MNRAS..64

A New Cluster in Cygnus, with Right Ascensions and Declinations of 103 *Stars included in it.* By F. A. Bellamy.

1. At the end of last year I exposed a plate for the purpose of obtaining a photograph of the region of Dr. Max Wolf's new variable B.D. $+37°$ 3876 (No. 59, 1903, *Cygni*) in order to measure the positions of stars surrounding it. The plate (2294) was exposed for 10^m and 16^m on 1903 October 9, and the adopted centre is $+37°$, $20^h\ 16^m$: the hour angle was about 4^h west. The plate probably contains stars fainter than the 13th magnitude.

2. Whilst proceeding with the measurement of stars close to the variable I was impressed with the appearance of a well-defined and compact cluster of stars about $1\frac{1}{2}^m$ away and became interested in ascertaining its name. Upon reference to Dreyer's "New General Catalogue of Nebulæ and Clusters" (*Memoirs, R.A.S.*, vol. xlix. p. 1) I failed to find any mention made about it, nor could I find it referred to in his additional catalogue (*Memoirs, R.A.S.*, vol. li. p. 185). Such being the case it occurred to me that it was desirable to fix the stars' positions, and the results form the basis of this communication.

3. Without further description, it need only be said that the plate was exposed in the 13-inch astrographic telescope, which was moved in decl. about $45''$ between the two exposures, that I measured both images in two positions of the plate 180° apart, using the glass-ruled scale in the microscope, the means of these four measures in each coordinate were carried to the fourth decimal—*i.e.* to a unit $\cdot0001 = 0''\cdot03$. The calculations were made according to the formulæ published by Professor Turner.

4. The reference stars for the purpose of determining the plate constants have been selected from the Lund A.G.C. These positions have been brought to the epoch 1900·0 with precessions given in that catalogue, but no proper motions have been applied. The standard coordinates ξ and η referred to the plate centre $+37°$, $20^h\ 16^m$, were computed for fifteen stars chosen in the SW, NW, NE, SE corners of the plate and about $45'$ from the plate centre. If we put ξ' and η' equal to $\xi+13$ and $\eta+13$ respectively we shall obtain the coordinates referred to the corner of the réseau; they will always be positive, and are easily compared with the measured x and y. Putting $ax+by+c=x-\xi$ and $dx+ey+f=y-\eta$, the values of a, b, &c., were found to be

a	b	c	d	e	f
$-\cdot00068$	$+\cdot00601$	$+\cdot0863$	$-\cdot00609$	$-\cdot00073$	$-\cdot0360$

These are derived from the mean of the two exposures. It is not considered that any appreciable error is introduced in the present case by proceeding in this way rather than by treating the exposures separately, and a great deal of work is saved

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MNRAS..64

without sacrificing accuracy. Reference may be made to *Monthly Notices*, vol. lxiii. pp. 513, 514.

5. The plate constants were applied to the mean measured x and y, and the standard coordinates ξ' and η' are thus obtained; they are given in columns 7 and 8 of Table I. By means of tables existing in MS. at the Observatory these ξ''s and η''s were readily converted to differences in R.A. and Decl., and when applied to the adopted plate centre ($+37°$, $20^h\ 16^m$) the R.A.s and Decls. for 1900·0, as given in columns 9 and 10, are obtained.

6. The magnitudes given in columns 5 and 6 consist, in the former case, of the *sum* of the four measured diameters; and in the next column I have given the approximate magnitude in the usual notation. These were derived by plotting the B.D. mags., comparing them with the measured diameters, assuming that the sum of the four measures of the smallest star visible was equal to 10 units (13th mag.), and then drawing a curve through these points. They must be considered as quite approximate, though I think they are not more than half a magnitude in error.

Grouping them, I find there are two stars brighter than 8·0, six stars from 8·0 to 9·9 (inclusive), fifty-one from 10·0 to 11·9, and forty-four from 12·0 to 13·0.

TABLE I.

