

**RESULTS OF OBSERVATIONS OF THE FIXED
STARS MADE WITH THE MERIDIAN CIRCLE AT
THE GOVERNMENT OBSERVATORY MADRAS
IN THE YEARS 1883, 1884, 1885, 1886, AND
1887 UNDER THE DIRECTION OF THE LATE
NORMAN ROBERT POGSON, C.I.E., F.R.A.S.**

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Results of Observations of the Fixed Stars Made with the Meridian Circle at the Government Observatory Madras in the Years 1883, 1884, 1885, 1886, and 1887 Under the Direction of the Late Norman Robert Pogson, C.I.E., F.R.A.S. by C. Michie Smith

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C. MICHIE SMITH

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Vol 8

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NORMAN ROBERT POGGSON, C.I.E., F.R.A.S.

BY

C. MICHIE SMITH, B.Sc., F.R.A.S., F.R.S.E.

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CONTENTS

	<i>Page</i>
Introduction	v.
Instrumental Corrections adopted in 1883	vii.
Instrumental Corrections adopted in 1884	xi.
Instrumental Corrections adopted in 1885	xiv.
Instrumental Corrections adopted in 1886	xvi.
Instrumental Corrections adopted in 1887	xvii.
Corrections to the Nautical Almanac Stars in the years 1883-85	xviii.
Errata	xxii.
Separate Results of Observations in 1883	1
Mean Positions of Stars for 1883, January 1st	45
Separate Results of Observations in 1884	75
Mean Positions of Stars for 1884, January 1st	93
Separate Results of Observations in 1885... .. .	109
Mean Positions of Stars for 1885, January 1st	117
Separate Results of Observations in 1886	123
Mean Positions of Stars for 1886, January 1st	129
Separate Results of Observations in 1887	135
Mean Positions of Stars for 1887, January 1st	141
Distribution List of Madras Astronomical Publications	147

INTRODUCTION.

This volume contains the results of the observations made with the Madras Meridian Circle in the years 1883-87 and completes the series of volumes preliminary to the general catalogue. The number of observations made during this period was only 4052, since after 1883 few observations were made except those required to complete the full number for each star in the list. The observers were the same as in the previous three years and no change has been made in the method of reduction.

The reductions have been revised throughout using corrected values for the meridian errors.

With this volume are also issued lists of the corrections that have to be applied to the results in volume I. to VI. on account of erroneous determinations of meridian error. The most serious errors were due to the use of the stars R. P. L. 14 (Groombridge 195), referred to in last volume, and 24 Cephei (Hev.). The position of this latter star was apparently taken from the *Radcliffe Polar List* and was brought up without the application of any proper motion. No proper motion is ascribed to this star either in the *Greenwich nine-year Catalogue* or in the *Williams College Catalogue*, but Carrington notes it is a proper motion star and there can be little doubt that it has a considerable proper motion. The positions given for 1885 in the *Redhill* and *Radcliffe* catalogues agree fairly well with each other but differ by about 12' from the place given by Safford's observations in 1883. As this star was in certain years frequently used for the determination of the azimuth it is evident that very serious errors were introduced. These errors ought certainly to have been discovered at an early date, but several circumstances conspired to conceal them. Into these it is not necessary to enter in detail here, but I may point out that when I took up the work in 1891, I had no experience either of the accuracy of the observations or of the steadiness of the instrument, and I underestimated

both. The corrections that have now been applied show that the older observations especially were very good and that the instrument was remarkably stable. After heavy rain there is usually a considerable and rapid change in the meridian error, but at other times changes are slow and progressive. Heavy rains are, I believe, responsible for a few outstanding cases of uncertain meridian error, for on a small number of days the error has had to be obtained by interpolation between days before and after such rain, but the number of observations affected is not great and the uncertainty lies between moderate limits.

