that my observations were made on 51 different dates, distributed through 7 months. This does not refer to the number of nights on which observations were made, which would be vastly greater, because meteors were frequently observed on the same date for many successive years. Does it not seem strange that if stationary radiants are fairly numerous, as Mr. Denning claims, so little indication of their existence should have been found with all this opportunity?

It may be added that some 300 meteors observed in October 1911 and 1912, as yet unpublished, confirm my former conclusions.

Yerkes Observatory,
Williams Bay, Wis.:
1913 *Aug.* 21.

Photographic Magnitudes of 262 Stars within 25′ of the North Pole. By S. Chapman, B.A., D.Sc., and P. J. Melotte. (Plate 1.)

(*Communicated by the Astronomer Royal.*)

1. The present work arose out of the need for the determination of the photographic magnitudes of a number of faint stars in certain special regions, for the standardisation of the star counts made on the Franklin-Adams' charts in the possession of the Royal Observatory. The standardisation of about thirty of these plates has been performed with the aid of the 30-inch reflector, by successive 30-minute exposures on pole and field when at equal altitude; but on account of (1) difficulties in maintaining the focus of the reflector, (2) the smallness of its field of good definition, and (3) the scarcity of nights sufficiently good for such long comparison exposures, the use of the reflector for the purpose has been abandoned. The 26-inch refractor is now used, and as regards focus and field of good definition (up to 25′ from the centre, at least) is entirely satisfactory; its grasp and transmission of light to the photographic plate is somewhat inferior to that of the reflector, but this is compensated for by the improvement in the images. The scarcity of nights suitable for long comparison exposures remains, however; and to obviate the necessity for such comparisons, another method has been adopted, which depends on the use of a wire diffraction grating.

2. The present procedure is to make a comparison of field and pole by four exposures on pole, field, field and pole (in this order) of six minutes' duration in each case.* The duplication of exposures checks the uniformity of the night and helps to detect

* It may be remarked here that a careful investigation has shown that there is no systematic difference in the images of the stars of the polar region, as obtained by the first and last exposures. Such a systematic difference has been reported elsewhere, but if any difference occurs on the Greenwich plates, its magnitude is certainly less than $0^{m}\cdot01$.

spurious images. With the 26-inch refractor, an exposure for six minutes (Ilford Monarch plates being used) gives measurable images of 13·5 magnitude stars (on the scale of Professor Pickering's north polar sequence—Harvard Circular, No. 170), in general, ranging from $13^{m}\cdot0$ to $14^{m}\cdot0$ on specially poor or good nights. The magnitudes of the field stars down to this limit of faintness are thus determined by direct comparison with the pole. Another series of plates is taken with a 60-minute exposure on the field alone, with a diffraction grating placed in front of the object glass of the telescope; this grating produces diffraction images on each side of the images of the brighter stars, with a definite magnitude interval between the central and diffraction images. A knowledge of this interval and of the magnitudes of the brighter stars (down to $13^{m}\cdot5$, say, as determined from the short-exposure plates) makes it possible to determine the magnitudes of the fainter stars on the plate, without further comparison with the pole. The diffraction grating is also used in taking the short-exposure plates, partly to determine its magnitude interval, and partly to measure the bright stars on the field (*see* the next paper for a description of the two gratings used, and a discussion of some results obtained with them). Both of the above sets of plates are being taken in duplicate. The fields to be dealt with include about 100 Franklin-Adams' regions, together with all Kapteyn's selected areas in the northern hemisphere. Short-exposure plates only are being taken for the Kapteyn areas.

3. The measures are made by simple comparison with a scale of numbered and graded comparison stars, the smallest of which is quite faint and grey. The method of measuring the diameters of the images seems to be unsuitable for the determination of the magnitude of faint stars, since to obtain images sufficiently black to have a measurable edge requires a longer exposure than can be afforded for the single-exposure plates (going down to $15^{m}\cdot0$ or $15^{m}\cdot5$), or than seems desirable for comparisons with the pole, in the case of the plates with four exposures.