Oxford Ref. No.	Potsd. No. on Plate 922.	B.D. +37° No.	Magnitude. B.D.	Magnitude. Oxford Diameter (sum of 4).	Magnitude. Inferred.	$\xi+13'0000$. 1900·0. R.I.	$\eta+13'0000$. 1900·0. R.I.	Deduced R.A. 1900·0. 20^h+ m	s	Deduced N. Dec. 1900·0. $37°+$ ′	″
1	...	...	...	27	12·3	3·8339	17·4099	12	9·37	21	49·0
2	...	...	...	13	12·9	3·9234	15·2629	12	12·15	11	5·2
3	...	...	...	23	12·5	3·9586	15·7206	12	12·92	13	22·7
4	...	...	...	28	12·3	3·9855	17·9992	12	13·03	24	46·2
5	...	...	...	46	11·6	4·0044	17·0919	12	13·73	20	14·1
6	212	...	...	57	11·1	4·0224	15·4606	12	14·59	12	4·8
7	...	...	...	19	12·6	4·0989	16·8512	12	16·17	19	2·2
8	...	...	...	19	12·6	4·0949	15·8247	12	16·32	13	54·3
9	222	...	...	80	10·2	4·2649	16·0572	12	20·53	15	4·5
10	...	...	...	25	12·4	4·3602	16·8854	12	22·73	19	13·2
11	...	...	...	28	12·3	4·3768	15·6205	12	23·45	12	53·8
12	...	...	...	48	11·5	4·3964	17·3520	12	23·53	21	33·2
13	225	3855	9·3	117	8·8	4·3961	16·9167	12	23·62	19	22·7
14	...	...	...	18	12·7	4·3956	16·6273	12	23·68	17	55·9
15	231	...	...	80	10·2	4·5084	17·9302	12	26·21	24	27·1

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MNRAS..64

Oxford Ref. No.	Potsd. No. on Plate 922.	B.D. +37° No.	Magnitude. B.D.	Magnitude. Oxford Diameter (sum of 4).	Magnitude. Inferred.	ξ+13°0000. 1900·0. R.I.	η+13°0000. 1900·0. R.I.	Deduced. R.A. 1900·0. 20h+ m s	Deduced. N. Dec. 1900·0. 37°+ ′ ″
16	230	3856	9·5	85	10·0	4·5002	16·0264	12 26·45	14 55·9
17	...	...	...	29	12·2	4·5054	16·3780	12 26·50	16 41·4
18	...	...	...	25	12·4	4·5141	16·3450	12 26·72	16 31·5
19	...	...	...	45	11·6	4·5641	16·3923	12 27·97	16 45·8
20	...	...	...	44	11·6	4·5854	17·7116	12 28·20	23 21·6
21	...	...	...	37	11·9	4·6453	15·4176	12 30·24	11 53·7
22	238	...	...	57	11·1	4·6625	15·8728	12 30·56	14 10·3
23	...	...	...	34	12·0	4·7154	17·7746	12 31·45	23 40·9
24	...	...	...	41	11·8	4·7196	15·5316	12 32·08	12 28·1
25	...	...	...	43	11·7	4·7503	16·0329	12 32·73	14 58·6
26	...	...	...	31	12·2	4·9068	16·7792	12 36·49	18 42·8
27	...	...	...	39	11·8	4·9245	15·3821	12 37·25	11 43·8
28	...	...	...	52	11·4	5·0770	17·3378	12 40·65	21 30·8
29	...	...	...	26	12·4	5·1042	17·5352	12 41·30	22 30·1
30	259	...	...	62	10·9	5·2228	16·3553	12 44·53	16 36·5
31	260	...	...	53	11·3	5·2448	16·6291	12 45·03	17 58·7
32	...	...	...	27	12·3	5·2506	16·6810	12 45·16	18 14·3
33	...	...	...	29	12·2	5·2931	16·8770	12 46·19	19 13·2
34	263	...	...	54	11·3	5·3090	15·8604	12 46·80	14 8·3
35	...	...	...	(13)	12·4	5·3197	16·9427	12 46·84	19 33·0
36	264	...	...	52	11·4	5·3333	17·1075	12 47·15	20 22·4
37	...	...	...	27	12·3	5·3392	16·7315	12 47·38	18 29·7
38	...	...	...	33	12·1	5·3524	16·8209	12 47·69	18 56·5
39	267	3859	9·2	105	9·2	5·3645	17·0508	12 47·95	20 5·5
40	268	...	...	45	11·6	5·3706	17·0289	12 48·10	19 59·0
41	271	...	...	51	11·4	5·4001	16·8110	12 48·89	18 53·6
42	274	...	...	67	10·7	5·4220	17·3410	12 49·33	21 32·7
43	275	3860	8·0	143	7·8	5·4246	17·0366	12 49 46	20 1·4
44	276	...	...	40	11·8	5·4255	17·1031	12 49·47	20 21·3
45	279	3862	9·2	118	8·8	5·4674	17·0731	12 50·53	20 12·5
46	...	...	...	35	12·0	5·4897	17·4039	12 51·02	21 51·8
47	...	...	...	(19)	11·9	5·4861	16·9266	12 51·03	19 28·6
48	...	...	...	37	11·9	5·4980	17·2611	12 51·26	21 8·9