One point that comes out clearly as a result of the investigation of the meridian errors is that for satisfactory work in low latitudes it is necessary to have either a much larger list of polar stars whose positions are accurately determined, or to have a good meridian mark. There are many nights here when good observations can be got of stars at a considerable altitude though it is quite impossible to get any observations of stars below the pole or even within 10° above the pole, and on a good many other nights stars below the pole are so unsteady that they, at times, appear to dance backwards and forwards across the wires. In the great majority of observations of polar stars the transits were taken over only three wires, and in many cases there was a considerable divergence between the times given by the different wires; passing clouds frequently prevented even three consecutive wires from being observed. With highly trained observers it is probable that better results would have been obtained by using the R. A. micrometer and observing a number of transits over the middle wire, but with the observers available for the work here this would have only led to increased errors, for it was found necessary even to give up the use of the P. D. micrometer. So long as the work was simple and purely routine good results were obtained, but the least complexity or interference with the routine was fatal.

It has not been considered necessary to print all the corrections that have been made. In most cases corrections have been entered in the *errata* only when they affected the mean place of the star for any year by more than $0\cdot02$, but all corrections affecting the separate results to the extent of $0\cdot01$ have been entered in the working copies and will be taken into account in forming the catalogue places.

INTRODUCTION.

Instrumental Corrections adopted in 1888.

Date.	Obser- var.	Index.	Run in 5'.	Clock Rate.	Inclina- tion.	Collima- tion.	Meridian.	Determining Stars.
Jan. 1	R	- 46	00	+ 025	+ 032	+ 000	+ 033	36 and 117 R. P. L.
2	"	- 47	00	+ 027	+ 033	+ 004	+ 027	34, 35 & 100, 118 R. P. L.
3	"	- 48	00	+ 038	+ 035	+ 003	+ 023	34 and 118 R. P. L.
4	"	- 68	00	+ 045	+ 033	+ 002	+ 031	37 and 117 R. P. L.
5	"	- 72	00	+ 045	+ 033	+ 004	+ 033	2 Ursa Minoris and 117 R. P. L.
8	M	- 59	00	+ 045	+ 032	+ 008	+ 029	37 and 118 R. P. L.
9	"	- 68	00	+ 045	+ 032	+ 004	+ 030	37 and 118 R. P. L.