Several comparison scales are in use, in order to suit the various qualities of definition on different plates, that one being chosen which best matches the images on the particular plate to be measured. The scales are cut out of negatives containing fourteen exposures on a selected star, of durations so calculated as to give a magnitude interval between each exposure of about $0^{m}\cdot25$; the actual intervals are, however, determined anew for each plate measured. The star to be measured and the comparison scale are viewed simultaneously in the eyepiece of a comparator by an arrangement of reflecting prisms. Estimates are made to one-tenth of the intervals on the comparison scale, and each plate is measured twice over by different people; a region 40′ square is measured on each plate.

4. The comparison scale is standardised on every plate measured, by means of the stars of known magnitude on the pole field. This rests ultimately on Pickering's determination of the

photographic magnitudes of 17 stars (down to magnitude 14·19) in his polar sequence, but in order to diminish the effect of accidental errors in the measurement of these stars, the magnitudes of *all* the pole stars in the field have first been determined. For this purpose a number of the short-exposure plates were used, and, in addition, six plates each with an hour's exposure (and in one case with duplicate hour exposures). The latter were taken partly to test the diffraction gratings and partly to extend the magnitude determinations on the pole field to below 15^m, as well as to improve the magnitudes of stars near the limit of faintness of the short-exposure plates. The polar region is photographed on these plates at all hour angles, and in varying positions on the plate, so that the total region measured is a circle of about 50′ diameter; some stars near the edge and some faint stars occur only on a few out of the twenty plates used for the purpose. On account of the varying positions of the stars on the plates and the excellence of definition over the region measured, no correction to the magnitude depending on position on the plate has been applied.

5. The magnitudes thus determined of 262 stars are given in the following list. The values derived from the long and short exposure plates are shown separately, together with the number of plates on which the star is measured, in each case. The first column of the list gives the number of the star in *Harvard Annals*, xlviii., No. 1, Table VI. (Catalogue of stars near the North Pole). The second and third columns give the co-ordinates of the stars as measured from the pole (epoch 1900). The unit is 5′ of arc, and the x and y co-ordinates increase in the directions from the pole to 0^h and 6^h respectively. These co-ordinates are directly comparable with those given in the "Catalogue of 2212 Stars within 3° of the Pole," *Greenwich Astrographic Catalogue*, vol. iii Columns four and five refer to the long-exposure plates, and the sixth and seventh columns to the short-exposure plates. The adopted mean value is given in column eight, and in the ninth column the Harvard magnitudes (H. C., No. 170), on which the whole work is based, are inserted.

The interpolation between the magnitudes of the standard stars of the sequence, to arrive at the magnitudes of the other stars, was made graphically. From the residuals it appears that the probable error of an estimate on a single long-exposure plate is $\pm 0{\cdot}077$; this value applies to the faintest stars (below 15^m) as well as to those of magnitude 12, 13, and 14. On the short-exposure plates, similarly, the probable error of the estimate from a single plate is $\pm 0^m{\cdot}080$. For the stars down to the 14th magnitude, the number of plates on which each star occurs is numerous, from 6 to 15 or so; the stars $14^m{\cdot}0$ to $15^m{\cdot}0$ have in the mean 5 determinations, while those still fainter have from 1 to 3 or more determinations.

For the convenience of other observers the stars in this list have also been set out on the chart, Plate 1, the images being graded according to magnitude. The chart is probably complete to magnitude 15·0 at least, except possibly near its edge.