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MNRAS..64

Oxford Ref. No.	Potsd. No. on Plate 922.	B.D. +37° No.	Magnitude. B.D.	Magnitude. Oxford Diameter (sum of 4).	Magnitude. Inferred.	ξ+13'0000. 1900'0. R.I.	η+13'00000. 1900'0. R.I.	Deduced. R.A. 1900'0. 20^h+ m s	Deduced. N. Dec. 1900'0. $37°+$ ′ ″
49	282	...	...	61	11·0	5·4944	15·9543	12 51·44	14 36·9
50	280	...	...	54	11·3	5·5057	17·0584	12 51·50	20 8·2
51	283	...	...	67	10·7	5·5262	17·0414	12 52·01	20 3·1
52	...	...	...	46	11·5	5·5342	16·9546	12 52·23	19 37·1
53	...	...	...	41	11·8	5·5498	17·3140	12 52·55	21 24·9
54	...	...	...	30	12·2	5·5562	16·8713	12 52·80	19 12·2
55	289	...	...	54	11·3	5·5784	17·3640	12 53·26	21 40·0
56	...	...	...	44	11·6	5·5902	17·0413	12 53·62	20 3·2
57	...	...	...	24	12·4	5·5916	16·4699	12 53·78	17 11·9
58	290	...	...	50	11·4	5·5989	16·1612	12 54·02	15 39·3
59	...	...	...	20	12·6	5·6191	15·4738	12 54·67	12 13·1
60	...	...	...	43	11·7	5·6350	17·1721	12 54·72	20 42·6
61	...	...	...	21	12·6	5·6334	16·2634	12 54·87	16 10·0
62	292	...	...	115	8·9	5·6459	17·5726	12 54·92	22 42·8
63	...	...	...	24	12·4	5·6551	16·9066	12 55·28	19 23·0
64	...	...	...	34	12·0	5·6796	15·8092	12 56·12	13 53·9
65	...	...	...	32	12·2	5·7157	16·9144	12 56·81	19 25·5
66	...	...	...	28	12·3	5·7701	16·3175	12 58·29	16 26·6
67	...	...	...	48	11·5	5·7890	17·5987	12 58·52	22 50·9
68	...	...	...	28	12·3	5·7928	17·3080	12 58·67	21 23·7
69	299	3864	8·8	131	8·3	5·8017	15·7340	12 59·20	13 31·6
70	...	...	...	46	11·6	5·8250	16·7212	12 59·59	18 27·8
71	303	...	...	54	11·2	5·8706	17·1674	13 0·65	20 41·7
72	...	...	...	30	12·2	5·9288	16·7298	13 2·20	18 30·6
73	307	...	...	82	10·1	5·9729	17·4677	13 3·17	22 12·0
74	312	...	...	46	11·6	6·0329	17·6432	13 4·64	23 4·8
75	...	...	...	25	12·4	6·0530	18·0341	13 5·07	25 2·1
76	...	...	...	44	11·6	6·0470	16·9992	13 5·12	19 51·7
77	...	...	...	23	12·5	6·1495	17·1029	13 7·68	20 23·0
78	...	...	...	30	12·2	6·1585	16·8592	13 7·95	19 10·0
79	...	...	...	22	12·6	6·1816	16·9166	13 8·52	19 27·2
80	...	...	...	38	11·9	6·1965	16·4708	13 8·98	17 13·5

