		~~36~~	12	
75	3.864	77.28	60	24	948				
80	5.759	1120 ~~115.18~~	90	16	14 ~~12~~	1/4	18	6	
85	11.47	212.8 ~~229.4~~	180	8	6	1/2	9	6	
90	∞	∞			1		1		

~~960~~ ~~967~~
970

64.0
8
512.0

26.6
8
212.8

Mar 30. 1890
Area Sphere = $4\pi r^2$. Log. 0.60206
0.49715
1.75812
1.75812
4.61545 = 41,252

tan 25° 14°.05 56.ᵐ : 12 plates 1650
tan 50° 26°.56 106.24 6 plates. 825. plates

20,626

10.31,

Jan 18. 1889

-2.5				36	
0 2.5	1.001	20.02	20	72	
7.5	1.009	20.18	"	"	
12.5	1.024	20.48	"	"	
17.5	1.049	20.98	"	"	
22.5	1.082	21.64	"	"	
27.5	1.127	22.54	"	"	
32.5	1.186	23.72	"	"	
37.5	1.260	25.20	"	"	
42.5	1.356	27.12	"	"	
47.5	1.480	29.60	30	48	
52.5	1.643	32.86	"	"	
57.5	1.861	37.22	"	"	
62.5	2.166	43.32	40	36	
67.5	2.613	52.26	"	"	
72.5	3.326	66.52	60	24	
77.5	4.620	92.40	"	"	948
82.5	7.66	~~153.2~~ 147.2	120	12	
87.5	229	458.		1	
					961

720
60
24
.144
948.

18.4
8
147.2

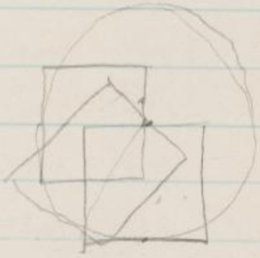
40-60 150
60-80

June 20, 1889

Covering sphere with maps 30° square

Center 30° squares

90°	1	75°	8
60°	8	45	12
30°	12	15	12
0°	6		
	27		32



40°-45°

90°-70	1	90°	
70-30	8	45°	8
40-0	8	0	8
	17		

Advantages. 0°-5°, 5°-10° &c

~~Precession Dm~~

N.P. stars in edges

Advantages -2°.5 to +2°.5

Pole, Equinox, &c. in centre,

.865
.871
.889
.894
.903
.904
.914
.934
.946
.977
.977
.917
.943
.960
.963
.946
.989
.986
1.012
.984

July 7. 1889

Rambaut's measures of β Lyrae

0	6867.47			6	67.47	68.27			6827	0	12.5
1				12						12.5	37.5
2	67.80	.56		48	67.32	68.54	27	27	6806	50.	62.5
3	68.36	.80	24	108	67.28	68.81	54		67.73	112.5	87.5
4	69.16	108 ~~99~~	~~1928~~	192	67.24	69.35 ~~68.81~~	40 ~~1.34~~	26	67.43 ~~66.89~~	200.	112.5
5	70.~~15~~ .24	130 ~~139~~	4022	300	67.~~24~~	70.15	104	24	67.15		137.5
6	71.54	155	~~16~~25	432	67.22	71.19	1.31	27	66.87		162.5
7	73.09	180	25	588	67.21	72.50	1.55	24	66.62		187.5
8	74.89	207	27	768	67.21	74.05	1.78	23	66.37		212.5
9	76.96	232	25	972	67.24	75.83	2.04	26	66.11		237.5
10	79.28		28	1200	67.28	77.87 ~~77.16~~	2.29	25	65.87		262.5
11	~~84.08~~			1452		80.16			65.64		287.5
12	84.08	2.89		17.28	66.80		5.84	90			
13	86.97	3.17	28	20.28	66.69	86.00	3.19		65.72		
14	90.14	3.41	24	23.52	66.62	89.19	3.43	24	65.67		
15	93.55	3.65	24	27.00	66.55	92.62	3.67	24	65.62		
16	97.20	3.92	27	30.72	66.48	96.29	3.92	25	65.57		
17	6901.12	4.15	23	34.68	66.44	00.21	4.16	24	65.53		
18	05.27	4.48	26	38.88	66.39	04.37	4.41	25	65.49		
19	09.68	4.66	25	43.32	66.36	08.78	4.67	26	65.46		
20	14.34	4.90	24	48.00	66.34	13.45	4.92	25	65.45		
21	19.24	5.19	29	52.92	66.32	18.37	5.20	28	65.45		
22	24.43	5.40	21	58.08	66.35	23.57	5.41	21	65.49		
23	29.83			63.48	66.35	28.98			65.50		

July 11, 1889.

Variability of Star c G.C. 3636

Plates	
1433	9.0
1525	9.8
1592	9.0
1654	—
1671	9.8

July 20. 10.3

July 21 1889

Clusters observed at Cordova Vol XIV

	R.A.			~~De~~		Dec.	~~Diam~~ Mi.	Δ R.A.	Δ Dec.
c Puppis	7h	39m	2s	43m	55s	−37° 17′ & 54′	31	4.9m	37′
Hydra	8	4	36	8	39	−5 11′ & 45′	30	4.0	34
Bris. 2210	8	41	24	45	10	−41° 47′ & 80′	30	3.8	33
Lac. 4151	9	55	53.	62	17	−59 20′ & 49′	57	6.4	29
Lac 4875	10	27	49	33	23	−57 30 & 38	27	5.6	8
η Argûs	10	35	6	46	23	−58 14 & 120	217	11.3	106
x Carinae	10	46	8	66	4	−57 22 & 127	211	19.9	105
κ Crucis	12	45	57	46	32	−59 37 44	28	0.6	7
Lac 6819	16	14	28	18	42	−40 16 28	20	4.2	12
Mess. 6	17	28	50	34	54	−32 55 89	58	6.1	34
" 7	17	39	2	49	5	−34 49 70	139	10.0	61
Sagitt.	17	59	19	74	43	−16 30 213	284	15.4	183

July 31, 1889

W. H. P. advises me to open all boxes, excepting letters (from Stella Madras) addressed to him.

September 1, 1889.

1. Mr. M. A. Seed states that celluloid films are more sensitive than glass plates since no light passes through. Could not same results be obtained by turning film side of glass from ~~light~~ light and placing mirror silvered against it. But perhaps film is opaque.

2. Select series of 14 mag. stars as standards in all declinations from +90° to −90° at R.A. 0^h, 6^h, 12^h and 18^h. Measure diff R.A. and Dec. from two adjacent D.M. stars. About 2 to each degree $\therefore 2 \times 180 \times 4 = 1240$ in all. Measure brightness of each with scale also of all 11 mag. standards from scale simultaneous with that of Doublet lens. Also of stars of 6 to 7 mag. later with Doublet. Thus compute mag. of each 14 m. star

3. Work for 8 in Draper Doublet.
Charts $\overset{\text{Ex}}{5^{m}}$ Doublet lens 5° sq. Draper 1° sq.
" 10^{m} Entire Sky −30° to +90°
" 60° Regions of all long period var.
" " Equator.
" " 0^h, 6^h, 12^h, 18^h, −30° to +60°
" 4^h? Pole, Pleiades, Neb. Orion &c.
Spectra " ~~Spectra~~ only narrow bright line stars Cygnus, Can. Maj. &c.
" 60^{m} IV Type Stars Erythrosin. Plates
Charts 60^{m} Pole " "
Charts Upper & Lower Culmin.

Sept: 8. 1889,

Revised. Blue Class M. P.

Mag. Em.	Pho.				
2.42	736	-018	-2.18	-19	+19
3.37	789	-18	-1.23	-19	+19
4.15	759	-14	-45	-15	+15
4.38	723	+38	-.22	+37	-37
4.63	704	+27	+3	+26	+26
4.93	740	-1	+33	-2	-2
5.11	709	+15	+57	+14	-14
5.38	803	-4	+.78	-5	-5
5.62	658	-12	+1.02	-13	+13
5.99	691	-1	+1.39	-2	-2
4.598	7362	±.015 +.004	8.14		79-73 +.006

Sept. 8. 1889.

Work on hand.

XXVI Draper Catalogue, also Tables II, III &c.

XXV Descrip. Bache work.

XXIII Summary Series. Compilation Discuss. stars absorp.

XXIV. Copy Printer. Gen. Catalogue

S. M. Phot. Lists, Summary Series. Table for contrast. Corr. stars. absorp.

Corr. blue stars.

Applic. contrast. enter in Tables. Wendell S.H.P.

Table Bache Plates. Ident.

Table Boyden 13 inch. Ident.

Sept. 12, 1889

Plan for covering the larger portion of the sky with a single photographic plate.

First panoramic photograph. The moving lens in declination and thus cover broad band of indefinite length.

$1 = a2 + b$ $\qquad 2 = 4a + 2b$

$2 = a3 + b$ $\qquad 6 = 9a + 3b$

$3 = a5 + b$ $\qquad 15 = 25a + 5b$

$4 = a6 + b$ $\qquad 24 = 36a + 6b$

$\underline{5 = a8 + b}$ $\qquad \underline{40 = 64a + 8b}$

$15 = a24 + 5b$ $\qquad 87 = 138a + 24b$

$360 = 576a + 120b$

$\underline{435 = 690a + 120b}$

$75 = 114a$ $\qquad a = .65$ 1

$$\begin{array}{l|l} 75 & \underline{114} \\ \underline{684} & 65 \\ 660 & \underline{24} \\ & 260 \\ & \underline{130} \\ & 13.60 \end{array}$$

$b = -.12$

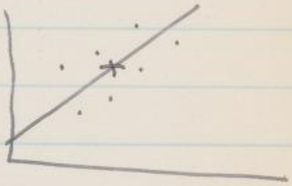
$y = .65x - .12$

Sept: 12, 1889.

Solution by Least Squares of 2 connected quantities

$y' = ax' + b$

$y'' = ax'' + b$



If sum of + = sum of –. line must pass through centre of gravity. Hence correct y by mean $\overset{y_0}{y}$, and x by mean $\overset{x_0}{x}$.

Then $y - y_0 = a(x - x_0)$ $a = \frac{y - y_0}{x - x_0}$ with weight $x - x_0$ ∴ $a_1 = y_1 - y_0$

Rule. Take mean of all values of y and subtract from each value of y. Do same with x. Call differences y' x' when x' is positive, and y'' x'' when x'' is negative.

Call $a = \frac{\Delta y' - \Delta y''}{\Sigma x' + \Sigma x''}$

Example

y = 1	x = 2	−2	−2.8
2	3	−1	−1.8
3	5	0	+0.2
4	6	+1	+1.2
5	8	+2	+3.2
Mean 3	4.8		

$y - 3 = .65(x - 4.8)$

$y = 0.65x - 0.12$

$a = \frac{+6}{+9.2} = .65$

3 ⌊46 .65
276
240
230
100

48
520
260
3.120

Sept-15, 1889.

Applicatn of theory of p.101 to 100 Circumpolar stars observed with Merid. Phot. 1882–'88.

y	x	y.	x.
−.018	2.42	−19	−2.18
−18	3.37	−19	−1.23
−14	4.15	−15	−.45
+38	4.38	+37	−.22
+27	4.63	+26 y''	+.03 x''
−1	4.93	−2	+.33
+15	5.11	+14	+.51
−4	5.38	−5	+.78
−12	5.62	−13	+1.02
−1	5.99	−2	+1.39
+.0012	4.60		8.14

$y' = 37 - 53 = -.016$

$y'' = 14 - 22 = -.008$

$y - .001 = +.001(x - 4.60)$

$y = +.001x - .004$

$\alpha = \frac{+.008}{8.14} = +.00098$

.001

8 | 814
7326 .98
6740
6512
2280

Oct. 8, 1889.

Plan for Volume on Proper Motion +50° to +55°

Table I. General Table.

Name Star in each Catalogue

R.A. 1875, brought forward geometrically

" " corr. for systematic errors and proper motion.

Dec. 1875, brought forward geometrically

" " corr. for systematic errors and proper motion.

Name	R.A. 1875		Dec. 1875	
1234	$15^m 28^s.32$	$27^s.92$	$52° 25' 36''.2$	$37''.6$
1234	$28^s.32$	$27^s.92$	$36''.2$	$37''.6$

~~138 pp. MSS av. 38 lines = 5168 lines~~

18000

550 pp. MSS. av. 30 lines = 16500 lines   150 lines per page 110 pages.

200 lines per page 82 pages.

Table II. Stars having proper motion.

Name	R.A. 1875		Proper Motion R.A.	Dec. 1875		Proper Motion Dec.
1234	$15^m 28^s.32$	$27^s.92$	$+0^s.007$	$52° 25' 36''.2$	$37''.6$	$+0''.15$

138 pp. M.S.S. av. 38 lines = 5168, 100 lines per page. 52 pages.

Oct. 31. 1889.

Report of Volumes 1888-9.

XV	Part II.	12h to Annex. nearly complete to 21h	Sturgis.
XVIII	Part VI.	Meas. Nebulae	Cutting
"	" VII.	Phot. Brightness of Polar Stars. Pleiades	Engl. Tr.
"	" VIII.	Indian Observ. var. Stars	
"	" IX	Close Polar Stars	
XIX.	" I	Meteorological Obsns. 1840-88	Sturgis
XX	" I	Blue Hill 1887	Cutting
"	" II	" " 1888	"
XXI	" I	N. E. Meteor. Obs. 1888. complete except corrections	Cutting Castle
XXII		Pike's Peak Obsns	Boyden
XXIII		to page 13 incl.	b
XXIV.		" " 146 " Peru Obs	Bailey.
XXV.			
XXVI.		" — 109 "	Draper.
XXVII		" 109 " Drap. Catal.	Draper

Oct. 31, 1889.

Annual Report.
Death of Mrs. Bowditch.
Gift of Miss Bruce.
Peru. Calif.
[illegible] Arnold.

Observ. Fund.
Draper Memorial.
Boyden fund.
Bruce telescope

HC Funds 100000 or greater

[illegible] tel.		125.	Univ.	17	100 or more
Dow "		115.	"	4	200 " "
Parker		113	"	2	400 " "
Gurney		161	College	1	600 " "
Class Subscrip.		145			
Bowditch		109		Greenleaf	689
Eben Wright		100	Library	Bussey	413
Sturgis Hooper		100	Mus. Zool.	Agassiz	297
Agassiz Mem.	3	297	"	Boyden	240
[illegible]		117	"		
Phillips		110	Obser.		
R. T. P.		118	"		
Boyden	4	240	"		
Bussey	2	413	Other Dept.		
Arnold		154.	"		
[illegible]		197.	"		
Mrs. Greenleaf	1	689.	"		

Nov. 2. 1889.

Form of International Meteor. Observation

Station — (~~Latitude~~) longitude, latitude, ht. above mean sea level.
ht. thermometers above ground in feet, ht, ht. raingauge above ground:
Succession column

Daily

Day.
Baro. 7
" 1
" 9
Air temp. 7
1
9
Max
Min.
Tension Vapor 7
" " 1
" " 9
Rel. Humid. 7
" " 1
" " 9
Wind Direction 7
1
9
Amount Cloud 7
1
9
Rainfall
Remarks

Monthly.
Mean press.
Air temp. 7
1
9
Mean
Mean Min
" Max
Absol. Min.
Date.
Max.
Date.
Tens. vapor 7
1
9
Mean
Relative Humid. 7
" " 1
" " 9
Mean

Monthly.
Amount Cloud 7
1
9
Mean
Rainfall tot.
Max
Date.
Weather No. Days Rain
Snow
Hail
Thunder St.
Clear Sky.
Overcast.
Gales
Wind No. Observ. N
N.E.
E
S.E.
S
S.W.
W
N.W.
Calms

Nov. 2. 1889.

