

Nebulæ seen on Mr. Franklin-Adams' Plates. By J. A. Hardcastle, with Note by A. R. Hinks. (Plate 18.)

In the *Monthly Notices*, vol. lxxi., No. 7, Mr. Hinks threw out the suggestion that it would be an advantage if the series of 206 plates on which Mr. Franklin-Adams photographed the whole sky could be examined and a statement made of the nebulæ visible on them. By the kind permission of the Astronomer Royal these plates have been placed at my disposal, and I now present the result of a scrutiny carried out simply with a view of obtaining a list of the more conspicuous objects found on them. The position angles of those that are markedly elongated have also been added.

The aperture of the instrument was 10 inches and the focal length about 4 feet, so that $1^\circ = 2$ cm. The exposures were usually two hours.

The following classification has been adopted :—

Class I.—Spirals.

This class includes :—

- (a) 33 nebulæ which clearly show a spiral structure.
- (b) 87 nebulæ which were judged to be probably spiral. About 20 of these are known from other sources to be spirals.
- (c) 53 nebulæ of which it was impossible to state the structure, but which are known already to be spirals.

These 173 objects are plotted on fig. 1.

Class II.—Elongated.

These are spindle-shaped, with or without a central condensation or nucleus; some are oval, with length at least double of the breadth. These 233 objects are plotted on fig. 2.

Class III.—Diffused.

This class contains the large gaseous nebulæ already well known and any others of which the images on the plates exceeded 2' in diameter, but show no structure. Of these there are 51.

Class IV.—Small.

Of these all that can be said is that they are distinguishable from star-images on these plates. About 20 which were originally placed in this class were found to be known to be spiral and were transferred to class I (c). About 25 others which appear in the lists given by Mr. Hinks in *M.N.*, vol. lxxi., No. 8, have also been removed, and the remaining 327 have been plotted in fig. 3.

The position angles which are printed in italics differ notably from those given in the *N.G.C.*

CLASS I(a). 33 SPIRALS.					
N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.
224		1300	99°	4254	
246		1365		4303	100°
247	172°	1566		4321	127
300		2442	39	4536	120
598		2903	8	5194	
613		2997		5236	
628		3031		5247	
908	72	3627		6744	
1097	144	3631		7125	90
1187		3893	167	7424	
1232		4051		7479	10

The following have not, I believe, been described before:—

- 300 !! 15' × 20', B no N, B* inv.
 1097 !! eBN, arms ext. to 6' × 8', central spindle 6' in 144°.
 1232 R. BN. 6' 2 arms.
 2442 !! F. 2 arms 6' 39° cFN.
 7424 cF. R. 6'.

CLASS I(b). 87 ?SPIRALS.					
N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.
55	108°	1510		3359	1°
134	41	1518	30°	3511	68
150		1527	88	3621	153
157	27	1531	24	3623	11
210	27			1532	3646
428		*1784	3649		
450		1808	144	*3686	
578	130	*2146	125	*3718	
672	72	2207	109	3794	
894		2280	158	4027	
		2403		4116	155
925		2532	5	4123	130
936		2835	179	4258	147
986		3079	159	4364	
1042		3115	40	4487	
1313	0	3169	80	4490	
1385	0	3175	52	4501	142
1398		3223	142	4517	85
1406	17	3281		4527	50
1425	129	3354	139	4535	

* 1784, 2146, 3686 described as Sp. in *L.O.B.*, 248. 3718 in *L.O.B.*, 248, is Bifid irreg. 3'.

CLASS I(b). 87 ? SPIRALS—*continued*.

N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.
4559	137°	*5427		7412	
4569	10	5468		7456	18°
4579		†5927		7496	
4605		6907		7552	90
4654	124	‡7023		7599	
4945	39	7083	13°	7723	
5068		7107		7756	
5128	121	7141	9	7793	102
5334		7184	46		
5364		7410	32		

In II. Index Catalogue 2132, 132°, and 5332.