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MNRAS..64

Oxford Ref. No.	Potsd. No. on Plate. 922.	B.D. +37° No.	Magnitude. B.D.	Magnitude. Oxford Diameter (sum of 4).	Magnitude. Inferred.	$\xi + 13'0000$. 1900·0.	$\eta + 13'0000$. 1900·0.	Deduced. R.A. 1900·0.	Deduced. N. Dec. 1900·0.
						R.I.	R.I.	$20^h +$ m s	$37 +^\circ$ ′ ″
81	...	...	...	46	11·6	6·2058	17·2562	13 9·07	21 9·1
82	...	...	...	22	12·5	6·2119	17·0270	13 9·26	20 0·4
83	...	...	...	25	12·4	6·2409	15·9445	13 10·19	14 35·8
84	318	3865	9·0	110	9·0	6·2395	15·5333	13 10·24	12 32·4
85	...	...	...	42	11·7	6·2657	16·9085	13 10·64	19 25·0
86	...	...	...	27	12·3	6·3026	16·9153	13 11·56	19 27·1
87	...	...	...	24	12·4	6·3633	17·8313	13 12·92	24 2·0
88	323	...	...	74	10·4	6·3688	17 8779	13 13·05	24 16·0
89	...	...	...	25	12·4	6·4080	15·9192	13 14·40	14 28·5
90	...	...	...	27	12·3	6·4228	17·6979	13 14·44	23 22·1
91	...	...	...	23	12·5	6·4487	17·3122	13 15·17	21 26·5
92	...	...	...	22	12·5	6·4607	17·4992	13 15·44	22 22·6
93	332	3866	8·0	165	7·0	6·5215	17·4903	13 16·97	22 20·1
94	...	...	...	43	11·7	6·5105	15·4744	13 17·05	12 15·3
95	...	...	...	38	11·9	6·5223	17·0303	13 17·07	20 2·1
96	...	...	...	22	12·5	6·5426	17·7584	13 17·45	23 40·5
97	335	...	...	59	11·0	6·5783	16·7143	13 18·53	18 27·5
98	...	...	...	46	11·6	6·6396	17·9095	13 19·86	24 26·1
99	...	...	...	34	12·0	6·6463	17·6439	13 20·08	23 6·4
100	336	...	...	55	11·2	6·6446	16·3118	13 20·27	16 26·9
101	...	...	...	49	11·4	6·7036	16·9905	13 21·64	19 50·5
102	...	...	...	46	11·6	6·7046	17·0518	13 21·65	20 8·9
103	338	...	...	48	11·5	6·7990	16·6175	13 24·10	17 58·9

Nos. 35 and 47.—The magnitude in column 5 for these two stars depends upon the first exposure only. The quantities given in columns 7 to 10 also depend upon the first exposure; in the former case the second image is completely involved in the first exposure of another star, in the latter case the second image is too doubtful to be measured.

It should be stated that these two stars have been corrected for plate constants, which had already been determined for another purpose, from the first exposure. But the values for a, b, d, e might have been used from the mean of the two exposures (§ 4), as there is a fairly close agreement between these two sets of constants. Of course c and f must differ.

a	b	c	d	e	f
−·00077	+·00605	+·0874	−·00618	−·00067	−·1114

7. After these stars had been measured and nearly the whole of the computations had been completed, I became acquainted

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MNRAS..64

with the fact that the region containing this cluster had already been measured at Potsdam, and the results are given in *Photographische Himmelskarte*, Band II., page 221, plate 922, where twelve stars are indicated with an asterisk as forming a small cluster. Having reached this stage it seemed to me that it would be of interest to compare these results with those from the Oxford plate 2294.