11	"	- 87	00	+ 057	+ 032	+ 004	+ 030	37 and 110, 117 R. P. L.
12	"	- 78	00	+ 036	+ 034	+ 004	+ 030	37, 39, 40, and 114, 117 R. P. L.
15	"	- 80	00	+ 033	+ 034	+ 004	+ 029	37, 39, 40, and 110, 114, 117 R. P. L.
16	"	- 77	00	+ 032	+ 033	+ 008	+ 025	37, 39 and 110, 114, 117 R. P. L.
17	"	- 77	00	+ 034	+ 034	+ 004	+ 030	37, 39 and 110, 114, 117 R. P. L.
19	"	- 75	00	+ 040	+ 032	+ 006	+ 030	37, 39, 40, 43, and 116, 120 R. P. L.
19	"	- 78	00	+ 043	+ 033	+ 004	+ 031	37, 41, 43 and 117, 118, 120 R. P. L.
20	"	- 70	00	+ 045	+ 034	+ 004	+ 032	37, 39, 43 and 116 R. P. L.
22	"	- 68	00	+ 045	+ 035	+ 004	+ 034	39 and 116 R. P. L.
24	"	- 73	00	+ 045	+ 035	+ 004	+ 032	43, 117 and 118 R. P. L.
25	"	- 67	00	+ 052	+ 035	+ 004	+ 034	39, 43 and 117 R. P. L.
26	"	- 69	00	+ 055	+ 034	+ 004	+ 032	29 and 116, 120, 133 R. P. L.
27	"	- 63	00	+ 053	+ 036	+ 004	+ 030	29 and 116, 120, 133 R. P. L.
29	"	- 74	00	+ 064	+ 037	+ 004	+ 032	29 and 116, 120, 133 R. P. L.
30	"	- 75	00	+ 068	+ 037	+ 004	+ 032	33 and 120, R. P. L.
31	"	- 71	00	+ 049	+ 040	+ 003	+ 030	118 and 133 R. P. L.
Feb. 1	R	- 101	00	+ 055	+ 041	+ 004	+ 030	118 and 133 R. P. L.
2	"	- 89	00	+ 055	+ 042	+ 004	+ 030	118 and 133 R. P. L.
3	"	- 90	00	+ 054	+ 042	+ 004	+ 031	
5	"	- 91	00	+ 069	+ 040	+ 004	+ 031	
6	M	- 93	00	+ 068	+ 038	+ 004	+ 032	
7	"	- 77	00	+ 050	+ 039	+ 004	+ 032	118 and 134 R. P. L.
8	R	- 80	00	+ 053	+ 040	+ 004	+ 033	51 Cephei and 120, 133 R. P. L.
9	"	- 82	00	+ 055	+ 039	+ 004	+ 034	51 Cephei and 120 R. P. L.
10	"	- 95	00	+ 057	+ 042	+ 002	+ 037	51 Cephei and 120, 134 R. P. L.
12	"	- 99	00	+ 055	+ 038	+ 004	+ 035	51 Cephei and 120 R. P. L.
13	"	- 100	00	+ 059	+ 039	+ 003	+ 033	51 Cephei and 134 R. P. L.
14	"	- 94	00	+ 058	+ 041	+ 004	+ 033	51 Cephei and 120, 134 R. P. L.
15	"	- 91	00	+ 055	+ 038	+ 004	+ 032	51 Cephei and 134 R. P. L.
16	"	- 95	00	+ 054	+ 038	+ 003	+ 033	
17	"	- 85	00	+ 054	+ 042	+ 004	+ 044	
19	"	- 93	00	+ 051	+ 041	+ 003	+ 045	51 Cephei and 134 R. P. L.
20	"	- 93	00	+ 063	+ 040	+ 003	+ 037	51 Cephei and 134 R. P. L.
21	"	- 86	00	+ 061	+ 038	+ 002	+ 038	
22	"	- 90	00	+ 062	+ 039	+ 003	+ 035	
23	"	- 85	00	+ 066	+ 038	+ 004	+ 035	
24	"	- 95	00	+ 037	+ 037	+ 003	+ 034	51 Cephei and 134 R. P. L.
25	"	- 95	00	+ 030	+ 043	+ 004	+ 031	
26	"	- 93	00	+ 030	+ 043	+ 004	+ 030	
28	"	- 97	00	+ 035	+ 043	+ 004	+ 029	32 and 134 R. P. L.
Mar. 1	"	- 103	00	+ 036	+ 045	+ 002	+ 030	