CLASS I(c).

221	3596	4402	5033
246	3810	4406	5897
488	3938	4449	6217
1068	3991	4450	6300
1433	4030	4472	6643
1559	4062	4485	6872
1637	4088	4548	7217
1672	4136	4571	7293
1792	4150	4618	7329
3034	4189	4631	7814
3109	4214	4639	II. 2995
3368	4236	4651	
3423	4374	4725	
3556	4382	4826	

CLASS II.

N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.
25	39°	493	50°	1055	90°
131	51	520	140	1084	34
185	35	625	98	1233	69
205	160	645	130	1249	71
253		779	155	1332	108
289	163	891	10	1350	13
337	130	958	0	1353	132
406	25	1003	89	1360	33

* D.S. says "probably ring."

† $\oplus \Delta$.

‡ Crossley 65.

CLASS II.—*continued.*

N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.
1428		3549	27°	4208	51°
1448	29°	3571	90	4216	16
1507	5	3593	91	4217	41
1511	116	3628	74	4220	136
1515	14	3669	156	4224	40
1553	143	3673	77	4235	46
1558	58	3675	178	4244	42
1560	10	3705	47	4246	75
1602	76	3726	1	4274	97
1617	122	*3729	153	4293	56
1620	20	3735	135	4294	141
1771		3756	179	4298	} 131
2543		3769	140	4302	
2613	115	3877	30	4304	
2715	10	3917	57	4307	22
2770	145	3949	133	4312	157
2784	59	3953	10	4313	136
2815	9	3957	172	4314	143
2841	144	3972	118	4350	27
2976	150	3976	45	4388	92
3020	93	3981	16	4389	93
3024	123	4010	54	4414	164
3044	115	4038	45	4419	132
3054	142	4064	150	4429	97
3187	116	4094	50	4448	94
3190	116	4096	15	4460	34
3198	30	4100	155	4469	87
3227	152	4109		4480	0
3254	35	4124	110	4498	132
3309	160	4125	77	4502	131
3347	179	4134	140	4504	150
3365	157	4144	101	4522	31
3368	33	4169		4526	111
*3389	83	4178	25	4546	85
3412	13	4179	150	4565	134
3449	143	*4192	136	4567	62
3454	44	4197	30	4568	15
3521		4206	1	4586	120

* *L.O.B.*, 248, spiral.

CLASS II.—*continued.*

N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.	N.G.C.	Pos. Ang.
4592	90°	5577	50°	7582	135°
4594	87	5584	150	*7640	
4602	100	5595	38	7721	10
4634	143	5676	38	7817	40
4656	}	5690	145	I. 749	
4657		5728	22	I. 1151	24
4666	45	5866	119	II. 1627	133
4698	158	5900	} 20	II. 1657	0
4710	18	5901		II. 1783	0
4712	167	5984	148	II. 1954	31
4746	108	6015		II. 1970	70
4747	37	6293		II. 2469	32
4762	21	6707	151	II. 2531	66
4793	48	6769		II. 2554	11
4835	150	6887	100	II. 2555	39
4856		6925		II. 2974	95
4866	89	6943	132	II. 3253	27
5005	55	7038		II. 4720	164
5012	10	7059	88	II. 4721	154
5055	108	7064	97	II. 4810	
5102	37	7090	126	II. 4837	
5161	66	7098	39	II. 5039	
5170	310	7124	142	II. 5041	
5248	125	7162		II. 5052	141
5253	35	7179	16	II. 5152	109
5348	175	7218	30	II. 5171	158
5356	15	7307	2	II. 5176	25
5483	13	7331	153	II. 5249	6
5496	0	7361	9	II. 5269	102
5507	90	7448	169	II. 5270	102
5529	117	7462	73	II. 5271	137
5560	105	*7497	25	II. 5273	37
5566	150	7531	16		

There is also a nebula at R. A. $13^{\text{h}} 5^{\text{m}}$ N. P. D. $121^{\circ} 53'$ not in the *N. G. C.*,
 cF. $3' \times \frac{1}{2}' 154^{\circ}$.