Monthly	Therm. 7 a.m. 2 p.m. 9 p.m.	Mean	Max	Min	Range	Date	Hygro	Date
Jan.								
Feb.								

Nov. 3. 1889.

Amounts paid since 1877

Harris.	2~~000~~
Appleton	5,~~000~~
Seary	13~~380~~
Standard.	50.
Raine.	168
Boyden	240
Bruce.	50
	528.
Raine	168
	696
	62
	~~60~~
	20
	250
	1028.
Rabbie	50
	1078

Nov. 7, 1889.

a

b

c

$\frac{1}{3}(a+b+c)$ $\qquad \frac{a}{3}+\frac{b}{3}+\frac{c}{3}-b=\frac{1}{3}(a-b)-\frac{1}{3}(b-c)$

$a-b$ $\qquad$ ~~(a-b)-(b-c)~~

$b-c$

$\frac{1}{2}(a-c)$

Obj.	Pl.		Aa	Ab	Ac	Ba	Bb	Bc
Σ	970	1	33.343	33.318	33.292	32.630	32.765	32.901
		2	41.142	41.234	41.345	40.416	40.679	40.947
		3	48.415	48.640	48.877	47.702	48.087	48.483

Mar. 28 1889.

Plan for Volumes of Annals

Distrib. XIX. Pt. I Meteor. H.C. 1844–88.
" II 1 Eclipse 1889 Jan. 1.
2 " " " Meteorol.
3. Actinom. Observ. Photog.
4. Gegenschein
5. Neb. Orion.
Distrib. XIX. Pt. I. Blue Hill Observ. 1887
Distrib. " " II. " " " 1888
Cat. XXI. Pt. I. New Eng. Meteor. Soc. 1888
" " II " " " " 1889
Cat. XXII. Pikes Peak. Meteor. Observ. 1873–1888.
XXIII Durchm. Meridian Phot.

XXIV. Revision DM.
Gen Catal.
XXV.

XXVI. Preparation and Discussion of the Draper Catl.

XXVII The Draper Cat.

XXVIII Spectra Bright Stars.

XXIX

XXX

Nov 28. 1889.

XXIII.

Chapter I. Description of Photometer.
" II. Summary of Series
" III. Standard Circumpolar Stars.
" IV. Catal. Observation. of Stars. S of -30°
" V. Large Residuals
" VI. Polar Stars.

XXIV. I Revision Obs
II Large resid. phot.
III " " est.
IV Gen. Catalogue.
V Large resid. phot.
VI Variables.
VII Asteroids.

Dec. 10. 1889.

List of stars in various photometric catalogues

Herschel J.		149	
Seidel (Rosen)		208	
Zöllner		227	
Wolf	I	475	1398
"	II '76-'83	923	
Peirce		494	
H Phot.		4260	
Pritchard.		535?	3319
"		2784	
Revis. DM		16700 ±	
Gr. C. Mel.		4400 ±	
Engelmann			
Vol. XIII		4143 (0°), + 591 (50°) + 549 (55°)	= 5283
" XVIII		1009 + 420, + 1131	= 2560
" XXVII		10498	

Jan. 1. 1890.

β Aurigae

Mean separation in enlargement [illegible] H&K 75

$75 : 6 = 33 : x \quad x = 264$

$394 : 2.64 = 186.300 : y \quad y = 125$

128 miles per second in 4 days = 43,200,000 miles

Radius = 6,280,000

$$\frac{M^2 t^2}{r^3}$$

$$\frac{M^2\, 4^2}{6,280,000^3} = \frac{365^2}{93^3} \quad \cancel{6.3^3}$$

$$M^2 = \left(\frac{365}{4}\right)^2 \left(\frac{6.3}{93}\right)^3$$

M = ~~91×~~ 5.1

6.3 | 93
558 .068
720
651
690

.000314.

.056
91
056
504
5096

$0.6 \times \frac{1}{40} = .015 \quad .04 = 60'' \quad \frac{3}{8}\ .015 = 20''$

$= 20''$

Parallax 0.″1 = 30 yrs.

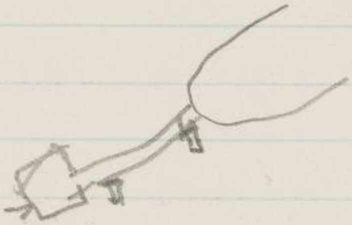
Spectrum Annals 1888.

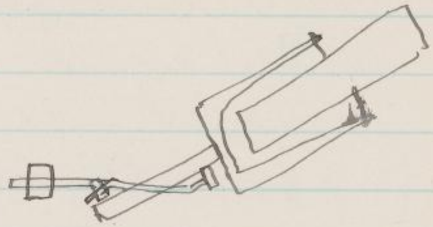
		P.E.	Par.
β Aurigae	Annals.	″.06	
ζ U. Maj.	"	″.10	
α Aurigae	Andr.	″.43	″.11

Aud.

P.E.	Par.	Yrs.
4.″93	″.32	210
2.33	.20	16
1.80	.20	1.6
.38	.18	18
.05	.16	20

Jan 12, 1890





Jan. 19. 1890

Widths of Column

		mm
1 figure or letter		4.
2 fig.		
2 fig. and period.	5.6	7.5
2 fig ±	+.90	9.
3 fig " "	5.62	
4 fig.		10.
R.A. hours and min	22 16	11
Dec.	+28 32	14
D.M. No.	+62 4139	17
Date	Nov 16	16
Constell.		20

Jan. 30. 1890.

On the possibility of determining the Distance of a Double Star by Measures of the Relative Velocities of the Components in the Line of Sight. By Arthur A. Rambaut.
Read, May 24, 1886. Proc. Roy. Irish Academy Series II, Vol. IV. 663.

Polar Equation of Ellipse, Todhunter p. 178.

$$r = \frac{a(1-e^2)}{1+e\cos\theta}$$

$$r = \frac{a}{1+b\cos v} \qquad (1+b\cos v)r = a$$

$$(1+b\cos v)\,dr = b\,r\sin v\,dv$$

$$\cancel{f}\; r^2 dv = c\,dt \qquad \frac{dr}{dv} = \frac{b\,r\sin v}{(1+b\cos v)}$$

$$r^2 = x^2+y^2$$

$$\sin(v-\alpha) = \frac{y}{r}$$

$$\cos(v-\alpha) = \frac{x}{r} \qquad x = r\cos(v-\alpha)$$

To find $\frac{dx}{dt}$

$dx =$ ~~$r\cos v\sin\alpha + r\sin$~~

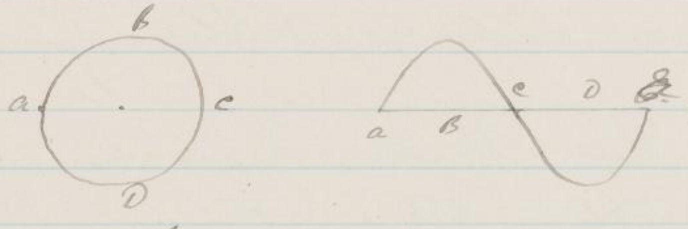
$$dx = -r\sin(v-\alpha)\,dv + \cos(v-\alpha)\,dr$$

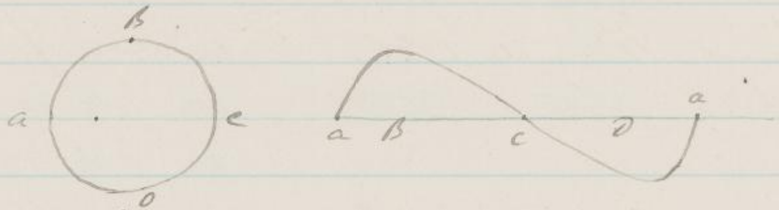
$$dt = \frac{r^2}{c}dv$$

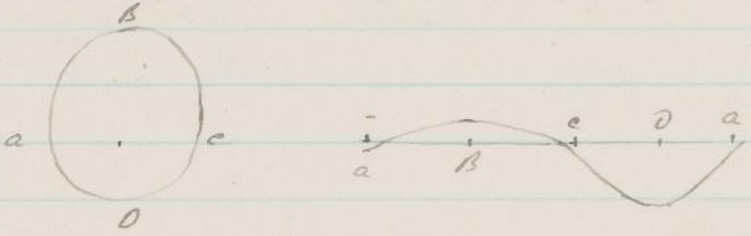
$$\frac{dx}{dt} = -\frac{c}{r}\sin(v-\alpha) + \cos(v-\alpha)\frac{dr}{dv}$$

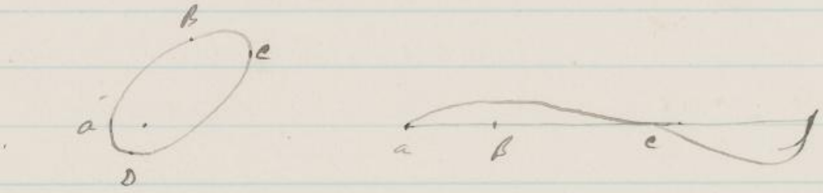
$$\frac{dx}{dt} \quad -\frac{c}{r}\sin(v-\alpha) + \cos(v-\alpha)\frac{b\,r\sin v}{1+b\cos v}$$

Jan 30, 1890.









Oct 7. 1890

Estimates Lithotype Publishing Co. Gardner, Mass.

Paper	Prints	Negatives	No prints	Price
10 × 12	7×9	250	100	4 & 6 Moon $1250
"	"	"	50	5 " 7
16 × 18	13×13	2000	100	8 " 10 Bonn $18,000
"	"	"	50	11 " 15
"	"	smaller no.	100	10 " 12 Obs. 200×11 = $2200
10 × 12	7×9	1	600	4

Cast-Plates. Received

1890	XXIII	XXIV	XXVI	XXVII			
March 7	48	206	.54	181			
" 14	1,49	1,207	6,60	7,188	15		
" 21	0,	3,210	0, –	3,191	6		
" 27	4,53	0 –	8,68	8,199	20		
" 28	. .	. .	. .	3 202			
	5	4	14	21	~~XX~~VIII 285		
Apr 2		3,213	472	1,203	7 291		
" 10	2 55	1,214		3,206	4 295		
" 15	2 57	3.217	6.78	2,208			Dr. Rp.
" 16				3,211			
" 22	4,61	1,218	4.82	5 216			
" 25	1,62	5,223		5 221		Cami hy 8±	
					~~XX~~	XXX	
" 29		2,225	6,88	3 224	165	1	
	9	15	20	22			
May 7	3,65	4,229.	3,91	9 233	5,170	6,7	
" 10		3.232		3,236	~~3,173~~	~~4,11~~	
" 14	6.71	2,234		4.240			
" 17	2.73	6,240			3,173	4,11	
" 19		1,241		5 245		2,13	
" 22	2,75	2,243	5,96	7 252	4,177,	4,17	
" 27	1,76				5,182,	8,25	
" 28			2,98	4,256			
" 29	1,79				3,185	2–	

Feb. 8. 1890.

Distribution of light in Spectrum of Stars

F		−3.94	486.1
	3.939		
G.		−0.00	434.0
	2.479		
h		+2.48	410.2
	1.626		
H		+4.11	397.0
	1.082		
α		+5.19	388.9

			522		−6.0
				9	
			513		
				9	
−10	503		504		−5.0
		7		8	
9	496		496		
		8		8	
8	488		488		−4.0
		6		8	
7	82		480		
		9		7	
6	73		473		−3.0
		7		7	
5	66		466		
		7		7	
4	59		459		−2.0
		6		6	
3	53		453		
		7		7	
2	46		446		−1.0
		6		6	
1	40		440		
		6		6	
0	34		434		0
		6		5	
1	28		429		
		5		5	
2	23		424		+1.0
		4		5	
3	19		419		
		5		5	
4	14		414		+2.0
		4		4	
5	10		410		
		5		5	
6	05		405		+3.0
		4		4	
7	01		401		
		5		4	
8	396		397		+4.0
		3		4	
9	93		393		
		4		4	
10	89		389		+5.0

Feb. 23, 1890.

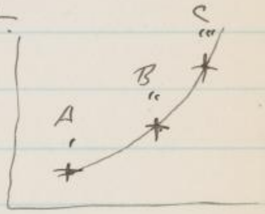
Plan for enlarging images of Vest.
Made positive from original negative.
Copying by [illegible] camera

March 23, 1890.

To find the value of a given interval between the K lines in β Aurigae.

Two methods may be used. 1st. Graphical. Draw a curve through the points ~~of the curve which~~ whose coordinates are the measures and wavelengths of the various lines in the spectrum. From this read off the measures corresponding to wavelengths 370, 380, 390, &c. Taking first differences derive the required differential coefficients graphically or by the usual formula for interpolation.

If we have only three values H, K and α draw parabola through them and derive diff. coef. from it.



$(y-a)^2 = c(x-b)$

~~$(y'-a)^2 = c(x'-b)$~~

If origin is at ~~$y''\ x''$~~ B

$y''=0 \quad x''=0 \qquad a^2 = -cb$

$y^2 - 2ay = cx$

$$\left.\begin{array}{l} y_{\prime}^2 - 2ay_{\prime} = cx_{\prime} \\ y_{\prime\prime\prime}^2 - 2ay_{\prime\prime\prime} = cx_{\prime\prime\prime} \end{array}\right\} \text{whence derive } a \text{ and } c$$

$2y\,dy - 2a\,dy = c\,dx$

$$\frac{dy}{dx} = \frac{c}{2y-2a} = \frac{c}{(y-a)} \text{ if } y=0 = \frac{c}{-a} = n$$

$c = -an$

$$\frac{y_{\prime}^2}{x_{\prime}} - \frac{2y_{\prime}}{x_{\prime}}a = \frac{y_{\prime\prime}^2}{x_{\prime\prime}} - \frac{2y_{\prime\prime}}{x_{\prime\prime}}a$$

$$a = \frac{\frac{y_{\prime\prime}^2}{x_{\prime\prime}} - \frac{y_{\prime}^2}{x_{\prime}}}{\frac{2y_{\prime\prime}}{x_{\prime\prime}} - \frac{2y_{\prime}}{x_{\prime}}} = \frac{1}{2}\,\frac{x_{\prime}y_{\prime\prime}^2 - x_{\prime\prime}y_{\prime}^2}{x_{\prime}y_{\prime\prime} - x_{\prime\prime}y_{\prime}}$$

$y_{\prime}^2 - 2ay_{\prime} = -anx_{\prime}$

$y_{\prime\prime}^2 - 2ay_{\prime\prime} = -anx_{\prime\prime}$

$$a = \frac{y_{\prime}^2}{2y_{\prime} - nx_{\prime}} = \frac{y_{\prime\prime}^2}{2y_{\prime\prime} - nx_{\prime\prime}}$$

$2y_{\prime\prime}y_{\prime}^2 - nx_{\prime\prime}y_{\prime}^2 = 2y_{\prime}y_{\prime\prime}^2 - nx_{\prime}y_{\prime\prime}^2$

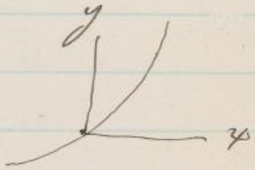
If $y_{\prime\prime} = ey_{\prime} \quad x_{\prime\prime} = fx_{\prime}$

$$n = 2y_{\prime}y_{\prime}^3 e\,\frac{(1-e)}{(f-e^2)x_{\prime}y_{\prime}^2} = \frac{2y_{\prime}(1-e)}{x_{\prime}(f-e^2)}$$

$$n = \frac{2(y_{\prime\prime}y_{\prime}^2 - y_{\prime}y_{\prime\prime}^2)}{x_{\prime\prime}y_{\prime}^2 - x_{\prime}y_{\prime\prime}^2} = 2y_{\prime}y_{\prime\prime}\frac{(y_{\prime} - y_{\prime\prime})}{x_{\prime\prime}y_{\prime}^2 - x_{\prime}y_{\prime\prime}^2}$$

April 6, 1890.