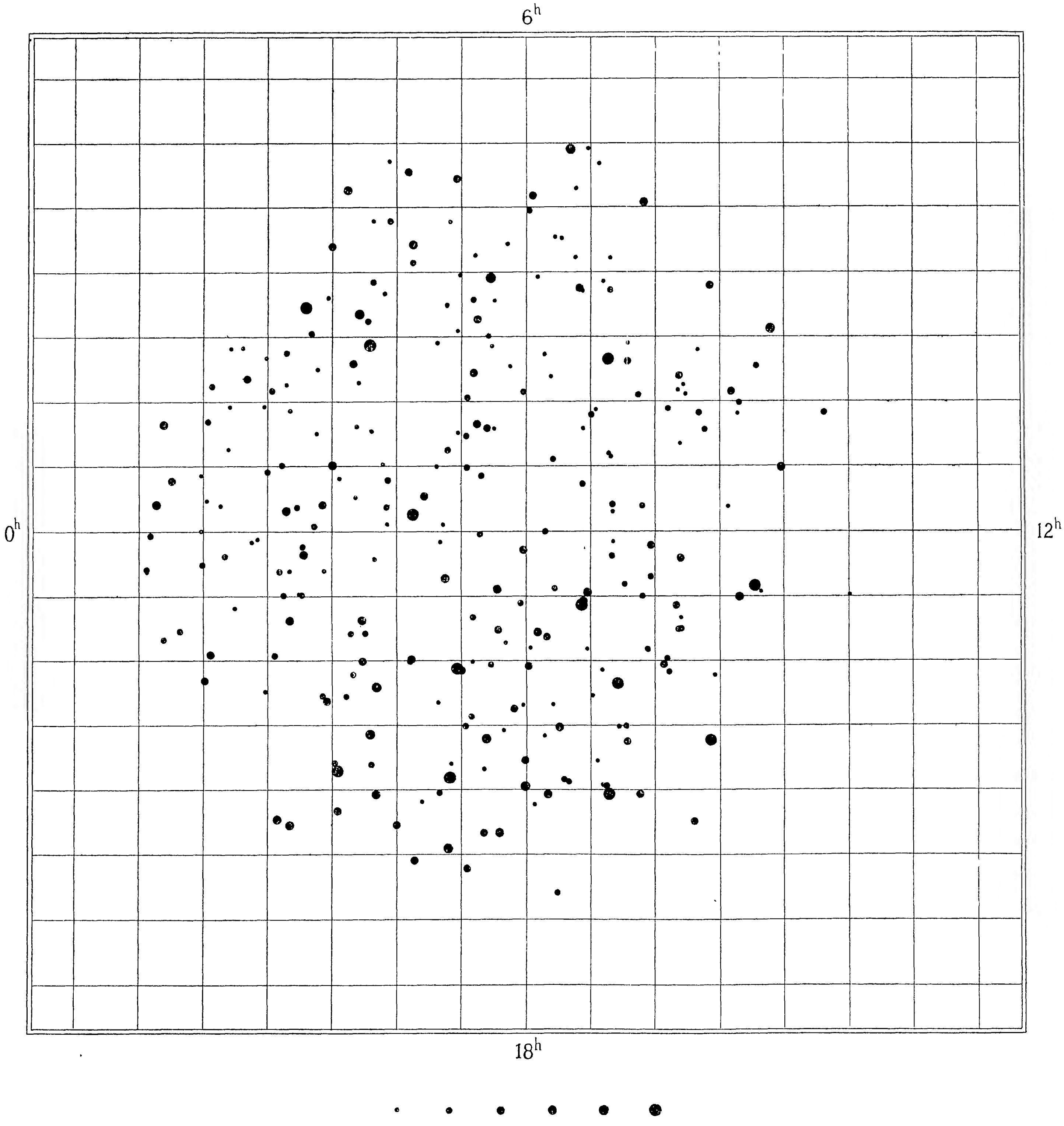

Chart of Stars within 25′ of the North Pole. Epoch 1900·0. One interval = 5′.
The position of the Pole changes about one interval in 15 years in the direction of 0^h.

Magnitudes of 262 Stars within 25′ of North Pole.