Instrumental Corrections adopted in 1888.

Date.	Observer.	Index.	Run in E.	Clock Rate.	Inclination.	Collimation.	Meridian.	Determining stars.
		<i>m</i>	<i>n</i>	<i>s</i>	<i>t</i>	<i>u</i>	<i>v</i>	
Apl. 3	M	- 76	0.0	+ 0.48	+ 0.56	+ 0.04	+ 0.48	89 R. P. L. and Polaris.
4	"	- 62	0.0	+ 0.49	+ 0.68	+ 0.04	+ 0.50	88 R. P. L. and Polaris.
5	"	- 70	0.0	+ 0.56	+ 0.59	+ 0.04	+ 0.51	82 R. P. L. and Polaris.
6	"	- 59	0.0	+ 0.40	+ 0.89	+ 0.08	+ 0.50	72, 82, R. P. L. & Polaris.
7	"	- 58	0.0	+ 0.28	+ 0.80	+ 0.08	+ 0.51	83 R. P. L. and Polaris.
9	"	- 68	0.0	+ 0.48	+ 0.68	+ 0.03	+ 0.52	83 R. P. L. and Polaris.
10	"	- 80	0.0	+ 0.46	+ 0.53	+ 0.08	+ 0.52	
11	"	- 87	0.0	+ 0.46	+ 0.58	+ 0.03	+ 0.52	
12	"	- 68	0.0	+ 0.51	+ 0.28	+ 0.03	+ 0.52	
13	"	- 59	0.0	+ 0.55	+ 0.33	+ 0.03	+ 0.53	
14	"	- 65	0.0	+ 0.49	+ 0.80	+ 0.03	+ 0.53	
16	"	- 57	0.0	+ 0.55	+ 0.59	+ 0.03	+ 0.53	82 R. P. L. and Polaris.
17	"	- 66	0.0	+ 0.59	+ 0.58	+ 0.08	+ 0.52	82 R. P. L. and Polaris.
18	"	- 58	0.0	+ 0.53	+ 0.59	+ 0.08	+ 0.56	
19	"	- 67	0.0	+ 0.28	+ 0.61	+ 0.03	+ 0.57	
20	"	- 57	0.0	+ 0.57	+ 0.62	+ 0.03	+ 0.60	
21	"	- 49	0.0	+ 0.56	+ 0.63	+ 0.04	+ 0.62	89 R. P. L. and Polaris.
23	"	- 68	0.0	+ 0.42	+ 0.80	+ 0.03	+ 0.60	
24	"	- 67	0.0	+ 0.41	+ 0.82	+ 0.03	+ 0.59	
25	"	- 66	0.0	+ 0.46	+ 0.83	+ 0.04	+ 0.59	
26	"	- 58	0.0	+ 0.51	+ 0.65	+ 0.02	+ 0.58	
28	"	- 49	0.0	+ 0.44	+ 0.66	+ 0.03	+ 0.56	
30	"	- 50	0.0	+ 0.27	+ 0.65	+ 0.03	+ 0.65	
May 1	E	- 58	- 0.1	+ 0.08	+ 0.70	+ 0.03	+ 0.54	
2	"	- 54	- 0.1	- 0.29	+ 0.66	+ 0.03	+ 0.63	
3	"	- 65	- 0.1	- 0.23	+ 0.65	+ 0.03	+ 0.62	111 R. P. L. and Polaris.