Same as page 121



Equation of parabola with axis parallel to Y and apex at $x = a$, $y = b$

$(x-a)^2 = c(y-b)$

$x^2 - 2ax + a^2 = cy - cb$.

If origin is on curve $x = 0$ when $y = 0$ $\therefore$ $a^2 = -cb$

$x^2 - 2ax = cy$

We wish direction of curve at origin. $2\cancel{y}dx - 2a\,dx = c\,dy$

$\frac{dy}{dx} = 2\frac{(x-a)}{c}$ at origin $x = 0$ $\frac{dy_0}{dx_0} = -\frac{2a}{c} = m$

$x^2 + cmx = cy \therefore c = \frac{x^2}{\cancel{x}y - mx}$

If curve passes through points $x_{,}y_{,}$ and $x_{,,}y_{,,}$

$\cancel{\ast}$ $c = \frac{x_{,}^2}{y_{,} - mx_{,}} = \frac{x_{,,}^2}{y_{,,} - mx_{,,}}$ $y_{,,}x_{,}^2 - mx_{,}^2x_{,,} = y_{,}x_{,,}^2 - mx_{,}x_{,,}^2$

$m = \frac{y_{,}x_{,,}^2 - y_{,,}x_{,}^2}{\cancel{x_{,}}x_{,,}(x_{,,} - x_{,})}$

If $x_{,} = 1$, $m = \frac{y_{,}x_{,,}^2 - y_{,,}}{x_{,,}(x_{,,} - 1)}$

If $x_{,,} = 1$ also, $m = \frac{y_{,} - y_{,,}}{\cancel{1}2}$ ~~so ∴ there must be an error in above formula.~~ $m = \frac{y_{,} - y_{,,}}{2}$ which is a property of the parabola

April 6 1890.

Sent by Rowland. [illegible] 137

C 6563.04
F. 4861.49
G' 4340.66
h 4101.85
H 3970.25 ± 0.2
α 3889.15 9.14
β 3835.6 5.34
γ 3798.0 8.1
27.3
δ 3770.7 0.8
20.6
ε 3750.15 0.2
16.0
ζ 3734.15 4.2
12.3
η 3721.8 3721.9
10.1
ϑ 3711.9 3711.8 7.8
3704.0 6.6
3697.4 5.9
3691.5 4.8
3686.7 3.2
3683.5
3679.5 5.3
3674.2

Hydrogen lines I
II

3712 10.7

	$\frac{1}{\lambda^2}$	
54	.4232	0
02	.5309	28
00	.5943	45
242	6345 ~~.6493~~ 6452	56 60
032	.6612.	64
246	.6799.	~~64~~
090	.6933	

Calcium

Rowland	Hale	
396.861	396.856	H
393.380	393.386	K

397.02 H }
396.86 Ca } 396.86
393.38 K 393.39

April 6. 1890.

	λ	log λ	2 log λ	log $\frac{1}{\lambda^2}$	$\frac{1}{\lambda^2}$	
F	486.1	.68673	.37346	.62654	.4232	0
G	434.0	.63749	.27498	.72502	.5309	28
h	410.2	.61300	.22600	.77400	.5943	45
H	397.0	.59879	.18758	.81242	6345 .~~6493~~	56
α	3863.7 388.9	.58984	.17968	.82032	6452 .6612.	60 64
β	383.5	.58377	.16754	.83246	.6799.	~~64~~
γ	379.8	.57955.	.15910	.84090	.6933	

p. 85 cap.

XXVI	Cornu
656.3	
486.1	
434.0	
410.2	410.10
397.0	6.89
388.9	8.78
383.5	3.45
379.8	9.69
377.1	6.94
375.0	4.98
373.4	3.36
372.2	2.06
371.2	1.07

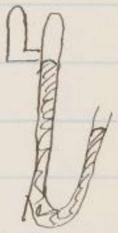
Calcium

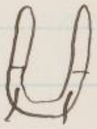
Rowland	Hale	
396.861	396.856	H
393.380	393.386	K

397.02 H }
396.86 Ca }   396.86
393.38 K   393.39

April 8. 1890.

Plan for studying spectrum of pure H and O. Produce by electrolysis. carry current by mercury column, and reverse current or detect impurities. Begin with vacuum and gradually increase pressure by electrolysis. ~~method~~ Better use U tube and expel air by boiling and seal. Vary pressure by electrolysis and measure by amount of elect. transmitted or more simply by inserting another tube in same circuit





April 16, 1890.

Font used for Annals.

Ordinary text.	Pica.
Figures.	Long Primer
Remarks Vols. XXVI, XXVII.	Bourgeois.
" Vol. XIV	Brevier

April 21. 1890.

Wave length lines Planet. Neb. and Bright Line Stars

Line	λ	M 13° Pr.	N 5° Pr.	AA 13°	1000 = λ			5°		
F	486.1	0	0	486	~~[illegible]~~ 350	130	130	486	380, 300	35
G	434.0	446	171	479^{7}_{13}	378^{22}_{11}	~~101~~ ~~94~~ 29	94^{36}	477	376, 400	25_{22}
h	410.2	730	281	466_{9}	389_{2}	77^{24}_{4}	77^{17}_{10}	467 26	385, 400	20
H	397.0	917	350	457_{4}	391_{1}	66_{5}	67_{6}	459	388 400	18
α	388.9	1046	401	453_{5}	392_{4}	61_{4}	61_{4}			
β	383.5	1137	429	448	391	57	57	455	388 400	17
γ	379.8	1204								

Diff Planet. Neb.

Line	N.G.C. 7027	6210	6543	6826	3242
F	0	0	0	0	0
G	−1	−6	+8	+11	−4
h	−3	−6	+11	+17	+3
H	+3	+4	+16	+28	+7
α	+11	+5	+18?	+14	+16
Omit α	~~−0.7~~	~~−4.~~	~~+8.8~~	+14.9	~~+1.5~~
	0	−2	+9	+14	+2

Br. Line Stars

	HA 1311		csm	17681		45°3571	37°3821	37°3871	22762	14636	14720	14648	22843
F	0	0	0	0	0	0	0	0	0	0	0	0	0
G	+1	−1	0	−1	−17	−14	−11	+9	+32	+6	+2	−11	−
h	+7	−2	+1				−5	0	−	+13	+6	+2	−11
H	+11							−12	+10	−9	−8		−
α	+9							−16	+14				−1
	+6	−1	0	0	−9	−7	−5	−6	+14	+2	0	−3	−4

April 22 1890

	1311			17681	37°3821	37°3871	22763	14626	14720	14648	22843	23073
				-1825?								
f	-6	+1	0	0	+5	+6	-14	-2	0	+3	+4	-3
	122	131	128	115	132		118	130	100	133	133	119
	179	196	194		177	191	159	171	173	174	171	160
	236	249	252		247	(318)	239	275		255 297	257 308	
g	441	446	446	445	440	(461)	464 517	450	448	438	336	441
	606	611	600		605		592 633	619	632	662		595
h	731	729	731		730	(736)	-	741	736	735	723	732
	792		790		793		795	798		799	786 829	
	844		850			(911)	856				872	
H	922						913	908	907			927
	942					951	966		978		953	
α	1049					1036	1046 1163				1049	1041
	1055						1261 1306 1506		1230		1073	

			f	487	486	486	486	485	-	488	486	486	486	485	486
				470	469	470	471	469		471	469	473	469	469	471
				463	461	462	-	463		465	464	464	464	464	465
				456	455	455	-	455		456	452	-	454 451	454 448 445	-
2843			g	434	434	434	434	435		432 428	434	434	435	-	434
-	23073	23072		420	420	421	-	420		421 418	419	418	416	-	421
0	0	0	h	410	410	410	-	410		-	409	410	410	411	410
-	-2	+4		406	-	406	-	406		405	405	-	405	406 403	-
-11	+5			402	-	401	-	-		401	-	-	-	400	-
-	+13		H	397	-	-	-	-		397	398	398	-	-	396
-1	-2			395	-	-	-	-		394	-	393	-	394	-
-4	+3	+2	α	389	-	-	-	-		389	-	-	-	389	389
				388	-	-	-	-		377	-	378	-	387	-
										..					
										..					

June 3. 1890.

Last page of call-proof recd on each date.

	XIX.	XXI.	XXIII	XXIV	XXVI	XXVII	BH XXX
June 1	184	152	79	244	98	256	26
" 3	185					262	32
"	196	~~(157)~~ (167)	83		99	269	6
" 16, 1					2,101	5,274	7,
" 18				3,252,	1,102	3,277	1,
" 23	201		84	1,253		4,281	8,
" 26	203			7,255		4,285	
July 1				3,258		5,290	8
" 3	8,211				1,103	5,295	
" 5			85			2,297	4
" 10			86	4,262		5,302	13
" 17	4,215		88			7.309	
" 19				1 P.	2,		Pub.
" 22			89			4,313	
" 26			4,99		5,108	4,317	
Aug 4			5,96	267 Pub.		2,319	
" 7			5,101	Cont.		8,327	Hist Colo.
" 8			1,102			5,329 t3	
			5,107	5	3,113	14,	
" 30	2,220			5		2,339	[illegible]12
Sept 4	10,230					5,344	12 24
" 5					2,115	4,345	
" 9						11,351	
" 13	9,239				4,119	1,352	8 31
" 16	1,240					3,355	

	XIX.	XXIII,	XXVI,	XXVII.	Mul. Ed.	Cor. Cat. XXVII		
Sept. 18	–	–	3,122.	—	—–			
" 19	–	–	–	4,359	– –			
" 22	–	–	4,126	4,363	– –			
" 23	–	3,110	–	—	– 7			
" 24	–	–	1,127	4,367	– –			
" 25	–	1,111	1,128	3,370	– –	24		
Oct. 7	–	4,115	2,131	—	– –	–		
" 13	–	3,118	2,138	–	– –	–		? Oct. 15 ± 1st printed copy recd of Vol XXIV
" 18	–	3,121	—	–	– –	–		Cat. proof Harv. Obs.
			—					
Nov. 4	–	5,126	3,141	–	– –	–		
" 17	–	1,127	2,143	–	– –	–		Nov. 28 recd copy of Vol XXXII 6 printed.
Dec. 2		Ref. Cat. 131–						
" 4		6,136	4,147		– –	–		
" 8		—	2,149		– –	–		
" 16			4,		– –	–	XXXII	
" 22							19	
" 29							29	Completed Cat.: Vol XXIII Pt I 26
" 30							34	1–32
				XXX				
Jan 8			4pp					Mailed copies XXVII, and XXIII
" 26			2pp 152					Part I and Annual Report dated
								Jan 25, 1891.
Feb. 3			1,153	5,92				
" 5			2,155	1,93				
" 10			- —	6 99				
" 11			4,167					
" 13				4 ...				

June 5. 1890.

Proposed plan of unpublished volumes of Annals

XV. Pt-II. Catalogue of Zone 50°–55°
XIX. " II Zodiacal light. Photog. Atmos. Absorption. Discuss. ring.
XXI. " II N. E. Met. Soc. Researches for 1889.
XXV. ? Proper Mot. 50°–55°
XXVIII. Draper Mem. 11 inch telescope Spectra Bright Stars
XXIX. ~~Sixth Draper~~?
XXX. Blue Hill Obsv. 1889, 1890. 1891 Contr. 20
XXXI. N. E. Met. Soc. Researches 1890, 1891. Contr. 21
XXXII. Boyden Volume. Geograph. Met. Conditions, Sunset Photos 13 inch Cat. Photos
XXXIII. Boyden. 13 in. telescope. Neb. Orion. Clusters. Planets, Moon. Eclipse '89?
XXXIV. S. Merid. Phot. Obsv. Contr. 14, 24
XXXV. Zone 50°–55° ?
XXXVI. S. Draper Cat. Description Contr. 26
XXXVII. " " " Contr. 27
XXXVIII. Bright S. Stars Contr. 28
XXXIX. Equatorial 1883± ?
XL. Blue Hill. 1892, 3, 4
XLI N. E. Met. Soc. 1892, 3

June 5. 1890.

Incomplete researches.

Proper Motion zone 50°–55° ?XXV.

Zone observations 50°–55° ?XXXV

Jupiter Satellites. ? XXIX

15 inch equat. Comets. Var. Stars. ?XXXIX

Miscell. Observ. researches. 8 in Double Stars. β Aurigae, I Plates

Zone –10° to –14° Zone observ.

Ex " " Catalogue

Observ. Fundamental Catalogue. Merid. Circle.

0	Blue Hill Met. Obs.	20, 30
1	M. E. Sm. " "	21, 31
2	Boyden	22, 32
3	"	
4	Merid. Phot.	14, 24, 34
5	Merid. Circ.	15, 25.
6	Draper,	26
7	"	27
8		
9		

July 20. 1890

New nomenclature for points of type

12 point = Pica
11 Small Pica
10 Long Primer
9 Bourgeois
8 Brevier
7 Minion
6 Nonpareil
5 Agate
4 Pearl
3 Diamond
2 Excelsior.
1 = One Lead

Aug 7. 1890.

Vol. XXIII
Discussn. Obsns.
A, b, c, Table.
No. Times large resid.
Chapter. V
Theory Nicol.
Chapter VI.
Reduction D.M. [illegible] D.M. magns. U.A. magns. H.P.
Mean Table. Other magns. H.P. - U.A.
U.A. Stand.
B.A.C.
Polar Stars.
Résumé.

S. Stars, U.A., H.P.

August 12., 1890.

Plans for ~~Assuming~~ publishing observations of Variable Stars 1st column Julian day and tenths. A = magn. derived from brighter of two comp. stars by adding to its magn. no. of grades assumed to be a tenths of a magnitude. B = magn. derived from fainter star, with col. mean magn. Orig. comp. stars in proper order Then observer and letters for remarks in last column, the mention if mention two stars.

J.D.	A	B	Mean Magn.	Comp. Stars	Notes
1632.4	10.3	10.6	10.4	e f	Ar.

Orig. Record.

Date.	h				
Aug 12 '90	6.3	c 4, 1 f	10.4 ~~Ar~~	0!	Ar

August 17 1890

Plan for discuss. magn. in Aster. Gesell. Cat.