8. The plate centre of Potsdam plate 922, exposed in 1896 July 13 by Dr. Clemens, when it was 7^m west of the meridian, is given as $20^h\ 14^m\ 47^s{\cdot}2$, $+37°\ 0'\ 30''$, but the x and y coordinates given have not been corrected for plate constants, and none are indicated. To make the results comparable with those I have deduced from Oxford plate 2294 I have computed the positions of fifteen stars from the Lund A.G.C., adopting $+37°\ 0'\ 0''$, $20^h\ 15^m\ 0^s$ as a convenient centre, and, after a comparison of these places, reduced to coordinates ξ' and η' (1900·0), with the Potsdam measured x and y have solved the equations and obtained the following constants :

a	b	c	d	e	f
−·00001	−·00014	+·5125	+·00027	+·00004	−·1009

These corrections have been applied to the measures (as printed) in a similar manner as was performed for the Oxford measures (§§ 4 and 5), and the results (ξ' and η') transformed to differences of R.A. and decl. from the adopted plate centre ($+37°\ 0'\ 0''$, $20^h\ 15^m\ 0^s$). A comparison of the plates is given in Table II.

9. In this table I have only given the number, R.A., and decl. for Oxford and Potsdam. The corrected Potsdam measures (X, Y) can be found by inference from the Oxford R.A.'s and decl.'s (centre $+37°$, $20^h\ 16^m$). In the fifth and eighth columns are the differences O−P, the means being $-^s{\cdot}002$ and $+0''{\cdot}59$, indicating a correction required to the constant f.

Owing to the difference between the centres of the two plates, only seven of the fourteen reference stars are common to the two plates.

TABLE II.

Oxford No.	Potsdam No.	Oxford.	Potsdam.	O−P	Oxford.	Potsdam.	O−P
		h m s	s	s	° ′ ″	″	′
6	212	20 12 14·59	14·57	+0 02	+37 12 4 8	4·3	+0 5
9	222	20·53	20·52	+ ·01	15 4·5	4·3	+0 2
13	225	23·62	23·60	+ ·02	19 22 7	22·5	+0 2
15	231	26·21	26·24	− ·03	24 27·1	26·2	+0·9
16	230	26·45	26·41	+ ·04	14 55·9	55·5	+0·4
22	238	30·56	30·55	+ ·01	14 10·3	9·4	+0·9
30	259	44·53	44·54	− ·02	16 36·5	36·1	+0·4
31	260	45·03	45·01	+ ·02	17 58·7	58 2	+0·5
34	263	46·80	46·81	− ·01	14 8·3	7·7	+0·6

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MNRAS..64

Oxford No.	Potsdam No.	Oxford. h m s	Potsdam. s	O−P s	Oxford. ° ′ ″	Potsdam. ″	O−P ″
36	264	20 12 47·15	47·15	·00	+37 20 22·4	22·1	+0·3
39	267	47·95	47·91	+ ·04	20 5·5	4·7	+0·8
40	268	48·10	48·04	+ ·06	19 59·0	60·8	−1·8
41	271	48·89	48·90	− ·01	18 53·6	52·9	+0·7
42	274	49·33	49·34	− ·01	21 32·7	31·5	+1·2
43	275	49·46	49·42	+ ·04	20 1·4	1·1	+0·3
44	276	49·47	49·50	− ·03	20 21·3	20·8	+0·5
...	277	...	49·59	...	19 ...	55·2	...
45	279	50·53	50·50	+ ·03	20 12·5	11·8	+0·7
49	282	51·44	51·52	− ·08	14 36·9	37·4	−0·5
50	280	51·50	51·50	·00	20 8·2	7·3	+0·9
51	283	52·01	52·03	− ·02	20 3·1	2·6	+0·5
55	289	53·26	53·33	− ·07	21 40·0	39·5	+0·5
58	290	54·02	54·08	− ·06	15 39·3	38·8	+0·5
62	292	54·92	54·88	+ ·04	22 42·8	41·6	+1·2
69	299	59·20	59·18	+ ·02	13 31·6	31·3	+0·3
71	303	13 0·65	0·66	− ·01	20 41·7	40·8	+0·9
73	307	3·17	3·19	− ·02	22 12·0	11·2	+0·8
74	312	4·64	4·66	− ·02	23 4·8	3·6	+1·2
84	318	10·24	10·19	+ ·05	12 32·4	30·6	+1·8
88	323	13·05	13·08	− ·03	24 16·0	14·9	+1·1
93	332	16·97	16·93	+ ·04	22 20·1	19·4	+0·7
97	335	18·53	18·57	− ·04	18 27·5	27·9	+0·5
100	336	20·27	20·27	·00	16 26·9	26·4	+0·5
103	338	24·10	24·15	− ·05	17 58·9	58·6	+0·3
			Mean	−·002		Mean	+0·56