4	"	- 64	- 0.1	- 0.26	+ 0.64	+ 0.03	+ 0.65	
5	"	- 68	- 0.1	- 0.26	+ 0.67	+ 0.03	+ 0.67	110, 116 and 26 R. P. L. Polaris.
7	"	- 66	- 0.1	- 0.28	+ 0.70	+ 0.03	+ 0.58	116, & 27 R. P. L. Polaris.
8	"	- 66	- 0.1	- 0.26	+ 0.68	+ 0.02	+ 0.53	116 R. P. L. and Polaris.
9	"	- 65	- 0.1	- 0.23	+ 0.69	+ 0.03	+ 0.56	116 R. P. L. and Polaris.
10	"	- 66	- 0.1	- 0.33	+ 0.67	+ 0.03	+ 0.48	
11	"	- 68	- 0.1	- 0.21	+ 0.69	+ 0.04	+ 0.37	
12	"	- 59	- 0.1	- 0.16	+ 0.71	+ 0.03	+ 0.37	116 R. P. L., * Ura. Min. and 27 R. P. L.
14	"	- 56	- 0.1	- 0.21	+ 0.70	+ 0.04	+ 0.38	
15	"	- 54	- 0.1	- 0.19	+ 0.69	+ 0.03	+ 0.59	
18	"	- 50	- 0.1	+ 0.01	+ 0.76	+ 0.04	+ 0.81	117, 120, and 39, 40 R.P.L.
19	"	- 50	- 0.1	- 0.03	+ 0.71	+ 0.02	+ 0.59	117, 120, and 39, 40 R.P.L.
21	"	- 45	- 0.1	- 0.24	+ 0.73	+ 0.03	+ 0.59	
22	"	- 47	- 0.1	- 0.22	+ 0.75	+ 0.02	+ 0.58	
23	"	- 45	- 0.1	- 0.25	+ 0.73	+ 0.02	+ 0.58	117 and 39, 40 R. P. L.
24	"	- 45	- 0.1	- 0.27	+ 0.75	+ 0.02	- 0.59	
25	"	- 48	- 0.1	- 0.24	+ 0.78	+ 0.02	+ 0.61	
28	"	- 44	- 0.1	- 0.29	+ 0.77	+ 0.03	+ 0.65	120 and 39 R. P. L.
29	"	- 48	- 0.1	- 0.24	+ 0.72	+ 0.01	+ 0.64	
30	"	- 48	- 0.1	- 0.18	+ 0.73	+ 0.02	+ 0.62	
31	"	- 50	- 0.1	+ 0.01	+ 0.70	+ 0.02	+ 0.61	
June 1	"	- 49	+ 0.3	+ 0.04	+ 0.70	+ 0.01	+ 0.60	120 and 41 R. P. L.
2	"	- 57	+ 0.5	- 0.31	+ 0.73	+ 0.01	+ 0.59	
7	"	- 43	+ 0.3	- 0.20	+ 0.72	+ 0.03	+ 0.57	
8	M	- 45	+ 0.1	- 0.23	+ 0.74	+ 0.03	+ 0.60	
9	"	- 50	+ 0.1	- 0.27	+ 0.75	+ 0.03	+ 0.62	
11	"	- 40	+ 0.1	- 0.29	+ 0.74	+ 0.03	+ 0.67	
14	"	- 50	+ 0.1	- 0.19	+ 0.74	+ 0.03	+ 0.75	
15	"	- 42	+ 0.1	- 0.14	+ 0.74	+ 0.03	+ 0.77	* Ura. Min. and 39 R.P.L.