Enter in Vol. XXIV magn. from Gesell. Cat. Also enter from H.C. zone +50° to 55° stars in 49° 50°, 54° and 55°. Each star observed in Vol. XXIV Table I ~~[illegible]~~ will then have four magn. M.P. Obs. and one from observatory taking zone north of it – and one from zone that taking zone south of it. Group stars in 49°, 50° according to each magn. in Catalogue from 6.0 to 9.5. Thus determine scale of estimates. Do same for 54° and 55°. Consider observed magnitudes and enter residual. Group these resid. for each two hours of R.A. Make this discussion for each of three eighteen (?) observatories.

Sept: 14, 1890.

Volume XXIV, Part–II.

Chapter VI Revision Dm. 6.3 – 9.0 Table I, every zone,
a, 1 2 3 &c.
6.3 – 9.0 from Table IV. a, 1, 2, 3 &c.
1.0 – 6.2 H.P.
S.D. 1.0 – 6.2 H.P.
Dm 1.0 – 6.2 – Table I, Table IV.

H.P. Comparison Table I, Table IV a, 1 2 3 &c every ½ magn.

U. Ch. Table I, Table IV. every 2h N. and S.
Table XVII every 2h.

A U.Q. Stations
B.S. B.A.C. Wm Herschel.
Mitchell. F. A.A.A.S., F.R.S. I Plummer. R Rosenth. to Lindsay
Cerulli. 54 standard Meridian. 10 in Scale.
Disused Med.

Sept. 16, 1890.

Criticisms on Vol XXI Pt. II

106. Method. note should begin right hand page

107.6 For Chart B read Plate IV.

113 Last number, 137

134–213 Heading of pages omitted

221.6 Schmid ? c

Plates. [illegible]

Oct. 19. 1890.

Long Period Variables ~~brighter than 7.0~~ Range > 6.0

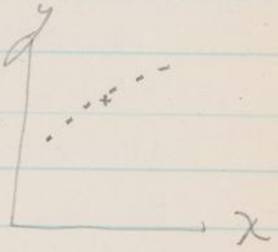
	Max	Min	Range		Max	Min	Range
· R Androm.	5.6	< 12.8	< 7.2	T Cen.	2.0	9.5	7.5
· S Cassiop.	6.7	< 13.5	< 6.8	U Herc.	6.6	12.7	6.1
~~R Sculpt.~~	~~5.8~~	~~7.8~~	~~2.0~~	R Drac.	6.5	13.4	6.5
· o Ceti	1.7	9.5	7.8	S. Herc.	5.9	13	7.1
R Ceti	7.5	13.5	6.0	~~R Aquilae~~	~~6.4~~	~~11.5~~	
~~U Ceti~~	~~6.8~~	~~< 10.5~~	~~< 3.7~~	· R Cygni	5.9	< 13	< 7.1
R Tauri	7.4	13.5	6.1	χ Cygni	4.0	13.5	9.5
R Aurigae	6.5	12.7	6.2	V Cygni	6.8	13.5	6.7
· R Gemini	6.6	< 13.5	< 6.9	T Aquar.	6.7	13.0	6.3
T Hydrae	7.0	< 13.0	< 6.0	R Vulpec.	7.5	13.6	6.1
R Cancri	4.3	10.0	6.7	R Pegasi	6.7	< 13	6.1
R Leo. Min.	6.1	< 12.5	< 6.4	R Cassiop.	4.8	12	7.2
~~R Leonis~~	~~5.2~~	~~10.0~~					
V Leonis	8.6	13.5	< 5.9				
R U. Maj.	6.0	13.2	7.2				
η Argus	> 1	7.4					
R Comae	7.4	< 13.5	< 6.1				
U Virg.	8	14	6				
T. U. Maj.	6.7	12.6	5.9				
~~R Virginis.~~	~~6.5~~	~~11.0~~					
R Hydrae	3.5	9.7	6.2				
S Virg.	5.7	12.5	6.8				
R Bootis	5.9	12.2	6.3				
S. Cor.	6.1	12.5	6.4				
R Can.	5.8	13.0	7.2				
R Serp.	5.6	13	7.4				

R Androm.
o Ceti
R Gemini.
χ Cygni
R Cygni

Oct. 28, 1890

The means of observations of cumulative results are subject to two errors.

Let y be a function of x and suppose that we have a number of observations of the corresponding values of x and y. If these are divided into groups and the means taken, the points thus found will not lie on the curve even if no errors are present. Evidently in figure the mean of selected points will give a point below the curve. Let the limits of the groups be x = a, a+b, a+2b &c.



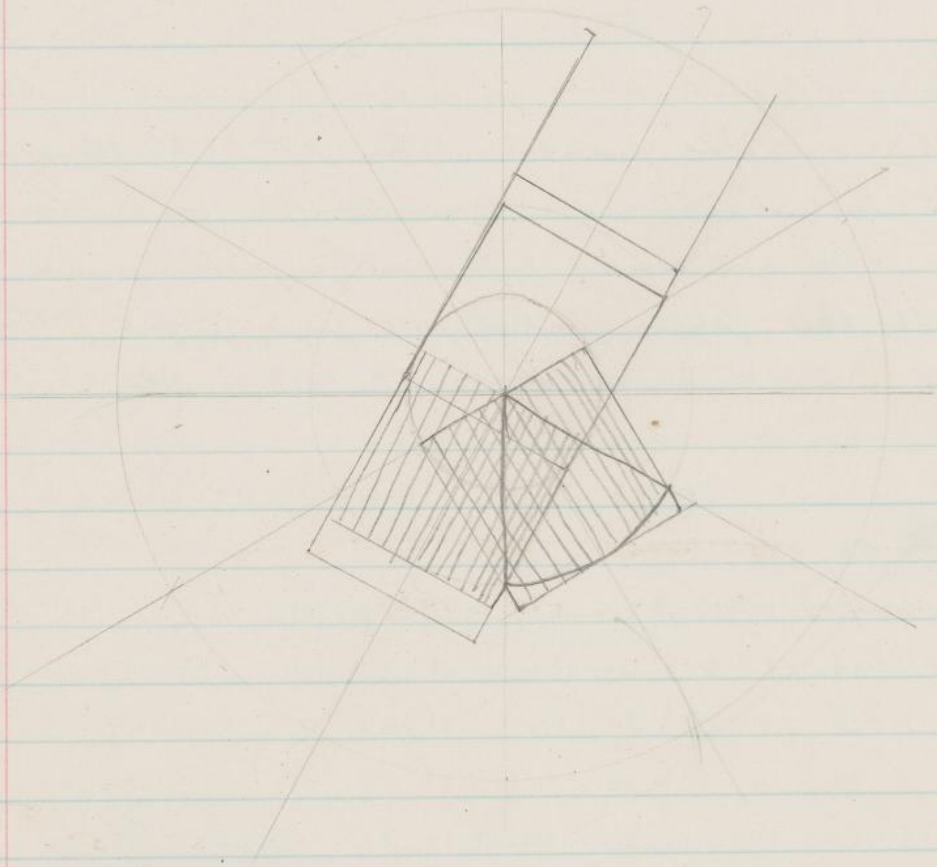
Then neglecting the third diff coeff. or. Supposing curve to be a parabola with axis vertical y will fall below curve by $\frac{1}{3}$ distance of ~~[illegible]~~ [illegible] of curve from chord. If diff. are taken this will equal $\frac{1}{24}$ of second diff.

~~This~~ ~~24 becomes 24 + $\frac{2}{24}$ = 24.08~~

Thus mean of 21, 24, and 29 = 24.67

x	y		
1	21		
		3	
2	24		2
		5	
3	29		2
4	36	7	
			2
5	45	9	

Nov. 29, 1890.
Dome design for Bruce Telescope.



Nov. 30, 1890.

Notation for Bruce Plates.

1. Give Dec. and R.A. of corner of plate furthest from equator. 15, 21,5 = +15°, $21^h 50^m$ $\underline{15}$, 21.5 = −15° $21^h 50^m$

2. Give Dec. and R.A. of center 12, 21,3 = +12°.5, $21^h 30^m$
Always add $0^{\circ}.5$ and 0^m

Designate each plate by a number which indicates the R.A. and Dec. of its center. Thus 12, 21,3 denotes Dec. +12°.5 R.A. $21^h 30^m$. South declinations are indicated by italics. Always insert 5 before the first comma, and 0 after the last figure, unless last figure is ~~f~~ 5, in this case insert 5 in both places. Thus, 52, 21.3 = Dec. +52°.5, R.A. $21^h 35^m$

~~2°~~	~~0,1~~	~~0.3~~	~~0.5~~	~~1,1~~	~~1,3~~	~~1,5~~
~~47°~~	~~0,1~~	~~0.3~~	~~0.5~~	~~1,1~~	~~1,3~~	~~1,5~~
~~52°~~	~~0.1~~	~~0.4~~	~~1,1~~	~~1,4~~	~~2,1~~	~~2,4~~
~~57°~~	~~0.1~~	~~0.4~~	~~1,1~~	~~1,4~~	~~2,1~~	~~2,4~~
~~62°~~	~~0.2~~	~~1,0~~	~~1,4~~	~~2.2~~	~~3.0~~	~~3.4~~
~~67°~~	~~0.2~~	~~1.0~~	~~1,4~~	~~2,2~~	~~3.0~~	~~3.4~~
~~72°~~	~~0.3~~	~~1.3~~	~~2.3~~	~~3.3~~	~~4.3~~	~~5.3~~
~~77~~						

72°	2°	0.1	0.3	0.5	1,1	1,3	1.5
	47°	"	"	"	"	"	"
48	52°	0.1	0.4	1,1	1,4	2,1	2,4
48	57	"	"	"	"	"	"
36	62	0.2	1.0	1,4	2.2	3.0	3,4
36	67	"	"	"	"	"	"
36	72	"	"	"	"	"	"
24	77	0.3	1.3	2.3	3.3	4.3	5.3
18	82	0.4	2.4 ~~[illegible]~~	3.2 ~~[illegible]~~	4.4 ~~8.4~~	6.0 ~~11.2~~	7.2 ~~14.0~~
6	85	2.0	6.0	10.0	14.0	18.0	22.0

972

Dec 7, 1890

Duplicity α Lyrae.

Maury. XLIII p 65. 14 plates ~~[illegible]~~ Oct-3 to Nov. 4

Oct. 8	.7^8	1649.3	649.3 1.03 650.3 651
" 17	single	58.3	
" 28	"	69.3	
Nov. 1, 8h	"	73.3	
" " 8.3a.	.23	"	
" " 10	.38	" .4	

Period 24.68h } Nov.0 } 672
Dec 0 } 702

Period 24.2
6

			1890	J.D. 780.7	
73.5	0	Oct. 8		649.3	2P
49.3	6	Nov. 1		673.5	7P
24.2	12	" 25		697.7	12P
97.7	13	" 29		701.7	12P
6~~[illegible]~~	14	Dec. 3		705.8	2a
Nov. 25.7	15	" 7		709.8	2a
1219	16	" 11		713.8	2a
	17	" 15		717.9	5a
	18	" 19		721.9	5a

Oct. 8
Nov. 1
" 25
Dec. 19 7
24 31
Jan. 12 24

24.2
24
968
484
5808 | 24.68
4936 24
8720

24.68 | 24
24 1.028
48
200

649.3
740.28

Plate	Date	
C 250	Dec. 2 1886	0243
1422	Sept. 14 1888	0895
	Oct. 8 1890	1649.3
	Nov. 1 1890	1673.5
	25	97.7

649.3
652
754
24.2
24.2

652 | 24.5
490 | 26
1620
0

65.2 | 27
54 | 24.15
112
108
40
27
13

652 | 26
52 | 25.
132

24.2
27

24.2
31
242
726
750.2

Dec. 8, 1890.

Approx. period of β Aurigae.

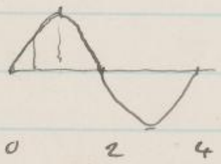
JD	Sep.	
0237.60	2.5	±.24
0600.95	0.5	.05
0704.53	2.5	.24
1333.71	0.5	.05
1353.57	0.0	
1357.73	0.0	
1363.67	0.0	
1365.58	0.0	
1371.55	0.0	
1385.81	1.5	.14
1389.40	0.0 (3)	
1710.0.	0 ±	

1385.67 14.12

1389.40 3.73

.11
4.18
4.07
.01628
3.98372

0.50 | 6.8
476 .74
240
272



365.66 995.94

1360.60

4
3.983.76

3.9838^d
24
39352
19676
23.6112
6
36.672
6
40.22

		0	$\frac{4}{90}$
0.5	.074	4°.2	.05
1.5	.222	12°.8	.14
2.5	.370	21°.7	.24

$3^d 23^h 36.7^m$

$3^d.9838$

$3^d 23^h 36^m 40^s$

4.77 1.36

4.29 1.84

1740. 2411733 + 3.9838

1891, Jan $0^d.1$ + $3^d 23^h 36^m 40^s$

[illegible]

Dec 19, 1890.

Mass of β Aurigae.

Let λ = wave length of K line = 3937.

l = separation of two components

V = veloc. light.

v = required veloc. in miles per second

$\frac{v}{V} = \frac{l}{\lambda}$ $v = \frac{l}{\lambda} V$

log $2\pi = \overset{2.8822}{0.7982}$
6.2832
$\overline{\quad 2.0840 \quad}$

~~$2\pi v$~~ $vt = 2\pi r$

$t_1^2 = \frac{a r_1^3}{M_1}$ $t^2 = \frac{a r^3}{M}$.

$t_1^2 : t^2 = \frac{r_1^3}{M_1} : \frac{r^3}{M}$

$\frac{t_1^2 r^3}{M} = \frac{t^2 r_1^3}{M_1}$

$m = t^2 r^3$

$v = \frac{l}{\lambda} V$

V = 186,330. miles = 299.860 Km. log 5.4769~~85~~

λ = 393.3 2.5947

T = $365^d\ 5^h\ 48^m\ 45^s.51$

$365^d.2564$ 2.5626

$r = \frac{vt}{2\pi}$

$m = t^2 r^3$

$\log v = \log l + 2.8822$ $v = 7624$ Kms

$\log r = \log l + \log t + 2.0840$ $r =$ lt

$\log m =$

Dec. 21, 1890.
Contents of Volume XXVI, Part II.

Description Draper 8 inch telescope.
Catalogue Plates.
Remarks.
Ledgers, Plates. I, II, C,
Spectra Variables.
New Variables.
Sus. Variables
Peculiar Spectra. III, IV.
IV.
V.
Effect approach, recession. ?
480 stars.
Proper motion (Chandler)

Jan 18. 1891.

Items for records of observing book.

Number of plate.

Class. Obj. H.P.?

R.A.

Dec.

Time started

H.A.

Obs. Dec.

Telesc. E or W.

~~Position or rate.~~

Condition of Sky. Clock

Sky

Dew

Time stopped.

Observer.

Jan. 23, 1891

Outlet of β Aurigae $\lambda = 397.02$

				a	b		9a	
F	486.15		72.346					
		19.029						
f		8.625	91.375					
G.	434.07	−17.361	100.000					
h	410.18	11.379	117.361	13.16	11.379	+1.78	12.02	+.64
H	397.02	3.425	128.740	0.00	.0000	.00	0.00	.00
K	393.7		132.165	−0.33	3425	−.01	0.30	−.04
		4.413						
α	388.92		136.578	−8.10	7.838	−.26	7.29	−.55
		~~64.232~~	~~64.232~~					

λ											
390	135.3			140	385.7	9.8	15	140			
		9.4									
400	129.9		10	130	395.5			130			
		8.4				11.3					
410	117.8		7	120	406.8		17	120	405.8	14.0	
		7.7									
420	109.8		8	~~110~~	~~413.1~~	13.0	16	110	419.8		16
		6.9	4	110						15.6	16
430	102.9			100	419.8	14.6	26	106	434.4		
		6.5	10							17.2	1.6
440	96.4			90	434.4	17.2	16	90	451.6		
		5.5	1		451.6	18.8				18.8	
450	90.9			80	470.8			80	470.8		
		5.4	3								
460	85.5			70							
		5.1	1								
470	80.4										
		5.1									
480	75.3										

!