Harvard No. (48).	x.	y.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (Mean).	Harvard Mag.
31	−5·02	−0·99	15·72	1	...	...	15·72	...
41	−4·62	+1·83	14·95	1	...	...	14·95	...
57	−3·95	+0·98	12·60	5	12·60	7	12·60	...
62	−3·79	+3·12	...	...	11·28	4	11·28	...
70	−3·64	−0·93	15·45	1	...	...	15·45	...
74	−3·57	+2·55	14·72	3	...	...	14·72	...
75	−3·55	−0·84	...	...	10·90	6	10·90	...
85	−3·31	−1·01	12·26	3	12·32	8	12·29	...
86	−3·31	+1·98	14·53	6	...	...	14·53	...
88	−3·28	+1·81	15·00	2	...	...	15·00	...
90	−3·19	+2·16	13·31	6	13·33	7	13·32	...
94	−3·14	+0·38	15·40	2	...	...	15·40	...
100	−2·93	−2·22	15·53	1	...	...	15·53	...
101	−2·87	−3·24	...	...	10·26*	2	10·26	10·17
103	−2·86	+3·79	...	...	13·08	6	13·08	...
105	−2·78	+1·56	14·72	6	...	...	14·72	...
111	−2·69	+1·82	14·63	4	...	...	14·63	...
112	−2·67	+2·80	15·67	1	...	...	15·67	...
115	−2·61	−4·49	...	...	13·12	2	13·12	..
122	−2·48	+2·11	15·39	3	...	...	15·39	...
123	−2·45	+2·26	15·69	1	...	...	15·69	...
125	−2·41	−1·50	14·63	6	...	...	14·63	...
126	−2·41	−1·33	15·29	3	...	...	15·29	...
127	−2·40	−0·41	13·72	6	13·68	7	13·70	...
128	−2·40	+1·35	15·27	4	...	...	15·27	...
130	−2·39	−1·51	14·42	6	...	...	14·42	...
131	−2·37	+2·39	13·90	6	...	...	13·90	...
132	−2·36	+2·17	15·40	1	...	...	15·40	...
134	−2·34	−1·14	13·79	6	...	...	13·79	...
139	−2·23	−2·17	14·82	3	...	...	14·82	...
140	−2·20	+1·89	14·66	6	...	...	14·66	...
142	−2·19	−1·97	14·04	6	...	...	14·04	...
146	−2·14	−2·06	13·82	6	...	...	13·82	...
151	−1·95	−0·22	13·18	6	13·20	12	13·19	...
152	−1·94	−0·69	14·11	6	...	...	14·11	...
154	−1·90	−1·82	14·66	5	...	...	14·66	...
157	−1·83	+5·08	...	...	12·52	3	12·52	...

* From diffraction images with grating II. (see next paper).

Magnitudes of 262 *Stars within* 25′ *of North Pole*—Continued.

