XXII. *Determination of the North Polar Distances and proper motion of thirty fixed Stars. By* John Pond, *Esq. Astronomer Royal, F. R. S.*

Read June 15, 1815.

WHEN a standard catalogue of some of the principal fixed stars was laid before the Society in the year 1813, I ventured to state as my opinion, that the error of this catalogue depending on the mechanical construction of the instrument, did not probably exceed a quarter of a second.

This opinion has been confirmed by the observations of another year; the results of which I have now the honour of transmitting to the Society, as it appears that in those stars which I have continued to observe, I have not had occasion to alter the position of any one, above one-tenth of a second. For this reason I should hardly have thought it necessary to make any farther communication on the subject, had I not wished for an opportunity of adding some valuable deductions respecting the proper motions of these stars.

The comparison of my own catalogue with that of Dr. BRADLEY in the year 1756, is shown in one of the annexed tables, (Table II.) in which the proper motions are given in the last column.

I have also subjoined to my own observations the mean state of the barometer and thermometer, so that the correction may be easily made for any other table of refractions,

as well as that of BRADLEY, which I have employed in reducing the Greenwich observations.

Table III. contains, in addition to the standard catalogue, those stars which have been observed with equal care south of the equator, but from the uncertainty of refraction their positions cannot be so accurately ascertained as those of the former. In this table, the catalogue has been computed both by BRADLEY's and the French Tables of Refraction.

I.

Standard Catalogue of the North Polar Distances of thirty principal fixed Stars, reduced to the beginning of 1813.

	Stars.	No. of Observations in former Catalogue.	Result of one year's obser. N. P. D. January 1, 1813.	Total No. of Observations.	Result of two year's observ. N. P. D. January 1, 1813.	Mean height of barometer.	Mean height of thermometer. In.	Mean height of thermometer. Out.
			° ′ ″		° ′ ″	° ′	° ′	° ′
1	Polaris	167	1 41 21.7	294	1 41 21.66	29 79	49 0	48 0
2	β Urs. min.	90	15 4 48.9	120	15 4 48. 9	29 73	50 7	50 5
3	β Cephei	40	20 15 30.7	70	20 15 30. 6	29 77	49 2	45 5
4	α Urs. maj.	60	27 14 31.5	70	27 14 31. 5	29 81	56 0	55 0
5	α Cephei	40	28 12 12.5	70	28 12 12. 5			
6	α Cassiop.	40	34 29 22.7	70	34 29 22. 6			
7	γ Urs. maj.	48	35 15 55.3	60	35 15 55. 3			
8	γ Draconis	90	38 29 3.6	140	38 29 3. 6			
9	η Urs. maj.	80	39 44 57.9	100	39 44 57. 8			
10	α Persei	40	40 48 52.7	50	40 48 52. 6			
11	Capella	80	44 12 20.5	110	44 12 20. 4			
12	α Cygni	70	45 22 56.9	130	45 22 57. 1	29 77	46 8	43 4
13	α Lyræ	90	51 23 0.5	170	51 23 0. 5	29 82	51 0	49 5
14	Castor	30	57 42 46.7	40	57 42 46. 7	29 81	50 4	48 4
15	Pollux	40	61 31 56.3	50	61 31 56. 4	29 95	50 0	49 2
16	β Tauri	50	61 33 43.7	70	61 33 43. 7	29 92	46 3	44 4
17	α Androm.	35	61 56 29.6	35	61 56 29. 6	29 88	54 2	53 1
18	α Cor. Bor.	80	62 38 55.4	90	62 38 55. 4	29 80	56 8	56 2
19	α Arietis	50	67 25 36.5	80	67 25 36. 5	29 85	43 3	40 3
20	Arcturus	80	69 50 19.1	120	69 50 19. 0	29 82	55 0	54 9
21	Aldebaran	56	73 52 35.4	76	73 52 35. 3	29 91	50 7	50 3
22	β Leonis	20	74 22 57.3	20	74 22 57. 3	29 81	65 4	62 4
23	α Herculis	50	75 23 14.0	50	75 23 14. 0	29 88	57 4	55 9
24	α Pegasi	20	75 47 51.7	30	75 47 51. 6	29 69	48 3	44 4
25	Regulus	65	77 7 22.7	65	77 7 22. 7	29 89	54 7	54 5
26	α Ophiuchi	70	77 17 39.2	90	77 17 39. 1	29 86	56 4	54 3
27	α Aquilæ	80	81 36 58.8	140	81 36 58. 8	29 81	51 0	46 6
28	α Orionis	50	82 38 15.7	60	82 38 15. 7	29 96	53 5	53 3
29	α Serpentis	70	82 58 39.3	70	82 58 39. 3	29 86	58 3	57 3
30	Procyon	40	84 18 14.4	40	84 18 14. 4	29 96	55 4	55 4
31	Polaris SP.					29 79	59 1	52 2

II.