140	385.7		
		21.1	
120	406.8		6.5
		27.6	
100	434.4		8.8
		36.4	
80	470.8		

$\lambda = ar^2 + br + c$

λ r

9.10 = 7.838

1.16

$$\begin{array}{r} 7838 \\ \hline 1262 \\ 7838 \\ \hline 47820 \end{array}$$

$y = ax^2 + b$

x	y		
1	1		
		3	
2	4		2
		5	
3	9		2
		5	

~~$y = 0 + y_0 + d'x +$~~

$y = y_0 + d_1 x_0 + d_2 \frac{x_0^2}{2}$

$y = 4 + 5 \times 1 + 1$

Jan 24, 1891.

Dating of doubling of ζ Ursae Majoris

.0360
780
1140
103
1243?
48
1291
55
1346
59
1405
46
1451
18
1469
41
1510
85
1595?
116
1711

	λ = 380	~~145~~					
f	106.15	95.535	49.465	72.346	-22.881		
f		~~48.663~~		91.375			
G	54.07	48.663	96.337	100.000	-3.663	2.704	-6.367
h	30.18	27.162	117.838	117.361	+1.477	1.509	-.032
H	17.02	15.318	129.682	128.740	+.942	.851	+.089
K	13.7	12.33	132.67	132.165	+.505	.685	-.180
α	8.92	8.028 ~~8.018~~	136.972	136.578	+.394	.446	-.052

	Δ~	Δλ				λ	
	27.654	52.08		460.11	1.884	460.11	
G	17.361	23.89	1.38	~~460.11~~ 422.12	1.376	422.12	
h	11.379	13.16	1.157	~~422.~~ 403.60	1.157	403.60	
H	3.456	3.32			1034 1.042	392.97 393.71 0.73	∴ 1042 = mg. rto.
K	4.413	4.78			.508	37.99	1.34
α					.219	18.52	1.18
	7.838	8.10	1.034	392.97	.123	10.63	1.16

Jan 28 1891.

See page 149

λ	$\frac{\Delta r}{\Delta\lambda}$	$\lambda - 390$	$1 + (\lambda-390).012$	O−C
460.11	1.884	70.11 1.40	1.845	+.039
422.12	1.376	32.12 6.4	1.385	−.009
403.60	1.157	13.60 27	1.163	−.006
392.97	1.034	2.97	1.036	−.002
1st line 437.54	1.514			

Hence to compute $\Delta\lambda$ for given value of λ, find $1+(\lambda-390).012$ and apply to it correction taken from last column of above table. For example for K = 393.7 $1 + 3.7 \times .012 = 1.044$ Corr. = .002 Hence required value = 1.042 1 turn of mic. screw = 1.042 μμ

Jan 26, 1891.

Approx. period of β Aurigae on page 144

2,411,733.0 + 3.9838   assume 3.98

1990.

-100 2,409,743.0

0 2,410,141.0

100 2,410,539.0

200 2,410,937.0

300 2,411,335.0

400 2,411,733.0

500 2,412,131.0

.334.62

2,411,733.00

12,131.38

12529.76

12928.14

13326.52

13724.90

14123.28

Jan. 27. 1891.

Wavelengths of Stellar [illegible] lines.

	λ	Int- order of		
Neb.	410.1	3rd	Hyd.	Young Astron. p. 506
	434.0	4	Hyd.	
	448?	1		
	486.1	5	Hyd.	
	495.8	6		
	500.4?	7		
	587.4?	2	Helium.	

Dr. 4001 468-9 Dr. Huggins.

		br.	fr.	bad
582	569	541	523	469 465

Corona 5316. Young Astr. p. 210

	Neb.	Bolin.	Orion. Star.
	502		
F	486	486	486.1
	470	470	
		462	463.3 ✓
		455	454.5
	447		447.1 ✓ 441.76 438.6 435.7
G.	434	434	— 434.1 425.8
		420	419.9 417.3 ✓ 414.9 414.6 ✓
h	410	410	410.2 409.8 409.4 406.9 402.6
		406	
		404	401.1
H	397	397 395	— 397.0 396.7 393.8
α	389	389 388	— 388.9

Jan. 27, 1891.

	Neb.	H.P. 1311	Spectr. B		
	502				
F	486	486	486.1	✓	10
	470	470			
		462	463.3	✓	10
		455	454.5		2
	447		447.1	✓	8
	~~434~~	~~434~~	441.7 ~~434.1~~		2
			438.6		3
			425.3		2
G	434	434	434.1	✓	10
			425.8		2
		420	419.9		2
			417.3	✓	4
			414.9		3
			414.6	✓	5
h	410	410	410.2	✓	10
			409.8		3
			409.4	✓	7
		406	406.9		2
		404	402.6	✓	8
			401.1		1
H	397	397	397.0	✓	10
			396.7		2
K		395	393.8		2
α	389	389	388.9	✓	10
		388			
β			383.6	✓	10
			382.3	✓	6
γ			379.8	✓	10

Neb.	H.P. 1311	Spectr. B		
502				
486	486	486.1	10	F
470	470			
	462	463.3	10	
	455	454.5	2	
447		447.1	8	
		~~438.6~~	~~3~~	
434	434	434.1	10	G
	420	419.9	2	
		417.3	4	
		414.6	5	
410	410	410.2	10	h
		409.4	7	
	406	406.9	2	
	40$\overset{2}{4}$	402.6	8	
397	397	397.0	10	H
	395	393.8	2	
389	389	388.9	10	α
	388			

aβ	1
ac	1
βc	6
c	3

Jan. 30. 1891.

Scale for o Ceti 1 grating Hand [illegible]

96	488.00		−423.00			423.00
		15		5.00	5.125	
97	473.00		418.00			417.875
		14		5.00	4.875	
98	459.00		−413.00			413.00
		13		4.50	4.375	
99	446.00		408.50			
		12		4.50	4.125	
100	434.00		−404.00			
		11		4.00		
101	423.00					
		10		4.00		
102	413.00					
		9				
103	404.00					
		8				
104	396.00					
		7				
105	389.00					

	λ			C	O–C			
F	486.15	96.00		488.00	−1.9	488.00	−1.85	+.15
G.	434.07	100.00		434.00	+0.1	434.00	+.07	+2.10
h	410.18	102.36	413.00 − 3.34 − 12 =	409.66	+0.5	409.54	+.64	
H	397.02	103.96	396.00 + .32	396.30	+0.7	396.32	+.70	
K	393.7	104.40	393.20 − 12	393.20	+0.2	393.08	+.62	
α	388.92	105.00.		389.00	+0.9	389.00	+.08	
	97.23			99.00 99.45				

~~[illegible] = 107~~

1 div = 0.1λ

96	486.00	
		52
100	434	12
		40
104	394	

$486 = a + b\,96 + c\,\cancel{96}^2 \quad 9216.$

$434 = a + b\,100 + c\,\cancel{100}^2 \quad 10000.$

$394 = a + b\,104 + c\,\cancel{104}^2 \quad 10816.$

$52 = -4b - 784c$

$40 = -4b - 816c$

$12 = 32c \qquad c = .375$

$52 + 294 = -4b \qquad 346 = -4b$

$40 + 306 = -4b \qquad b = -86.5$

$9\frac{5}{3}$

Jan. 30. 1891.

		β Aur. A.B.C.		β Aur. a		β Aur. ABCD
F	4	19027				—
f	11	8625			4	11559
G.	11	17361			4	23306
h	11	11379			4	15318
H	29	3426	8	1117	11	4618
K	22	4323	8	1466	11	6019
α						

	+2.20		
96.0	486.00	155	153
.1	484.45	154	
.2	482.91	153	
.3	481.38	152	
.4	479.86	151	
.5	478.35	150	
.6	476.85	149	
.7	475.36	148	
.8	473.88	147	
.9	472.41	146	
97.0	470.95		

96.0	486.00	15.05	488.20
97.0	470.95	14.05	473.15
98.0	456.90	13.05	459.10
99.0	443.85	12.05	446.05
100.0	431.80	11.05	434.00
101.0	420.75	10.05	423.95
102.0	410.70	905	90
103.0	401.65	805	.85
104.0	393.60	705	.80
105.0	386.55		

96	486.00	14.85	487.40	+1.40
	471.15	13.85	2.55	
98.	457.30	12.85		
	444.45	11.85		
100.	432.60	10.85	434.00	00
	421.75	9.85		
	411.90	8.85		
	403.05	7.85		
	395.20	6.85		
	388.35	97.65	389.75	-.17

96.0 487.40 1.53

96.1

Jan 31, 1891.

Atmos. Absorp.

	pp.	lines	pp.
I. Catal. Objects.	~~[illegible]~~ 24~~70~~	228 1393	10 ~~14~~
II. Catal. Stars.	47	887	18
III Upper Culmin.	57	1135	12
IV Lower Culmin.	70	1393	14
			54

~~XIX~~ Ms. I pp. 158.	158	Merid. Obs. 1840–'88
II pp. 241.	83	Zod. Catal.
	70	Atmos. Absorp.
	311	

Oct. 8, 1891.

Haswell p 267

	Arc	log. a	$\frac{\log a}{-\log \frac{\pi}{4}}$	10−			
.0	.00000 ~~.01468~~	−∞			∞		
.1	.01468 ~~.04087~~	8.16673 ~~8.17202~~	8.27693	1.72307	4.309	1,100 15 19	.63938
.2	.04087	8.61140	8.71631	1.28369	3.209	.642	.77815
.3	.07387	8.86847	8.97338	1.02662	2.567	.450 51	.85379
.4	.11182	9.04852	9.15343	.84657	2.117	.345	.90309
.5	.15355	9.18625	.29116	70884	1.772	.277	.93753
.6	.19817	9.29704	.40195	59805	1.495	.230 84	.96214
.7	.24498	9.38913	.49404	50596	1.265	.196 91 96	.97952
.8	.29337	9.46742	.57233	42767	1.069	.169 99	.99114
.9	.34278	9.53502	.63993	36007	.900	1.47	9.99782
1.0	.39270	9.59406	.69897	.30103	.753	1.30	0.00000
1.1	.44262	9.64603	.75094	.24906	.623	1.15	
1.2	.49203	9.69199	.79690	.20310	.508	1.02	
1.3	.54042	9.73273	.83764	.16236	.406	.90	
1.4	.58727	9.76884	.87375	.12625	.316	.80	
1.5	.63185	9.80061	.90552	.09448	.236	.69	
1.6	.67358	9.82839	.93330	.06670	.167	60	
1.7	.71153	9.85219	.95710	.04290	.107	49	
1.8	.74453	9.87188	.97679	.02321	.058	38	
1.9	.77072	9.88690	.99181	.00819	.020	20	
2.0	.78540	9.89509	.00000	.00000	.000		

Mag	10	1210	1210
.5	1.2~~009~~ ~~.840~~	~~.319~~	.370
1.0	~~.687~~	~~.068~~	.227
1.5	.613		.182
2.0	.431		.118
2.5	.313		

Feb. 17. 1891

	xxx
Feb. 17.	4, 103
" 19	2, 105
" 26	5, 123
" 28	5, 125
Mar. 4	3 -
14	4, 133
16	2, 135

Oct. 23. 1891.

Solution by least-squares of problem of two variables connected by linear equation, both being subject to accidental error. by Mr [illegible].

$ax+b-y=0$ if x is free from error.

$[x^2]a+[x]b-[xy]=0$ } are normal
$[x]a+nb-[y]=0$ } equations

$\frac{1}{a}y-\frac{b}{a}-x=0$ if y is free from error.
$[y^2]\frac{1}{a}-[y]\frac{b}{a}-[xy]=0$ normals.
$-[y]\frac{1}{a}+n\frac{b}{a}+[x]=0$

n = number obsns. Wt. of values of x is g, of y, unity

$$\frac{g+a'^2}{(a'-a)^2}\left[(ax_1+b-y_1)^2+(ax_2+b-y_2)^2+\dots\right]=\text{a minimum}$$

$$a^2[xy]-a^2b[x]-a[y^2]+2ab[y]-nab^2+ga[x^2]-g[xy]+gb[x]=0$$
$$a[x]+nb-[y]=0$$
= normals.

Eliminate b and

$$a^2+\frac{ng[x^2]+[y]^2-g[x]^2-n[y^2]}{n[xy]-[x][y]}a-g=0 \quad (11)$$

One of these values of a is a max, other a min.
then $b=\frac{[y]-a[x]}{n}$

Oct. 23, 1891.

If $x = 6 \ 7 \ 7 \ 8 \ 8 \ 8 \ 9 \ 9 \ 10$ be readings of
$y = 7 \ 7 \ 8 \ 7 \ 8 \ 9 \ 8 \ 9 \ 9$ two thermometers

$g = 1$, $n = 9$, $[x] = 72$ $[y] = 72$, $[x^2] = 588$,
$[y^2] = 582$, $[xy] = 582$. Substit in (11) gives

$$a^2 + a - 1 = 0$$

$a = +0.618$ or -1.618 former being condition for minimum. Then $b = +3.056$ ∴ most-probable value relation of two scales is $y = 0.618\,x + 3.056$

Let a_1 be value of a when x held as exact
" a_2 " " " " y " " "

Then from (11) coef of $a = \frac{g}{a_1} - a_2$ and (11) becomes

$a^2 + \left(\frac{g}{a_1} - a_2\right) a - g = 0$. from which a may be computed if a_1 and a_2 are first found. Then this g may be computed when a is known.

Feb. 24, 1891.
Eclipses Jupiter's Satel.

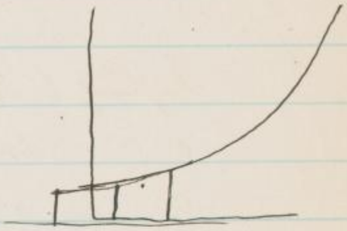
Mag.	Coef.	I										
c		Re.	Dir.	Mean	Obs.			1.1c		Obs. +15.2	11.5c	
0.0												
.5	1.211	43.7	48.1	45.9	125.2	169.5	141.3	133.2	-8.0	140.4	139.3	+1.1
1.0	.840	26.1	25.6	25.8	179.3	117.6	8.3	92.4	-13.1	94.5	96.6	-2.1
1.5	.613	16.8	19.1	18.0	53.5	85.8	32.3	67.4	-13.9	68.7	70.5	-1.8
2.0	.431	13.2	13.6	13.4	35.5	60.3	24.8	47.4	-11.9	50.7	49.6	+1.1
2.5	.314	10.3	11.1	10.7	22.1	44.0	21.9	34.5	-12.4	37.3	36.1	+1.2
3.0	.228	7.3	9.0	8.2	11.4	31.9	20.5	25.1	-13.7	26.6	26.2	+0.4
3.5	.167	2.5	4.0	3.2	3.2	23.4	20.2	18.4	-15.2	18.4	19.2	-0.8
4.0	.122				0	17.1	17.1	13.4	-13.4	15.2	14.0	+1.2
∞	.000											

Mag.	Coef.	Obs. +15.2	11.5c	O-C
0.0	2.000	~~140.4~~	230.0	"
.5	1.211	140.4	139.3	+1.1
1.0	.840	94.5	96.6	-2.1
1.5	.613	68.7	70.5	-1.8
2.0	.431	50.7	49.6	+1.1
2.5	.314	37.3	36.1	+1.2
3.0	.228	26.6	26.2	+0.4
3.5	.167	18.4	19.2	-0.8
4.0	.122	15.2	14.0	+1.2
∞	.000	"	0.0	"
				$\frac{5.0-4.7}{8}$
				±1.2

+1.1
-2.1
-1.8
+1.1
+1.2
+0.4
-0.8
+1.2

Feb. 24. 1891.