* *L. O. B.*, 248, spiral.

CLASS III.				
346		Diffused	2736	Diffused
521		„	3113	90° „
864		„	3137	0° „
1435		Merope	3324	„
1549		Diffused	3351	M. 95
1574		„	3372	η Argūs
1760/1		Magellanic Cl.	3587	The Owl
1783		„	3672	178° Diffused
1788		„	4050	90° „
1952		Crab	4532	160° „
1976		θ Orionis	5085	„
2011		Magel. Cl.	5339	„
2023	140°	ζ Orionis	6503	125° „
2024		Diffused	6514	Trifid
2030		Magel. Cl.	6618	The Omega
2068	15°	Diffused	6726/7	Diffused
2069/70		Looped Neb.	6822	„
2103		Magel. Cl.	6853	The Dumb-bell
2237		Diffused	6992	Cygnus
2257		„	7293	Helix (Shaw)
2264		„	7314	0° Diffused
2417		„	II. 1727	„
2427	135°	„	II. 2177	„
2467		„	II. 2944	„
2517		„	II. 4499	„
2626		„		

CLASS IV.			
121	458	881	1316
132	514	897	1344
147	516	922	1367
152	602	941	1395
173	643	942	1466
234	685	950	1473
238	701	1022	1533
278	720	1199	1536
339	753	1208	1543
361	755	1209	1546
404	782	1302	1581
411	788	1309	1596
419	852	1315	1629

June 1914.

Mr. Franklin-Adams' Plates.

705

CLASS IV.—*continued.*

1651	2177	3336	4106
1652	2187	3358	4143
1676	2190	3367	4152
1703	2203	3370	4158
1718	2209	3377	4168
1736	2213	3379	4193
1779	2214	3384	4215
1789	2249	3414	4241
1796	2305	3430	4257
1805	2389	3455	4260
1806	2397	3464	4272
1826	2424	3485	4273
1831	2434	3486	4278
1852	2573	3488	4310
1884	2633	3489	4336
1887	2665	3504	4351
1900	2763	3512	4365
1920	2787	3513	4371
1944	2849	3514	4380
1951	2855	3546	4407
1978	2889	3557	4430
2010	2916	3564	4435
2046	2943	3568	4442
2047	2968	3607	4452
2053	2971	3608	4458
2075	2983	3626	4459
2082	2985	3655	4461
2105	3001	3659	4465
2107	3019	3660	4473
2111	3059	3681	4474
2114	3077	3684	4476
2120	3091	3813	4479
2121	3095	3887	4494
2133	3162	3923	4496
2145	3166	3941	4503
2147	3193	3973	4519
2154	3208	4026	4525
2155	3226	4036	4531
2162	3268	4037	4540
2166	3275	4074	4550
2173	3285	4105	4551

50

CLASS IV.—*continued.*

4552	5230	6780	I. 1303
4561	5300	6848	II. 1933
4570	5324	6878	II. 2056
4574	5327	6880	II. 2070
4578	5363	6902	II. 2073
4580	5419	6935	II. 2113
4589	5494	6937	II. 2202
4593	5576	7006	II. 2440
4596	5597	7007	II. 2522
4606	5633	7070	II. 2537
4621	5645	7126	II. 2580
4633	5665	7135	II. 2582
4647	5668	7192	II. 2588
4689	5674	7321	II. 2627
4693	5695	7377	II. 2631
4696	5701	7457	II. 3026
4697	5893	7515	II. 3115
4733	5967	7590	II. 3797
4750	5970	7689	II. 4628
4753	6060	7755	II. 4662
4754	6077	I. 59	II. 4830
4902	6102	I. 63	II. 4901
4947	6106	I. 382	II. 5156
4958	6235	I. 391	II. 5186
4965	6245	I. 405	II. 5265
4995	6340	I. 532	II. 5325
5042	6355	I. 602	
5172	6753	I. 724	