Observations made with the Mural Circle, compared with the observations of Dr. BRADLEY *in the year* 1756.

	Stars.	N. P. D. begin. 1756.	N. P. D. begin. 1814.	Variation in 58 years.	Precession in 58 years.	Difference.	Annual Proper Motion.
		° ′ ″	° ′ ″	′ ″	′ ″	′ ″	″
1	Polaris						
2	β Urs. min.	14 50 47.4	15 5 3.6	+ 14 16.2	14 10.4	0 5.8	+ 0.100
3	β Cephei	20 30 26.2	20 15 15.0	− 15 11.2	15 7.7	3.5	− 0.060
4	α Urs. maj.	26 56 18.5	27 14 50.7	+ 18 32.2	18 27.3	4.9	+ 0.084
5	α Cephei	28 26 27.9	28 11 57.6	− 14 30.3	14 27.3	3.0	− 0.052
6	α Cassiop.	34 48 14.5	34 29 2.9	− 19 11.6	19 11.7	0.1	+ 0.002
7	γ Urs maj.	34 56 57.8	35 16 15.3	+ 19 17.5	19 17.2	0.3	+ 0.005
8	γ Draconis	38 28 22.0	38 29 4.3	+ 0 42.3	0 42.2	0.1	+ 0.002
9	η Urs. maj.	39 27 40.4	39 45 16.1	+ 17 35.7	17 33.9	1.8	+ 0.031
10	α Persei	41 1 47.2	40 48 39.2	− 13 8.0	13 7.6	0.4	− 0.007
11	Capella	44 16 51.5	44 12 15.9	− 4 35.6	4 56.4	20.8	+ 0.358
12	α Cygni	45 34 52.4	45 22 44.3	− 12 8.1	12 2.8	5.3	− 0.091
13	α Lyræ	51 25 47.1	51 22 57.4	− 2 49.7	2 29.9	19.8	− 0.341
14	Castor	57 36 10.7	57 42 53.8	+ 6 43.1	6 40.7	2.4	+ 0.041
15	Pollux	61 24 28.4	61 32 4.3	+ 7 35.9	7 34.1	1.8	+ 0.031
16	β Tauri	61 37 30.9	61 33 39.8	− 3 51.1	3 57.9	6.8	+ 0.117
17	α Androm.	62 15 27.3	61 56 9 6	− 19 17.7	19 20.4	2.7	+ 0.047
18	α Cor. Bor.	62 27 0.2	62 39 7.9	+ 12 7.7	12 4.3	3.4	+ 0.058
19	α Arietis	67 42 12.9	67 25 19.1	− 16 53.8	16 57.4	3.6	+ 0.062
20	Arcturus	69 32 13.6	69 50 38.1	+ 18 24.5	16 30.0	1 54.5	+ 1.972
21	Aldebaran	74 0 15.4	73 52 27.4	− 7 48.0	7 53.9	5.9	+ 0.102
22	β Leonis	74 3 55.6	74 23 17.3	+ 19 21.7	19 15.4	6.3	+ 0.109
23	α Herculis	75 18 46.1	75 23 18.5	+ 4 32 4	4 36.4	4.0	− 0.069
24	α Pegasi	76 6 10.6	75 47 32.3	− 18 38.3	18 32.9	5.4	− 0.093
25	Regulus	76 51 5.1	77 7 40.0	+ 16 35.0	16 37.1	2.1	− 0.036
26	α Ophiuchi	77 14 35.9	77 17 42.3	+ 3 6.8	2 56.9	9.5	+ 0.164
27	α Aquilæ	81 45 27.8	81 36 49.6	− 8 38.2	8 11.4	26.8	− 0.462
28	α Orionis	82 39 42.3	82 38 14.3	− 1 28.0	1 23.3	4.7	− 0.081
29	α Serpentis	82 47 24.7	82 58 51.0	+ 11 26.3	11 31.7	5.4	− 0.093
30	Procyon	84 10 10.3	84 18 21.9	+ 8 11.6	7 14.7	56.9	+ 0.981

The N. P. D. of Polaris determined by upwards of 200 observations of Dr. BRADLEY, by computations made under the direction of Dr. MASKELYNE, a short time before his death, and reduced to the beginning of the year - - 1749 - 2° 2′ 17″.25
By my observations for - - - 1813 - 1 41 21 .75

Variation in - - - - 64 years - 20 55 .50
Precession for - - - - 64 years - 20 51 .83

Difference - - - - - - - 3 .67
Annual proper motion - - - - - - — 0.0 57

i. e. The annual precession, which is itself negative, must be increased by the above quantity.