Error in grouping values of x only.



$y = mx^2 + nx + p$

$4ma^2 + 2na + p$ $\quad 4na^2 + 2na$ $\quad 8ma^2$

p $\quad -4na^2 + 2n$

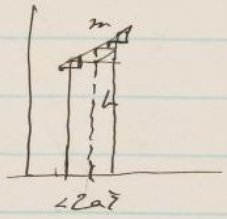
$4ma^2 \mp 2na + p$

$$\int_{-a}^{a} \frac{y\,dx}{dx} \quad \frac{mx^2dx + nxdx + pdx}{x} = \frac{\frac{1}{3}mx^3 + \frac{1}{2}nx^2 + px + c}{x}$$

$$\frac{1}{3}ma^3 + \frac{1}{2}na^2 + pa + c$$
$$-\frac{1}{3}na^3 + \frac{1}{2}na - pa + c$$

$$\frac{\frac{2}{3}ma^3 + 2pa}{2a} = \frac{1}{3}ma^2 \cancel{+p}$$

Feb. 25. 1891.



$b + am$

$b - am$

$a^2m \times \frac{1}{2}a$ $\qquad \frac{\frac{1}{2}a^3m\,\cancel{b}}{2ab}$ ~~[illegible]~~

$\frac{1}{4}\,\frac{a^2m}{b}$

$\frac{a^2m}{4b} =$ corr.

$2mp^2$

Feb. 28, 1891.

	Read. I.	Dis. I.	Read. II.	Dis. II.							
.0									2.000		
.5	44.3	46.7	43.8	43.3	147.8	~~164.2~~ 159.2	174.3	174.9	1.211		
1.0	26.7	26.0	28.1	31.1	103.5	112.5	130.5	131.6	.840	.371	
1.5	17.1	22.0	21.8	23.1	76.8	~~91.5~~ 86.5	102.4	100.5	.613	.227 .182	
2.0	12.8	14.0	15.0	18.6	59.7	64.5	80.6	77.4	.431	.117	
2.5	12.7	14.3	18.0	16.1	45.9	50.5	65.6	58.8	.314	.086	
3.0	9.2	11.2	17.6	12.7	33.2	39.2	47.6	42.7	.228	-.061	18
3.5	5.3	7.0	13.5		24.0	28.0	30.0	30.0	.167	.045	13
4.0	8.7	11.0	9.0		18.7	21.0	16.5		.122	.032	8
4.5					10.0	10.0	~~7.0~~ 7.5		.090	.024	6
									.066	.018	5
	136.8	154.2	166.8	144.9					.048	.012	
	125.73	133.87	192.7	165.1					.036		

13.68 | 1.211
1211 | 1
15

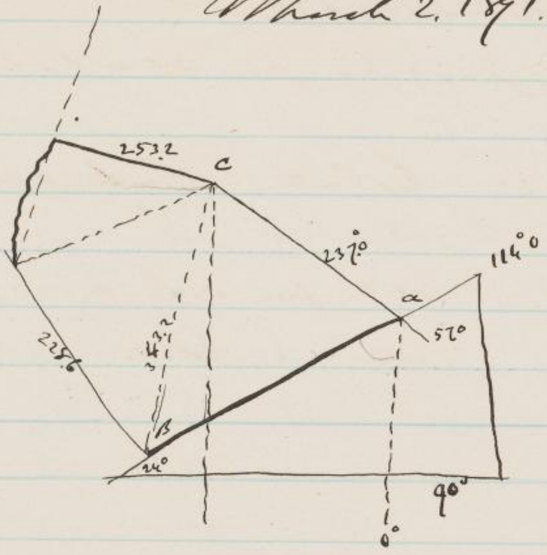
13.68 | 1.089
13.69 | 109
109 | 125.6
279
218
610
545
650

	Read. III	Dis. III			
0	115.5	125.5	407.5	453.1	.5
5	71.3	80.1	292.0	327.6	1.0
10	59.4	57.5	220.7	247.5	1.5
15	37.6	57.2	161.3	190.0	2.0
20	31.6	31.7	123.7	138.8	2.5
25	21.7	28.7	92.1	107.1	3.0
30	14.4	14.4	70.4	78.4	3.5
35	16.0	24.5	56.0	64.0	4.0
40		20.5	40.0	39.5	4.5
45		9.0		19.0	5.0
50				10.0	5.5

363.3
1211

144 | 105
288 | 274
210
780
735
450

March 2, 1891.



a = 56.0 57.0 57.4
β = 114.6 114.8 114.6
c = 163.8 162.8 163.0

168

~~343.2~~
163.2
294.0
457.2
228.6

57.0

106.8
57.0
163.8

253.2
237.0
16.2
163.8

68
114
50

270
253.2
16.8

March 18. 1891.

Estimate Photogravure Co. for reprod. of Ch

40 charts 17×28 Gelatine Plate [illegible]

5 to 8 prints $5.00 per subject.
100 each   13.00 " plates

March 30, 1891..

	λ 4123					1h.	2h.	3h.	4h.
F	486.15	~~90.8~~ 5.85	67 .88	6.712	90.871	181.742	272.613	
f								
G	434.07	4.83	.49 .986	4.901	99.986	199.972	299.916	
h	410.18	2.32	.37 .63	3.737	105.621	211.242	316.863 ~~633.726~~	
H	397.02	1.88	2.9 .65	2.937	109.640	219.280	328.920	
K	~~388.92~~							
α	388.92	1.88	2.3 .82		112.811	224.622	338.433	
β	383.56	0.94	1.7 .55+		115.539	231.078	346.617	

r	λ	
9.0	492.0	6.7
9.1	485.3	6.5
9.2	478.8	6.3
9.3	472.5	6.1
9.4	466.4	5.9
9.5	460.5	57
9.6	454.8	5.5
9.7	449.3	53
9.8	444.0	51
9.9	438.9	49
100	434.0	47
101	429.3	45
102	424.8	43
103	420.5	4.1
104	416.4	39
105	412.5	37
106	408.8	
107		

		35
107	405.3	33
108	402.0	31
109	398.9	29
110	396.0	27
111	393.3	25
112	390.8	23
113	388.5	21
114	386.4	19
115	384.5	17
116	382.8	

$$\lambda = r + \alpha_1 n + \frac{n(n-1)}{2}\alpha_2$$

$$\alpha_1 n + \frac{1}{2}n^2\alpha_{11} - \frac{1}{2}n\alpha_{11} = \lambda - r$$

$$n^2 = n\cancel{\alpha_{11}} + \lambda - r - \alpha_1 n$$

$$\frac{1}{2}n^2\alpha_{11} = \frac{1}{2}n\alpha_{11} - \alpha_1 n + \lambda - r$$

$$\cancel{n^2 = n\left(1 - \frac{2\alpha_1}{\alpha_{11}}\right)}$$

$$n^2 = n\left(1 - \frac{2\alpha_1}{\alpha_{11}}\right) + \frac{2}{\alpha_{11}}(\lambda - r)$$

$$n = \frac{1}{2}\left(1 - \frac{2\alpha_1}{\alpha_{11}}\right) \pm \sqrt{\frac{2}{\alpha_{11}}(\lambda - r) + \left(1 - \frac{2\alpha_1}{\alpha_{11}}\right)^2}$$

$$n = \frac{1}{2}(1 - \alpha_1) \pm \sqrt{(\lambda - r) + (1 - \alpha_1)^2}$$

90.9 = 492.0 - 6.03 +.009

492.0 - 3.45 + .025
.025
3.45
488.55
.05

492.0
3.4
488.6
488.55

492.0
- 3.35
488.65
+ .025
488.675

99.493
2
19.899
24.8
4.901

105.32
210.63
24.8
2320 | 3737
22422 621
7780
7474
3060

1 1
2 4 3 5
3 9

1 + 1.5 ~~2~~ .25 = 2.25

492.009
6.03
485.979
485.98
6.15
.17 | 66
3

109.325
21.865
24.8
188 | 2.935
376 | 587

112.41
224.82
24.8
~~24.8~~
2.318

188 | 2318
18815 | 232
.811

492.0
488.575
485.3

3.425
3.275 150
3.125 150
2

67
87
46.9
536
58.29

492.013
5.829
486.184
486.15
.033

115.53
115.27
230.55
24.8
94 | 1.745
188 | 349
539

$a + \frac{1}{2}b$
$a^2 + ab + \frac{1}{4}b$

492.0
488.675
485.3

3.375
3.375

$\lambda = r + d_1 n + \frac{n(n-1)}{2}$

99
99
10.89
5.85
16.74

90.87

$n^2 - n + d_1 n = \lambda - r$

$n^2 + n(d-1) = \lambda - r$

$n^2 + n(d-1) + \frac{1}{4}(d-1)^2 = \lambda - r + \frac{1}{4}(d-1)^2$

$n = -\frac{1}{2}(d-1) \pm \sqrt{(\lambda - r) + \frac{1}{4}(d-1)^2}$

$n = -\frac{1}{2}6.6 \pm \sqrt{5.85 + 3.3^2}$

$-3.3 \pm \sqrt{16.74}$

-3.3 ± 4.09 $n = 7.39$

~~r 90 = a 6.8 + b~~
~~100 = a 4.8 + b~~
~~-10 = 2a a = -5~~
~~90 = -34 + b, b = 124~~
~~100 = -24 + 124~~
~~r = -5~~

585 | 67
536 | .88
490

585 | 6712
53696 .871
48.040
46984
10560

r = 90.44
18.088
24.8
6.712

6.8 = a 90 + b
4.8 = a 100 + b 15.2
2.0 = -10a a = -0.2
b = 15.2

$dr = -0.2r + 24.8$

April 3. 1891.

Mean readings

	29 β aβe.	11 ζ aβe	12 β βeD	ζ βeD	11 β aβeD	14 ζ aβeD,	Cat	82 β βe.
A	90.782		90.510				90.871	90.675
f	97.125	97.119	97.037	97.108	97.110			$\overset{7.0}{9\cancel{6.5}54}$
G	100.000	100.000	100.000	100.000	100.000	10	99.986	100.000
h	105.787		105.949	105.836	105.826		105.621	105.906
H	109.580		109.867	109.665	109.656		109.640	109.789
K	110.723		110.024	110.807	110.810			110.947
α	112.[illegible]81		112.559	112.297	112.315		112.811	112.427
β			114.450					

A	-.089		-.361					-.796
f								
G	+.014	+.014	+.014	+.014	+.014		~~-.014~~	+.014
h	+.166		+.328	+.215	+.205		~~[illegible]~~	+.285
H	-.060		+.227	+.025	+.016			+.149
K								~~-.284~~
α	-.630		-.252	-.514	-.496			-.344

		β.e. β.	
A	69	12.959	81.150
f		5.891	94.109 100.000
G		11.813	111.813
h		7.765	119.578
H		2.316	121.894
K		2.960	124.854
δ			

April 5, 1891

Results found by subtracting β. βCD.

	aβc	aβc.	βcD	aβCD	aβc.	βc		
A.	+.272	–	1	–		+.065 ~~[illegible]~~	9.22	9.49
f	+.086			+.071		+.015 ~~[illegible]~~	2.98	2.96
G	.000			.000		.000	00	00
h	-.162			-.123		-.043	5.79	5.95
H	-.287			-.211		-.078	9.58	9.87
K	-.301 ~~[illegible]~~			-.214		-.077	10.72	11.02
α	-.378			-.244		-.132		12.56
β								

	×29	×21	8
A	+.275	..	-.076
f	+.086	+.062	+.024
G	.000	.000	.000
h	-.173	-.125	-.048
H	-.290	-.210	-.079
K	-.320	-.231	-.088
α	-.364	-.264	-.100

				Mean.	[illegible]
A	-.003	..	-.011	-.005	90.505
f	.000	+.009	-.009	.000	97.039
G	.000	.000	.000	.000	100.000
h	+.011	+.002	+.005	+.004	105.953
H	+.003	-.001	+.001	+.001	109.868
K	+.019	+.017	+.011	+.012	111.036
α	+.014	+.020	-.032	.000	112.559

April 5, 1891.

90.	490. 492	489.05	636	491.0	66
91		482.69	617	484.4	64
2		476.52	598	478.0	62
3		470.54	579	471.8	60
4		464.75	560	465.8	58
5		459.15	541	460.0	56
6		453.74	5.22	454.4	54
7		448.52	5.03	449.0	52
8		443.49	4.84	443.8	50
9		438.65	4.65	438.8	48
100	434. 434	434.00	~~5.36~~ 4.46	434.0	46
1		429.54	~~5.17~~ ~~49~~ 4.27	429.4	44
2		425.27	~~4.98~~ 4.08	425.0	42
3		421.19	~~4.79~~ 3.89	420.8	40
4		417.30	4 3.70	416.8	38
5		414.60	3.51	413.0	36
6		411.09	3.32	409.4	34
7		407.77	3.13	406.0	32
8		404.64	2.94	402.8	30
9		401.70	2.75	399.8	28
110.	397. 396	398.95	2.56	397.0.	