Harvard No. (48).	*x*.	*y*.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (mean).	Harvard Mag.
158	−1·81	−1·00	14·96	3	...	...	14·96	...
159	−1·81	+0·39	14·96	3	...	...	14·96	...
162	−1·78	−4·07	13·19	1	13·26	4	13·23	...
163	−1·75	+2·10	14·97	3	...	...	14·97	...
171	−1·59	+2·90	15·43	1	...	...	15·43	...
172	−1·59	+2·62	13·12	6	13·16	10	13·14	...
174	−1·58	−3·26	13·12	4	13·13	9	13·13	...
175	−1·56	−3·01	14·67	3	...	...	14·67	...
176	−1·54	−0·81	14·07	5	...	...	14·07	...
182	−1·44	−3·03	15·47	3	...	...	15·47	...
184	−1·43	−2·36	...	...	10·54	8	10·54	...
188	−1·35	−0·16	15·62	2	...	...	15·62	...
189	−1·34	+0·30	15·50	4	...	...	15·50	15·52
190	−1·34	+0·41	14·93	5	...	...	14·93	14·97
191	−1·34	−0·38	14·12	6	...	...	14·12	14·06
192	−1·32	+1·15	15·11	4	...	...	15·11	...
193	1·31	+3·72	14·82	5	...	...	14·82	...
194	−1·30	+4·21	15·65	1	...	...	15·65	...
195	−1·29	−4·07	...	...	10·94	7	10·94	...
196	−1·29	+1·20	15·04	4	...	...	15·04	...
197	−1·28	+2·65	...	...	10·95	10	10·95	10·94
199	−1·25	−3·94	14·99	1	...	...	14·99	...
201	−1·20	+3·86	15·14	4	...	...	15·14	...
204	−1·19	−3·92	15·40	1	...	...	15·40	...
205	−1·18	−2·14	15·44	2	...	...	15·44	...
206	−1·14	+5·69	15·29	1	...	...	15·29	...
209	−1·10	−3·55	15·10	2	...	...	15·10	...
210	−1·09	+1·87	15·55	2	...	...	15·55	...
214	−1·03	−2·53	15·17	3	...	...	15·17	...
215	−1·02	+1·79	14·87	3	...	...	14·87	...
216	−0·97	+5·92	15·62	1	...	...	15·62	...
218	−0·96	−1·82	15·00	5	...	...	15·00	...
219	−0·95	−0·94	12·64	6	12·68	13	12·66	...
223	−0·89	+1·58	15·61	2	...	...	15·61	...
225	−0·88	−1·09	12·24	6	12·26	13	12·25	12·31
226	−0·87	+0·73	14·58	4	...	...	14·58	...
227	−0·87	−1·13	...	...	10·64	12	10·64	10·68
228	−0·87	+3·70	15·11	2	...	...	15·11	...
230	−0·83	+3·74	13·69	5	13·76	1	13·73	...

Magnitudes of 262 Stars within 25′ of North Pole—Continued.

Harvard No. (48).	*x*.	*y*.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (mean).	Harvard Mag.
233	–·078	+5·30	15·53	1	...	...	15·53	...
234	–0·77	+4·23	15·33	5	...	...	15·33	...
237	–0·69	+5·90	11·89	1	...	..	11·89	...
239	–0·66	–3·87	14·93	3	...	...	14·93	...
243	–0·59	–3·84	14·02	4	...	...	14·02	...
246	–0·56	+4·52	15·00	5	...	...	15·00	...
248	–0·51	–3·03	12·87	6	12·86	12	12·86	12·82
249	–0·48	–5·59	14·98	1	...	...	14·98	...
252	–0·45	+4·54	15·18	2	...	...	15·18	...
254	–0·44	–0·88	14·94	6	...	...	14·94	14·91
256	–0·43	+1·10	14·11	4	...	...	14·11	...
258	–0·41	–2·67	15·49	2	...	...	15·49	...
260	–0·39	+2·39	15·71	1	...	...	15·71	...
262	–0·33	–4·07	12·72	4	12·70	7	12·71	...
263	–0·32	–1·63	13·73	6	13·77	6	13·75	13·73
264	–0·29	+2·73	15·26	5	...	...	15·26	...
265	–0·29	0·00	14·33	6	..	...	14·33	14·33
266	–0·28	–3·17	15·66	1	...	...	15·66	...
268	–0·18	–1·55	12·34	6	12·30	13	12·32	12·28
269	–0·18	+3·92	15·44	1	...	...	15·44	...
273	–0·13	–4·22	15·14	3	...	...	15·14	...
275	–0·10	+5·18	13·98	2	...	...	13·98	...
277	–0·07	–1·80	15·09	5	...	...	15·09	...
278	–0·06	+4·96	14·89	2	...	...	14·89	...
279	–0·02	–2·09	13·55	6	13·51	6	13·53	13·50
281	+0·02	–3·55	13·85	6	13·84	4	13·85	...
282	+0·02	–3·95	...	...	11·47	7	11·47	11·49
283	+0·04	+2·15	14·33	4	...	...	14·33	...
284	+0·04	–0·29	13·20	6	13·20	12	13·02	13·20
286	+0·05	–2·68	15·49	2	...	...	15·49	...
288	+0·08	–1·10	14·15	6	...	...	14·15	14·19
292	+0·19	–2·75	12·99	6	13·05	12	13·02	13·05
293	+0·24	+2·55	15·14	5	...	...	15·14	...
294	+0·29	+4·44	15·10	3	...	...	15·10	...
295	+0·31	–1·72	15·26	3	...	...	15·26	...
297	+0·34	–3·07	15·40	2	...	...	15·40	...
300	+0·43	–1·52	13·22	6	13·15	11	13·19	...
302	+0·45	–0·89	12·60	6	12·62	12	12·61	12·59
303	+0·48	+3·56	15·27	5	...	...	15·27	...