III.

North Polar Distances of forty-four principal Stars for January 1, 1813.

	Stars.	With Bradley's Refraction.	With the French Refraction.	Annual variation.	Annual Proper Motion.
		° ′ ″	° ′ ″	″	″
1	Polaris	1 41 21.6	1 41 21.6	— 19.45	— 0.057
2	β Urs. min.	15 4 49.0	15 4 49.3	+ 14.70	+ 0.100
3	β Cephei	20 15 30.6	20 15 30.9	— 15.70	— 0.060
4	α Urs. maj.	27 14 31.5	27 14 31.9	+ 19.30	+ 0.084
5	α Cephei	28 12 12.5	28 12 12.7	— 14.96	— 0.052
6	α Cassiop.	34 29 22.7	34 29 23.1	— 19.80	+ 0.002
7	γ Urs. maj.	35 15 55.3	35 15 55 8	+ 20.00	+ 0.005
8	γ Draconis	38 29 3.7	38 29 4.2	+ 0.70	+ 0.002
9	η Urs. maj.	39 44 57.9	39 44 58.5	+ 18.20	+ 0.031
10	α Persei	40 48 52.6	40 48 53.2	— 13.50	— 0.007
11	Capella	44 12 20.5	44 12 21.1	— 4.57	+ 0.358
12	α Cygni	45 22 57.0	45 22 57.7	— 12.63	— 0.091
13	α Lyræ	51 23 0.5	51 23 1.2	— 3.00	— 0.341
14	Castor	57 42 46.7	57 42 47.5	+ 7.06	+ 0.041
15	Pollux	61 31 56.4	61 31 57.2	+ 8.00	+ 0.031
16	β Tauri	61 33 43.7	61 33 44.5	— 3.83	+ 0.117
17	α Andromedæ	61 56 29.6	61 56 30.3	— 19.99	+ 0.047
18	α Cor. Bor.	62 38 55.4	62 38 56.2	+ 12.49	+ 0.058
19	α Arietis	67 25 36.5	67 25 37.2	— 17.40	+ 0.062
20	Arcturus	69 50 19.0	69 50 19.8	+ 18.99	+ 1.972
21	Aldebaran	73 52 35.4	73 52 36.3	— 7.95	+ 0.102
22	β Leonis	74 22 57.3	74 22 58.5	+ 20.04	+ 0.109
23	α Herculis	75 23 14.0	75 23 15.1	+ 4.48	— 0.069
24	α Pegasi	75 47 51.6	75 47 52.8	— 19.43	— 0.093
25	γ	75 51 21.0	75 51 22.3	— 20.20	— 0.084
26	Regulus	77 7 22.7	77 7 23.9	+ 17.33	— 0.036
27	α Ophiuchi	77 17 39.1	77 17 40.3	+ 3.10	+ 0.164
28	γ Aquilæ	79 50 0.6	79 50 1.1	— 8.38	— 0.082
29	α	81 36 58.8	81 37 0.0	— 9.06	— 0.462
30	α Orionis	82 38 15.7	82 38 16.9	— 1.37	— 0.081
31	α Serpentis	82 58 39.3	82 58 40.6	+ 11.73	— 0.093
32	β Aquilæ	84 3 4.1	84 3 5.8	— 8.57	+ 0.391
33	Procyon	84 18 14.4	84 18 15.9	+ 7.55	+ 0.981
34	α Ceti	86 39 0 7	86 39 2.6	— 14.75	— 0.005
35	α Aquarii	91 13 21.6	91 13 23.8	— 17.37	— 0.106
36	α Hydræ	97 51 11.3	97 51 13.0	+ 15.19	— 0.066
37	Rigel	98 25 33.8	98 25 36.5	— 4.92	— 0.108
38	Spica Virginis	100 10 51.3	100 10 54.1	+ 18.95	+ 0.002
39	1 α Capricorni	103 4 35.4	103 4 38.5	— 10.80	— 0.083
40	2 α Capricorni	103 6 52.3	103 6 55.5	— 10.80	— 0.090
41	1 α Libræ	105 12 38.7	105 12 42.0	+ 15.20	0.000
42	2 α Libræ	105 15 22.7	105 15 26.2	+ 15.20	+ 0.036
43	Sirius	106 28 0.7	106 28 4.2	+ 4.36	+ 1.158
44	Antares	116 0 16 6	116 0 22.2	+ 8.62	+ 0.012