Potsdam 277 has a double note of interrogation against the printed measures. I cannot find anything on the Oxford plate to agree with this, but on the original measures I have the following note written opposite to Oxford No. 43: "? another star coalesced in the image of the bright star in the position *s.f.*" It is therefore very probable that Potsdam 277 is a star, as the position given would agree with my note; the semi-diameter of the image would be quite sufficient to overspread the faint star.

Potsdam 268 (Oxford 40). On the Oxford plate the images are partly involved in those of No. 39.

10. At the moment of completing this paper an advance copy of the first volume of the Greenwich Astrographic Catalogue was received by Professor Turner. In view of what has just been written in § 6 about the magnitudes it will be of interest to apply the Astronomer Royal's method for converting photographic into actual magnitudes to the measured diameters given

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MNRAS..64

for this plate (2294) in column 5 ; it will, however, be necessary to divide those sums by 2 to reduce them to the same scale as adopted at Greenwich, *i.e.* the sum of D and R diameters.

In the formula given by Dr. Christie

$$\text{Mag.} = C - n\sqrt{d}$$

where C is a constant to be determined, d is the measured diameter, the unit being $0''.15$; and n a constant which varies slightly with the duration of exposure. The mean value of n is found to be at Greenwich 0·73 for 20 sec., 0·77 for 6 min., and 0·84 for 40-min. exposures. In making the present comparison I have adopted 0·82 as the value of n for plate 2294, and have used B.D. magnitudes for twenty-two stars in the comparison with the Oxford measures, when divided by 2, and obtain 14·78 as the value of C. From this data I have formed Table III.

TABLE III.

Diameter.	$0{\cdot}82\sqrt{d}$.	$C-{\cdot}82\sqrt{d}$. mag.	Diameter.	$0{\cdot}82\sqrt{d}$.	$C-{\cdot}82\sqrt{d}$. mag.
5	1·84	12·94	40	5·18	9·60
10	2·59	12·19	50	5·80	8·98
15	3·17	11·61	60	6·36	8·42
20	3·67	11·11	70	6·86	7·92
25	4·10	10·68	80	7·33	7·45
30	4·49	10·29	90	7·78	7·00
35	4·85	9·93			

University Observatory, Oxford:
1904 *May* 12.

The Definitive Places of the Standard Stars for the Northern Zones of the Astronomische Gesellschaft. By A. M. W. Downing, D.Sc., F.R.S.

In *Astron. Nachrichten*, Nos. 3927–9, Professor Auwers has published his definitive corrections to the provisional places of the standard stars for the northern zones of the *Astronomische Gesellschaft*, which have been adopted in the reduction of the German zone observations. The Appendix to the *Berliner Jahrbuch* for 1906 supplies the corresponding corrections, for 1906·0, to the places of these stars as given in the body of that work.

It may be of some interest, therefore, to exhibit the results of a comparison of the places of the *Berliner Jahrbuch* stars, thus corrected, with their places as derived from Newcomb's "Fundamental Catalogue," which are given in the *Nautical*

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