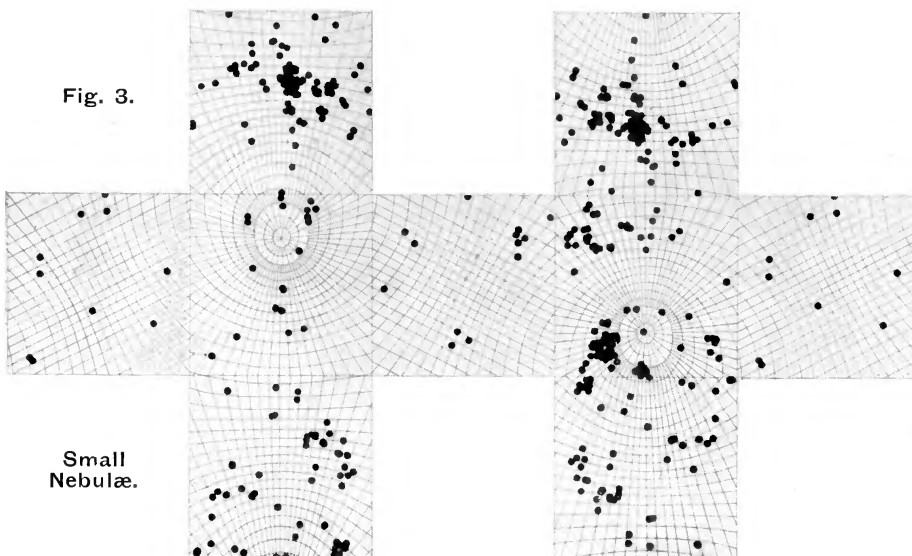
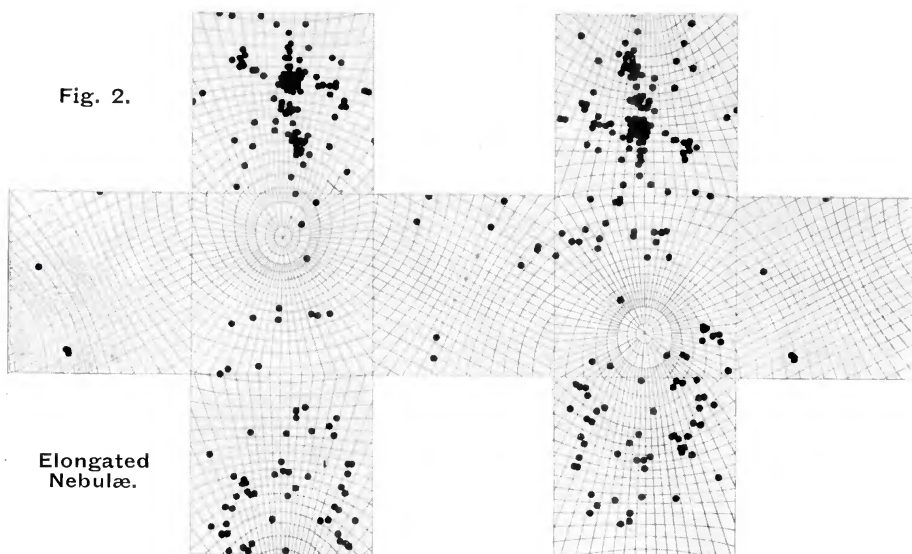
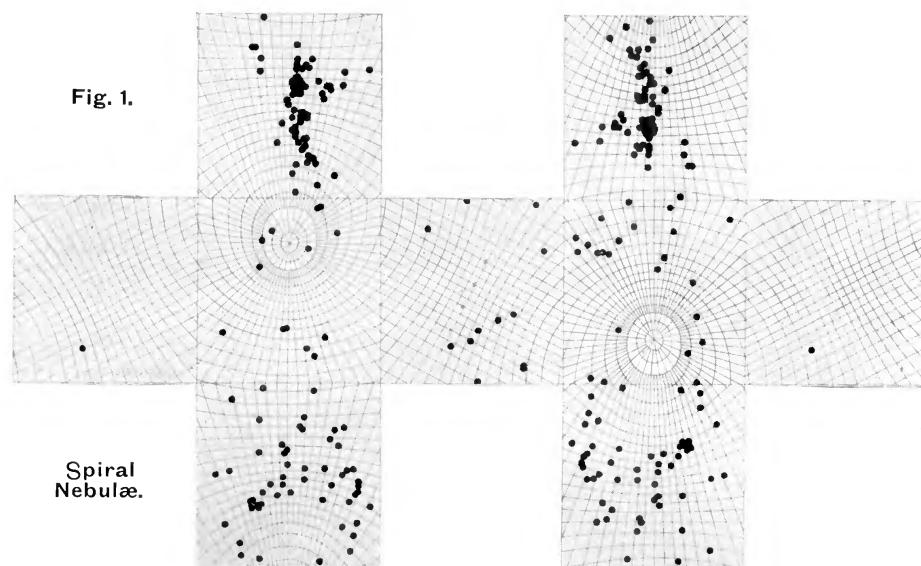
For all the heaviest part of the work, such as identifying the *N.G.C.* numbers and sorting out the various classes, I am indebted to Miss A. G. Cook, for whose most efficient help I wish to express my thanks.