May 1.—Transit clock put forward 1m.

Instrumental Corrections adopted in 1888.

Date.	Observer.	Index.	Run in 5'	Clock Rate.	Inclination.	Collimation.	Meridian	Determining Stars.
		"	"	"	"	"	"	
June 19	M	- 3.7	+ 0.1	- 0.06	+ 0.75	+ 0.03	+ 0.76	
20	"	- 4.4	+ 0.1	- 0.07	+ 0.98	+ 0.03	+ 0.78	
22	"	- 3.9	+ 0.1	- 0.11	+ 0.83	+ 0.03	+ 0.76	
26	"	- 3.8	+ 0.1	- 0.15	+ 0.60	+ 0.03	+ 0.75	
July 3	B	- 4.0	+ 0.1	- 0.27	+ 0.50	+ 0.04	+ 0.74	
4	"	- 3.1	+ 0.1	- 0.26	+ 0.63	+ 0.02	+ 0.73	
17	"	- 2.6	+ 0.1	- 0.38	+ 0.56	+ 0.02	+ 0.71	
18	"	- 1.6	+ 0.1	- 0.49	+ 0.56	+ 0.02	+ 0.71	
20	"	- 1.9	+ 0.1	- 0.43	+ 0.55	+ 0.03	+ 0.70	
24	"	- 2.0	+ 0.1	- 0.35	+ 0.54	+ 0.03	+ 0.70	
25	"	- 0.7	+ 0.1	- 0.30	+ 0.51	+ 0.04	+ 0.69	
30	"	+ 0.5	+ 0.1	- 0.38	+ 0.45	+ 0.02	+ 0.67	143, and 53 R. P. L.
31	"	+ 0.5	+ 0.1	- 0.39	+ 0.47	+ 0.03	+ 0.66	
Aug. 2	"	- 0.4	0.0	- 0.35	+ 0.50	+ 0.02	+ 0.63	
3	"	- 0.3	0.0	- 0.32	+ 0.45	+ 0.02	+ 0.62	
4	"	0.0	0.0	- 0.30	+ 0.46	+ 0.02	+ 0.61	133, 138, and 48 R. P. L.
8	"	- 0.1	0.0	- 0.35	+ 0.49	+ 0.02	+ 0.55	133, 134, and 89 R. P. L.
9	"	- 3.6	0.0	- 0.37	+ 0.46	+ 0.01	+ 0.67	133, 134, and 89 R. P. L.
10	"	- 3.7	0.0	- 0.31	+ 0.43	+ 0.02	+ 0.67	133, and 43 R. P. L.
11	"	- 4.4	0.0	- 0.25	+ 0.45	+ 0.02	+ 0.67	113, 132, 134, & 41, 53 R. P. L.
13	"	- 4.8	0.0	- 0.21	+ 0.49	+ 0.02	+ 0.68	118, 133, 134, & 41, 46, 53 R. P. L.
14	"	- 5.0	0.0	- 0.23	+ 0.43	+ 0.03	+ 0.60	3 Ure. Min., 118, and 41, 48 R. P. L.
18	"	- 4.3	0.0	- 0.30	+ 0.49	+ 0.02	+ 0.69	118, 133, and 41, 43 R. P. L.
19	"	- 4.5	0.0	- 0.30	+ 0.48	+ 0.02	+ 0.67	118 and 41, 43 R. P. L.
25	"	- 4.9	0.0	- 0.41	+ 0.43	+ 0.03	+ 0.70	120 and 43 R. P. L.
28	"	- 4.6	0.0	- 0.41	+ 0.44	+ 0.03	+ 0.70	
Sep. 3	M	- 5.4	0.0	- 0.22	+ 0.44	+ 0.02	+ 0.70	
4	"	- 4.7	0.0	- 0.23	+ 0.39	+ 0.02	+ 0.70	133, 138, 149 & 48 R. P. L.
5	"	- 4.8	0.0	- 0.36	+ 0.44	+ 0.02	+ 0.71	
10	"	- 5.4	0.0	- 0.36	+ 0.40	+ 0.02	+ 0.76	
11	"	- 4.4	0.0	- 0.34	+ 0.41	+ 0.02	+ 0.77	
12	"	- 4.5	0.0	- 0.31	+ 0.38	+ 0.02	+ 0.78	
13	"	- 4.5	0.0	- 0.33	+ 0.39	+ 0.02	+ 0.79	
14	"	- 4.8	0.0	- 0.25	+ 0.37	+ 0.02	+ 0.80	134, 138, 149 and 48, 55, 62 R. P. L.
15	"	- 4.7	0.0	- 0.23	+ 0.37	+ 0.02	+ 0.82	138 and 62 R. P. L.
17	"	- 5.3	0.0	- 0.24	+ 0.34	+ 0.02	+ 0.84	
19	"	- 5.2	0.0	- 0.31	+ 0.34	+ 0.02	+ 0.87	
20	"	- 3.1	0.0	- 0.34	+ 0.33	+ 0.03	+ 0.88	
21	"	- 4.8	0.0	- 0.26	+ 0.35	+ 0.03	+ 0.89	
22	"	- 4.4	0.0	- 0.20	+ 0.34	+ 0.03	+ 0.91	
24	"	- 3.4	0.0	- 0.30	+ 0.34	+ 0.02	+ 0.93	
25	"	- 4.1	0.0	- 0.25	+ 0.33	+ 0.03	+ 0.94	
26	"	- 3.6	0.0	- 0.23	+ 0.32	+ 0.03	+ 0.96	
27	"	- 3.4	0.0	- 0.30	+ 0.33	+ 0.03	+ 0.97	
28	"	- 3.1	0.0	- 0.23	+ 0.32	+ 0.03	+ 0.98	134, 138 and 80 R. P. L.
29	"	- 3.6	0.0	- 0.23	+ 0.31	+ 0.03	+ 0.96	
Oct. 1	K	- 2.9	0.0	- 0.29	+ 0.29	+ 0.04	+ 0.82	
3	"	- 4.7	0.0	- 0.30	+ 0.23	+ 0.04	+ 0.83	
4	"	- 4.4	0.0	- 0.32	+ 0.25	+ 0.04	+ 0.86	
5	"	- 2.9	0.0	- 0.34	+ 0.29	+ 0.05	+ 0.84	
6	"	- 1.6	0.0	- 0.35	+ 0.23	+ 0.03	+ 0.82	
8	"	- 0.2	0.0	- 0.05	+ 0.22	+ 0.06	+ 0.77	

Oct. 6.—Line of transit clock broken; clock stopped and restarted.