April 29, 1891

	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45;	45–50			
I D	46.7	26.0	22.0	14.0	11.3	11.2	7.0				s 123	120.0
R	44.3	26.7	17.1	13.8	12.7	9.2	5.3			240	117	114.6
II D	43.1	31.1	23.1	18.6	16.1	12.7					134	132.0
R	43.8	28.1	21.8	15.0	18.0	17.6	13.5	9.0		263	129	126.7
III D	98.3	59.6	37.9	33.5	24.0	21.3	10.4	12.0	7.5	9.0	258	253.3
R	93.3	56.7	42.7	28.8	22.7	21.9	13.2	13.0		506	248	244.2
IV D	108.8	76.4	77.7	57.6	40.8	40.0	24.0	35.0	16.0		367	361.3
R	101.4	72.4	53.8	52.8	25.3					682	315	309.7
	579.7	377.0	298.1	236.1	170.9							1661.8
c	.371	.227	.182	.117	.086	.061	.045	.032	.024	.018		.983
O	.343	.223	.176	.139	.104	9.7	6.1	6.6	3.6	3.5		
O-c	~~+~~ −.038	~~+~~ −.004	~~+~~ −.006	+.022	+.015	+.036	+.016	+.034	+.012	+.017		

I D	38.0	21.1	17.9	11.4	9.2	9.1	5.7			
R	~~36.0~~ 37.9	22.8	14.6	11.8	10.9	7.9	4.5			
II D	32.2	23.2	17.2	13.9	12.0	9.5				
R	34.0	21.8	16.9	11.6	14.0	13.6	10.5	7.0		
III D	38.1	23.1	14.7	13.0	9.3	8.2	4.0	4.7	2.9	3.5
R	37.6	22.9	17.2	11.6	9.2	8.8	5.3	5.2		
IV D	29.6	20.8	21.2	15.7	11.1	10.9	6.5	9.5	4.4	
R	32.2	23.0	17.7	17.4	8.0					
	279.6	18.7	57.4	26.4	83.7	68.0	36.5	26.4	7.2	3.5
	37.4	22.3	17.2	+0.3	~~10.6~~ 10.5	9.7	6.1	6.6	3.6	
	+3.7	−1.2	+0.3	−2.5	−0.9	−0.6	−0.4	~~+0.4~~	..	..
	+3.6	+0.5	−3.0	−2.1	+0.8	−1.8	−1.6	~~+0.9~~	..	..
	−2.1	+0.9	−0.4	0.0	+1.9	−0.2	..	~~+1.2~~	..	..
	−0.3	−0.5	−0.7	−2.3	+3.9	+3.9	+4.4	~~+2.9~~ +0.4	..	..
	+3.8	+0.8	−2.9	−0.9	−0.8	−1.7	−2.1	−1.9	−0.7	0.0
	+3.3	+0.6	−0.4	−2.3	−0.9	−0.9	−0.8	−1.4	..	..
	−4.7	−1.5	+3.6	+1.8	+1.0	+1.2	+0.4	+2.9	+0.8	..
	−2.1	+0.7	+0.1	+3.5	−2.1	..	..	..	..	..

April 30 1891

	Obs.		Cal.
0			
5			
10	34.3	37.4	371
15	22.3	22.3	227
20	17.6	17.2	182
25	13.9	13.3	117
30	10.1	10.5	086
35	9.7		061
40	6.1		.045
45	6.6		.032
50	3.6		.024
55	3.5		.018

	C.	Log light	light	O	O-C
0	2000	0.00	1.000		
5	1211	9.8	.631	1.216	+.005
10	.840	9.6	.398	.842	+.002
15	.613	9.4	.257	.619	+.006
20	.431	9.2	.158	.447	+.016
25	.314	9.0	.100	.314	.000
30	.228	8.8	.063	.209	-.019
35	.167	8.6	.040	.112	-.055
40	.122	8.4	.025	.051	-.071
45	.090	8.2	.016	-.015	-.105
50	.066	8.0	.010	-.051	-.117
55	.048	7.8	.006	-.086	-.134
60	.036	7.6	.004		

May 6 1891

At 7^h 8^m 15^s, Puffer felt the house shake as with an earthquake lasting 10 – 15 seconds. No motion perceptible but motion shown by sound like rattling of many wagons. Mrs Fleming found motion very perceptible

May 2, 1891.

$.631 = a\,1.211 + b$

$.398 = a\,.840 + b$

$.233 = a\,.371 \qquad a = +.628$

$b = -.1295$

$y = +.628\,x - .130$

$650.0 = a\,1.211 + b$

$114.5 = a\,\overset{.840}{\cancel{.371}} + b$

$.355 = a\,.371$

$.2330 / .371$
2226 628
1040
742
2980
2968

.628
1211
628
628
1256
628
.760508
.631
b = .1295

628
84
2512
5024
.52752
398
1295

May 3. 1891.

Mag	Log	Light	1-light	Log(1-light)			Mag				
.05	9.98	95.50	4.50	8.653	291	1.347	3.37	73	248	1.752	126
.1	9.96	91.20	8.80	8.944	167	1.056	2.64	42	374	1.626	93
.15	.94	87.10	12.90	9.111	115	.889	2.22	28	467	1.533	74
.2	.92	83.18	16.82	.226	87	.774	1.94	22	541	1.459	65
.25	.90	79.43	20.57	.313	70	.687	1.72	18	.606	1.394	58
.30	.88	75.86	24.14	.383	57	.617	1.54	14	664	1.336	47
.35	.86	72.44	27.56	.440	49	.560	1.40	12	711	1.289	46
.4	.84	69.18	30.82	.489	42	.511	1.28	11	757	1.243	40
.45	.82	66.07	33.93	.531	36	.469	1.17	9	797	1.203	38
.5	.80	63.10	36.90	.567	32	.433	1.08	8	835	1.165	35
.55	.78	60.26	39.74	.599	29	.401	1.00	7	.870	1.130	34
.6	.76	57.54	42.46	.628	26	.372	.93	7	904	1.096	35
.65	.74	54.95	45.05	.654	23	.346	.86	5	939	1.061	28
.7	.72	52.48	47.52	.677	21	.323	.81	6	967	1.033	
.75	9.70	50.12	49.88	.698		.302	.75				

The above table serves to determine the [illegible] corresponding to any small change in brightness of J. satellites. Thus the distance from the central point (when satellite is one half eclipsed) is same for dimin of light of $\overset{m}{0.1}$ and $\overset{m}{2.64}$ of $\overset{m}{.05}$ and $\overset{m}{3.37}$

30103

.7526

May 24. 1891.

.1	.81	.56	1.016	9.748	~~9.764~~	~~.560~~	.764	.581	
.2	.93	.50	.694	.699	~~.393~~	~~.500~~	.393	.247	
.3	1.08	.43	.497	.634		~~.430~~	.131	.135	.107
.4	1.28	.37	.351	.568		~~.370~~	.919	.0829	.085
.5	1.54	33	.233	.518		~~.330~~	.751	.0564	.073
.6	1.94	.28	.132	.447		~~.280~~	.579	.0379	.066
.7	2.64	.20	.043	.301		~~200~~	.344	.0221	062
.75									

May 31 1891

		$\frac{1}{a}$	$\log \frac{1}{a}$	$\log \frac{I_1}{1-I_1}$			
.1	2.64	.20	9.301	1.016	0.317	2.07	
.2	1.94	.28	.447	.694	.141	1.38	
.3	1.54	.33	.518	.497	.015	1.04	107
.4	1.28	.37	.568	351	.919	.83	85
.5	1.08	.43	.634	.233	.867	.736	73
.6	.93	.50	.699	.132	.831	.678	66
.7	.81	.56	.748	.043	.791	.618	62
.75	.75	.60	.778 ~~.875~~	.000	.778 ~~.875~~	.60	~~60~~
~~9~~							

September 18, 1891.

End of spectrum given first in tables and to left in plates.

Author.	Table	Plates.
Kirchhoff	red	blue ~~red~~.
Angstrom		blue
Roscoe.		
Schellen.		
Salet:	red.	
Scheiner	blue	
Kayser	~~b~~red.	
Watts	red.	
Capron.		red.
Rowland		blue
Liveing Dewar $\frac{1}{\lambda}$		blue

Sept. 20. 1891

Constants employed in determining orbit of β Aurigae

5.47692 Velocity of light 299.860 Kms. Newcomb. Young's Astron. ~~5.47692~~ 392

5.47694 " " 299.877.64 Km. Harkness. ~~5.47694~~ 142

Parallax of Sun 8."848. Nautical Alm.

8.86 French Alm.

8.783 ± 0.015

0.9441 8.793 Vel. Light.

0.9449 8.809 ± 0.005 Harkness 140

0.9445 8.80

							Km.
Wavelengths	F	486.15		2.68677	2.7902	617.
	Mg.	448.13		2.65140	2.8255	669
	G.	434.07		2.63756	2.8393	691
	h	410.18		2.61297	2.8639	731
	H	397.02		2.59881	2.87811 3755	755
	"	396.86	Ca. Row. 396.86 Hale	2.59864	2.8783	756
	K	393.38	Ca. Row. 393.39 "	2.59482	2.8821	762
	α	388.92		2.58986	2.8870	771 82
	β	383.56		2.58383	2.8931	779

~~$v : \lambda = 1$~~

$\lambda : 1 = V \div v$

Sept 22. 1891.

Cost of large telescopes

	Ap.	Obj.	Photo-lens.	Stand.	All.
Lick	36	50	13	46	111
Pulkowa	30	32			
Washn	26				46
McCorm	"				38 gold
Princeton	23				28.
Denver,	20	11 [illegible]			

Washington new mounting. Polar axis. 7' long. 9$\frac{1}{2}$ in. dia.
Dec " 6' 3$\frac{1}{2}$" 8$\frac{3}{16}$ " "

Sept-27. 1891

Ephemeris of β Aurigae by formula =

J.D. 2411733.00 + 3.984 E.

199.2.

3.984	1
19.92	5
39.84	10
199.2	50
398.4	100
1992	500

	E			
1885 July 18	0	2,409,741.00		2409.741.00
	50		.	9.940.20
	100	10,940.2		10,139.40
			.	10,338.60
	200		9.4	10,537.80
			.	10,737.00
	300		8.6	10.936.20
			.	11,135.40
	400		4.6	11,334.60
			3.8	11,533.80
1891 Jan. 0	500	2,411,733.00		11.733.00
				11,932.20
1892 Feb. 2	600			2,412,131.40
				12,330.6
	700			12,529.8
				12,729.0
	800			12,928.2
				13,127.4
	900			13,326.6
				13,525.8
	1000			13.725.00
				13924.2
	1100			14123.4
				14322.6
	1200			14521.8
	1250			14721.0

$12\,|\,\underline{3.984}$
.332

Dec 27 1891.

Time Service
T. Bell
[illegible]

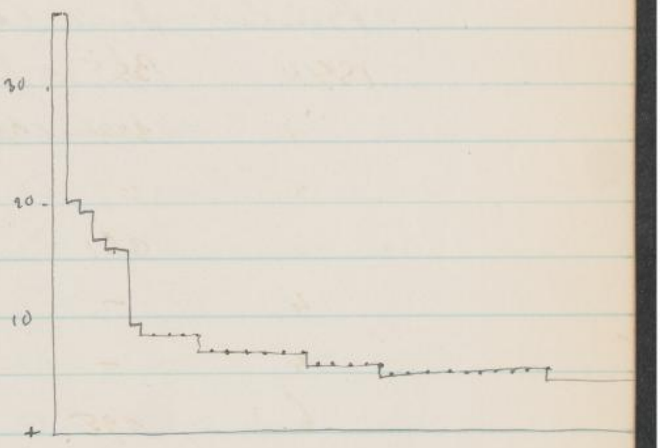
av. err. [illegible] 10 Ch. [illegible]

1880	355		10					
1	322	35 days absent	8					
2	357		6					
3	361		4					
4	–		–					
5	–		–					
6	295		18					
7	289		24	0.30	0.26	0.19	21	
8	286		27	.32	.33	.18	24	
9	290		.23 ~~22~~	.32	.27	.23	29	520
1890	286		.327	.42	.37	.38	24	700
1								
2								

March 11 1892

No of articles in various Publications
Astron. Soc. of the Pacific

Harvard College	36
Greenwich	20
Washington	19
Paris	17
Pulkowa	16
Rio Janeiro	16
Leipzig	9
4	8
6	7
5	6
10	5



April 17. 1892.

Mr 36 Certain Indian & Early Volumes Annals HCO.

Notes New Building

Bricks	Perth Amboy	$50–60	a thousand	Hastings
"	Hand Molded	$20	" "	Dane Hall
"	Waterstruck	$13	" "	College Infirmary
"	"	"	" "	Jeff. Phys. Lab.

July 26. 1893.

Mr. Dunn finds that the ~~[illegible]~~ value of n had a marked annual variation during 1890 – 92

	dn	n	Temp.	Wash.	Curve n	O–C		
			15th	°	100	s	s	°
Jan	+.074	.000	24°.1	27	~~±.010~~	+.100	+.10	+5.0
Feb	–.007	+.074	25.8	25	+.060	+.014	+.01	
Mar.	–.100	+.067	32.5	29	+.100	–.033	–.03	
Apr.	–.177	–.033	44.6	38	±.020	–.013	–.01	
May	–.201	–.210	54.7	50	–.160	–.050	–.05	
June	–.181	–.411	65.9	60	–.400	–.011	–.01	
July	–.196	–.592	70.7	68	–.600	+.008	+.01	
Aug.	+.001	–.788	68.5	69	–.760	–.028	–.03	
Sept.	+.113	–.787	60.6	64	–.780	–.007	–.01	
Oct.	+.167	–.674	49.9	55	–.680	+.006	+.01	
Nov.	+.141	–.507	39.6	45	–.500	–.007	–.01	
Dec.	+.150	–.366	30.3	35	–.300	–.066	–.07	
		–.216					$\frac{13-22}{12}$	
							±.03	

1° = .02 s

From the above table we may infer:- first that the value of n diminishes .02 s for every 1° that the temperature increases, assuming that the temperature of the instrument is that of the air one month previously. The average value of the monthly residuals is thus reduced to ±.039 s, or ±1°.5. Omitting the values for Dec. and Jan. which are large and have opposite signs these values are reduced to one half to ±.015 s and ±0°.8

Nov. ~~28~~ 27. 1893

July 30. 1893.

Fourth Ann.
Plan Annals.
Letter Monthly Notices p 509 A.A.B. 425
Publications. ask H.C.O.

Jan 5. 1894

Anderson's Variable in Andromeda A. Th 134,4165

O-C

Approx. Max. Sept. 10 '55 JD 2398,837 8487 8873 -36
" " Dec. 5 '78 " 2407.324 4756 7303 +21
12080 80 0
360 61
630 32
910 13

Sept 7, '55 -39 9.0
Sept 10 '55 -36 8.3
Nov 29 '78
Dec 11 '78

8487 | 4756
4756
3731 | 4756
3731
1025
3
3075
656

4756 | 280
28 17
195
196

8487 | 280
84 3
87

13243 | 47
94 281
384
376
83

281
30
8430

281
17
1967
281
4777

2412080
.4777
2407303
8430
2398873

8873 / 57

Oct. 16 '55
Nov. 14 '78

Sept 7	1855	9.0		2398893	242 -39	10.3	+1.3	10.2	-1.2	10.3	-1.3
" 10	"	8.3		"	245 -36	10.1	+1.8	10.1	-1.8	10.2	-1.9
Nov 29	1878	8.7	7318	2407303	+15	9.5	+.8	9.4	-.7	9.7	-1.0
Dec 11	1878	8.7	7330		+27	10.0	+1.3	9.9	-1.2	10.1	-1.4
Nov 2	1891	10.4	2039	2080	239 -41			10.2	+.2	10.4	0
" 27	"	9.3	2064	"	265 -16			9.3	0	9.5	-2
Dec 13	"	9.2	2080	" ~~2080~~	0			9.2	0	9.3	-1
Oct 24	1892	10.6	2396	361	+35			10.2	+4	10.4	+2
Nov 6	"	11.1	2409	"	+48			10.9	+2	11.0	+1
" 13	"	11.4	2416	"	+55			11.2	+2	11.3	+1
Sept 13	1893	12.3	2720	632	+88			12.3	0	12.4	-1
Jan 2	1894	12.3	2830	913	-83 198			11.9	+4	12.3	6

0	9.2
35	10.6
48	11.1
55	11.4
88	12.3
198	12.3
239	10.4
265	9.3

13
18
8
13
52
13

2398893
5
2398888
281
2,398,607
8711
2407318
4777
2095

281
31
281
843
8711
4777
13488

281
17
1967
281
4777

281
48
2248
1124
13488
98607
2,402,095

~~2398,888 + 281 E~~
2398.607 + 281 E

2,402075
13,488
2388,587
8711
2397,298
4777
2.095

1513
1794
207.5
281
2356
281
2637
2918

Length Curve

D																						
0	9.2				9.2		9.3				9.3				9.3				9.3		9.2	
		3		3		4		5		5		5				5				5		6
20	9.5		9.6		9.6		9.8				9.8				9.8				9.8		9.8	
		12		10		9		10		9		9				9				8		9
40	10.7		10.6		10.5		10.8		10.7		10.7				10.7				10.6		10.7	
		9		9		9		9				9				9		8		9		9
60	11.6		11.5		11.4		11.7		11.6		11.6				11.6		11.5		11.5		11.6	
		5		6		7		6				6		7		7		7		7		6
80	12.1		12.1		12.1		12.1		12.2		12.2		12.3		12.3		12.2		12.2		12.2	
		5				5		4				5		5		5		5		5		6
100	12.6				12.6		12.7				12.7		12.8		12.8		12.7		12.7		12.8	
		2				3		2				3		2		2		3		3		
120	12.8				12.9		12.9				13.0		13.0		13.0		~~12.9~~ 13.0		13.0			
		2				1		-1				2		0		0		2		2		
140	13.0				13.0		12.8				13.2		13.0		13.0		13.2		13.2			
		2				-2		4				-1		2				0		0		
160	12.8				12.8		12.4				13.1		13.3		13.3		13.2		13.2			
		4										3		5		4		3		3		
180	12.4				12.4						12.8		12.9		12.9		12.9		12.9			
		6										6		7		7		7		7		
200	11.8				11.8		12.2				12.2		12.2		12.2				12.2			
		8						9				9				9				9		
220	11.0				11.0		11.3				11.3		11.3		11.3				11.3			
		8						9				9				9				9		
240	10.2				10.2		10.4				10.4		10.4		10.4				10.4			
		7						8				8				8				8		
260	9.5				9.5		9.6				9.6		9.6		9.6				9.6		9.5	
		3										3				3				3		
280																						

9.2					
	1				
9.3					4
	3				
9.6					
	6	5			
10.2			10.1		10
	6			5	
10.8			10.6		
	3	5		5	
11.1			11.1		9
	4				
11.5					
	3				
11.8					6
	3				
12.1					

Jan 6. 1894.