Crowthorne, Berks:
1914 *June.*

Note by A. R. Hinks.

The author of this paper kindly allows me to add a note on his results.

We have now available for the first time a count and rough classification of nebulæ, from plates covering the whole sky, made with one instrument, under fairly uniform conditions. Only a small proportion of all the known nebulæ are recognisable on the plates; but as far as they go the results are unbiased. In



particular they are not affected by the tendency to search in regions known to be rich.

The results have been plotted on the projection used in my papers in *M.N.*, vol. lxxi., Nos. 7 and 8, and may thus be compared readily with my earlier diagrams. If we letter the squares containing the northern and southern galactic poles N and S, and the galactic squares A, B, C, D, we have the following numbers:—

	Spirals.	Spindles.	Small.
N	70	118	122
S	52	51	58
A	1	4	10
B	13	14	18
C	12	9	13
D	23	34	106

It should be noted that the nebulae here called small are not so small as the smaller planetary and the stellar nebulae. The latter are indistinguishable from stars on these plates.

The conclusions which I would draw are briefly as follows:

1. Open spirals are nearly equally common in the northern and southern squares, but there is a great excess of spindles in the northern, as shown in column 2 and reflected in column 3. This excess of spindles in square N is the most important fact established by Mr. Hardcastle's investigation.

2. The notable absence of spirals and spindles in square A, previously remarked by me, is confirmed by this paper. Along the other galactic squares the distribution approaches uniformity, except for square D, "small," which is influenced by the Magellanic cloud, whose nebulae are of a quite different kind.

3. The old view that the distribution of these spirals and spindles, the "white" nebulae, is determined by mere avoidance of the galactic plane cannot be maintained. Whatever may be the law of distribution, it is not a function of galactic latitude only. Galactic longitude is equally important.

* *Note on the Star 42 Virginis.* By E. W. Barlow, B.Sc.
(Plate 19.)

The star in the constellation Virgo to which the Flamsteed number 42 was allotted is now apparently absent from the sky. There is no object in or close to its position except two stars of the 9th and one of about the 10th magnitude. The disappearance of the star 42, of about the 6th magnitude, is alluded to in several astronomical works of the nineteenth century, and is left unexplained. Furthermore, the evidence for and against such an object ever having existed is presented in a very partial and incomplete form. This evidence I have attempted to render as complete as possible,