Anderson's Var.

9.0

$\frac{d}{25} = \frac{281-d}{27}$

$27d = \overset{\times 25}{281} - 25d$

$25 \times 281 = 52d$

7025 | = 52d

52 | 135

182 | 146

156

265

260

5

135 / 25 = 5.40 mag

146 / 27 = 5.41

135

110

108

20

9.0

14.4

∴ Max 9.0

Min 14.4 135 days later.

Jan 7 1894

Mean [illegible]

29
58
87
116

1892		c		G	G−c			
Mar 4	5.86	5.4	+46					
5	6.14	5.7	+37					
7	6.26	6.3	−04	62	0	6.30 58	6.3	−1
9	6.81	6.9	−09	68	−1	.88 87	6.9	−2
12	7.84	7.8	+04	78	0	.75 58	7.8	−1
14	8.27	8.4	−13	84	0	.33 29	8.3	−1
15	8.54	8.7	−16	85	~~+2~~	.62 116	8.6	+1
19	9.71	9.9	−19	97	~~+2~~	.78 87	9.8	+1
21	10.46	10.5	−04	10.5	0	~~.79~~ 10.65	10.6	−1
24	11.69	11.4	+29	117	+3	87 1.52	11.5	+2
25	11.98	11.7	+28	120	+3	29 1.81	11.8	+2
26	12.18	120	+18	122	+2	12.10		+1
28	12.82	126	+22	128	+2	1268		+1
29	12.80	129	−10	128	−1	1297 29		−2
30	13.18	13.2	−02	132	0	13.26		−1
31	13.30	13.5	−20	133	−2 ~~+2~~	13.55		−3
					10−8 / 14			8−12 / 14
					±.13			1

93
229 | 8
27

24 days 70
29
216
48
696

18×29
630
522
1152

7	6.26	6.30 58	−4
	6.81	6.88 87	−7
	7.84	7.75 58	+9
	8.27	8.33 29	−6
	8.54	8.62 116	−8
	9.71	9.78 58	+7
	10.46	10.36 87	+19
	11.69	11.~~23~~ 11.52 29	+17
25	11.98	~~[illegible]~~ 29	+17
	12.18	11.81 58	
	12.82	12.39	
	12.80		
	13.18		
	13.30		

	O	C	
7	6.26	6.30	-04
8	6	6.61	
9	6.81	6.92	-11
10		7.23	
11		754	
12	7.84	785	-1
13		816	
14	8.27	847	-20
15	8.54	878	-24
16		909	
17		940	
18		971	
19	9.71	1002	-31
20		1033	
21	10.46	1064	-18
22		1095	
23		1126	
24	11.69	1157	+12
25		1188	
26	12.18	12.19	-1
27		12.50	
28	12.82	12.81	+1
29	12.80	13.12	-32
30	13.18	13.43	-25
31	13.30	13.74	-44

Feb. 28. 1894

A.A.S.	M. Club	[illegible]
Band, Moon Stars.	Arequipa Station, Clark	√H.C.O. from [illegible]
" ζ U. Maj.	" " Misti	√Arequipa Station
" Saturn.	13 inch [illegible]	Mt. Station Chachani
Chart	α Centauri.	Bruce Telescope
	47 Toucanae	√ [illegible] Draper.
	S. Cross.	~~Mott. S~~
Double stars.	η Carinae	Chart S. Cross.
	Spectrum.	" η Carinae.
~~AS~~ Type V	Nova Norma	Spectrum η Carinae
Distribution	κ Crucis	α Centauri
		Saturn.
Jupiter.		Jupiter
Saturn		Venus.
Neptune		Neptune.
Venus		√ Moon
Moon		√ [illegible] a
Variables		Nova Aurigae [illegible]
Russia		β Aurigae

Jan. 12. 1894.

Lantern Slides.

Station Cambridge
Arequipa
Misti.
Blue Hill.

Instruments: 15 inch Equat.
8 in Mer. Circ.
1st Merid. Phot.
Merid. Phots
Bache Telescope
Bruce Telescope
8 inch Draper.
Transit Photom.

Astron. Objects
Moon. Bond. half.
" " full
" Hyginus,
" Apennines
" Copernicus
Venus.
Jupiter
Saturn
Neptune and Satellite.
Trail a Pole.
Clust. ω Centauri.
" Neb. Orion.

Spectra. η Argus

β Aurigae
Nova Aurigae ο Ceti

Jan. 15. 1894.

Frontispiece. Spectrum of Argûs. 180" ✓
1 Southern Cross 180" ✓
5 ~~α~~ α Centauri. 10" ✓
7 or 7b 47 Tucanæ 10"
4a ~~η~~ η Argus cluster 180"
6 " " 10" +
3 { Large Magell Cloud.
4b Small Magell Cloud.
2 Trifid Nebula ✓
8 κ Crucis

Henry Draper Memorial. Examples. Charts Spectra.
Nebulae Gas. Objects having peculiar spectra.
Type V Variable Stars.
" IV Nova Aurigae
Var. Hy period Nova Normae Spectrum before after New Nova " Cure Chart before " after
Nova ζ U. Majoris
Flash light β Aurigae ✓ Frontispiece Spectrum of Carina
Resolution β Lyrae ✓ 1 S Cross
Spectrum of Argus ✓ 2 Trifid Nebula
" Clusters 3a Magell Cloud large
3b " " sm.
κ Crucis 3 others. 4a η Carinae 180
9 Clusters. 60
Nova Normae ✓6 η Carinae 10"
Var Star Spect. ✓7 α Centauri
Nova Aurigae ✓8 47 Toucani

April 1. 1894.
Lines in Spectra of Type V.

6564
5877
5848
5812
5693
5593
5472
✓ 5412
5284
5250
5131
5021
4940
F 4862
4786
✓ 4688
4652
4633
4615
✓ 4540
4441
G' 4340

May 21 1894.

Record of spectrum given [illegible] Tables and [illegible] Plates

Tables.		Plates.	
Measured λ	Deduced λ	Blue	Red.
	Kirchhoff		Fraunhofer
		Kirchhoff	~~Kirchhoff~~
		[illegible]	
[illegible]			
		Rowland	

May 30. 1894.

$X = \cancel{\tan}\ \alpha \sec \delta$ $Y = \delta - q$

$q = \delta \cos \alpha$

June 20. 1894.

Crown glass of new Bruce prism density 2.52
Ref. F line 1.5218 h 1.5297 diff. .0079

$\frac{.0079}{24} = \frac{.00033}{29} = 1.14$

$33/29 \; 1.14$
$\underline{29}$
$\;\;40$
$\underline{\;\;29}$
$\;110$

July 17. 1894.

Wavelengths Standard lines

Rowland Astr. Astrophys. XII p 321

	Arc	Sun.
K Ca	3933.809	3933.809
H Ca	3968.617	3968.620
H	3970.05	
F H		4861.496
Neb.	4959.02	
"	5007.05	

See page 123

Hale Deslandres
Astron Astrophys. XI. 602. 618. 713
Hale
822

Frost. 187

Sept 25. 1894

Speed of Trotting Horse World's Record

Boston Herald Sept 22. 1894

1880	Rarus	2	11¾
"	"		11¼
1881	Maud S.		10¾
"	"		10¼
1884	Jay-Eye-See		10
"	Maud S.		9¼
1885	"	"	8¾
1891	Sunol		8½
1892	Nancy Hanks		7¼
1893	"	"	4
1894	Alix		3¾

Oct. 16. 1894.

Index refrac: ordin. 1.67 extra 1.49

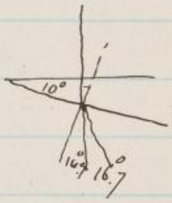
10° separ. 1°.8

C F

1.6584 1.668

.485 .491

1°.69 1°.77 1°.7



Hence with an angle of 10° the separ. will be about 1°.7

May 28, 1895

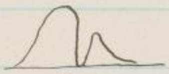
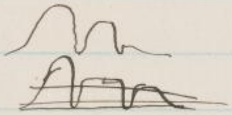
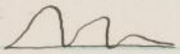
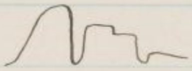
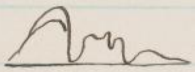
Identification of Stars near η Carinae B 7748

See Blk 4 & 40 for card – of B 9431

Star	V	H	RA	Dec.	3V	
337	12.8	20.1	10h 59.8m	−57° 25′	384	57 24
427	14.0	21.8	6.6	57 55	420	58 0
503						

June 1, 1895

Classification of Stars of Type IV (Provisional)

	Red Hβ Blue	
M_a		η Sagittarii
M_b		$12^{h}\,19^{m}.3$ $-48^{\circ}\,51$
M_c		+14° 2048
M_d?		20937
N_a.		20937

Selected List of Newspapers from J. H. Bates 38 Park Row N.Y.
Sept 1889

			Began	Circulation		
Ala	Mobile	M. Register d.w. Sun	1820	3500 6000 6000		
Cal.	San Francisco	Exam. d.w. Sun	1865	33,000 29,000 62,000		
Colo	Denver	Rep. d w Sun	1866	12,000 6,000 14,000		
Conn	New Haven.					
D.Col	Washington	Star	1852	29,000 d 3000 w		
Georgia	Savannah	News	1850	6500 10,000 7000		
"	Atlanta	Constitution	1868	12 000 120 000 20 000		
Ill.	Chicago	Herald	1878	60 000 d 75 000 w 75 000 S		
"	"	Inter Ocean	1872	45 000 d 12 000 sw 125,000 w 35 000 Sun.		
"	"	Staats Zeitung	1847	23,000 35,700 33,000		
		Times	1854	31,000 d 63 000 w 50 000 Sat 40 000 Sund.		
		Tribune	1846	45,000 d 60,000 w		
				d	w	~~Sun~~ Sun
Kentucky	Louisville	Courier Journal	1830	17000	100,000	25,000
Louis.	New Orleans	Picayune	1836	14,000	12000	18,000
"	"	Times Democrat	1863	17000	15,000	24,000
Mary.	Baltimore	American	1773	22000	22,000	32000.
	"	Sun	1795	30,000	12000	—
Mass.	Salem	Gazette.	1768	sw 1400	2200	—
	Springfield	Republican	1824	11,000	4,000	8000
	Boston	Advertiser (Record)	1811 1884	9000 30.000		
		Globe	1872	145,000 ~~60,000~~	40,000	145000
		Herald	1846	126,000		101,000
		Journal	1833	46,000		16,500
		Post	1784	12,000	5,000	~~5000~~
		Transcript	1830	12,000	3,000	~~3000~~
		Traveller	1824	15,000 sw 6000	15000	—
		Youth's Companion	1828	—	430,000	—
		Atlantic Monthly	1858	mo. 12,000		
Mich.	Detroit	Free Press.	1826	25,000	110,000	25,000

				d	w	Sun
Missouri	Kansas City	Times	1868	17,000	60,000	20,000
	St Louis	Globe Democrat	1852	44,000	80,000	70,000
		Republic	1808	45,000	87,000	40,000
N.H.	Manchester	Mirror	1851	2500	27,000	—
N.Y.	Elmira	Sunday Telegram	1879	—	—	125,000
	Brooklyn	Eagle	1840	47,000	48,000	—
	New York	Herald	1835	100,000	20,000	100,000
		Journal	1882	150,000	~~140,000~~	140,000
		News	1858	170,000	—	40,000
		Post – Nation	1801	15,000 sw 15,000	8,000	—
		Press	1887	75,000	15,000	—
		Sun	1833	m 90,000 ev 100,000	50,000	140,000
		Times	1851	60,000	30,000	65,000
		Tribune	1841	60,000	sw 20,000 120,000	65,000
		World	1860	m 200,000 e 85,000	85,000	260,000
		Frank Leslie	1835		45,000	
		" " (Germ.)	"		22,000	
		Harpers Weekly	1856		100,000	
		Illustrated News	1887		20,000	
		Judge	1881		75,000	
		Life	1882		35,000	
		Sci. Amer.	1845		40,000	
		N.Y. Weekly	1845		175,000 mo	
		Century	1870		185,000	
		Harpers	1849		185,000	
		Metropolitan	1885		500,000 !	
		N. Amer. Review	1815		50,000	
		Scribner	1887		100,000	

				d	w	Sund
Ohio	Cleveland	Leader	1847	35,000	35,000	25,000
	Cincin	Gazette	1840 1780	30,000	60,000.	40,000
		Enquirer	1842	55,000	50,000	75,000 Sat 50,000 Sun
	Toledo	Blade	1833	10,000	125,000	—
	Pittsburg	Dispatch	1846	30,000	10,000	48,000
Penn	Philada.	Item	1847	125,000	25,000	100,000
	"	Press	1857	50,000	32,000	90,000
	"	Public Ledger	1793	80,000		
		Record	1870	105,000		50,000
		Times	1875	75,000	25,000	55,000
R.I.	Providence	Journal	1818	27,574 8,874	54,750 1800	5,000
S.C.	Charleston	News	1803	7,500	4,000	7,500
Va	Richmond	Dispatch	1824	10,000	10,000	—
Wis.	Milwaukee	Sentinel	1839	15,000	15,000	18,000