Magnitudes of 262 Stars within 25′ of North Pole—Continued.

Harvard No. (48).	x.	y.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (Mean).	Harvard Mag.
304	+0·49	+1·59	15·43	1	...	...	15·43	.
306	+0·52	+2·86	14·90	6	...	...	14·90	...
309	+0·54	+3·90	...	...	11·03	12	11·03	...
311	+0·55	−2·06	14·70	4	...	...	14·70	...
312	+0·58	+3·02	15·42	2	...	...	15·42	...
313	+0·58	−4·66	12·90	1	13·06	5	12·98	...
319	+0·60	+1·58	13·95	3	...	...	13·95	...
320	+0·62	−3·22	11·95	4	11·99	12	11·97	11·92
321	+0·65	−4·67	13·84	1	...	...	13·84	...
322	+0·66	−3·69	15·80	2	...	...	15·80	...
323	+0·69	+0·85	14·87	4	...	...	14·87	14·88
324	+0·71	−0·04	14·56	6	...	...	14·56	14·55
327	+0·75	+3·27	13·99	6	...	...	13·99	...
329	+0·76	+1·65	13·88	6	13·82	4	13·85	...
331	+0·78	+4·26	15·63	1	...	...	15·63	...
332	+0·80	+2·44	13·85	6	...	...	13·85	...
333	+0·81	+3·58	14·32	6	...	...	14·32	...
334	+0·82	−1·32	14·90	6	...	...	14·90	...
335	+0·83	−2·01	15·76	2	...	...	15·76	...
336	+0·85	−2·87	14·50	6	...	...	14·50	...
338	+0·90	+2·06	14·27	6	...	...	14·27	...
339	+0·91	+0·98	14·99	5	...	...	14·99	15·09
340	+0·92	−5·23	...	...	13·50	3	13·50	...
341	+0·92	+1·46	14·80	5	...	...	14·80	...
342	+0·94	−3·02	14·62	6	...	...	14·62	...
345	+1·00	−2·15	13·10	6	13·16	11	13·13	...
346	+1·02	+3·95	15·38	2	...	...	15·38	...
347	+1·05	+1·52	15·50	2	...	...	15·50	...
348	+1·06	+3·09	15·10	5	...	...	15·10	...
349	+1·07	+5·45	13·21	3	13·11	3	13·16	...
350	+1·07	−2·13	...	...	10·64	11	10·64	...
354	+1·16	−3·60	15·17	4	...	...	15·17	...
355	+1·17	+4·78	15·34	2	...	...	15·34	...
356	+1·18	−3·82	...	...	10·42	9	10·42	...
358	+1·20	+1·26	14·99	6	...	...	14·99	...
359	+1·21	−4·91	...	...	10·98	4	10·98	...
360	+1·21	+3·49	15·68	2	...	...	15·68	...
362	+1·25	−0·73	12·61	6	12·59	13	12·60	...
363	+1·28	+0·10	15·63	1	...	...	15·63	15·61

Magnitudes of 262 Stars within 25′ of North Pole—Continued.

Harvard No. (48).	x.	y.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (Mean).	Harvard Mag.
365	+1·32	−0·16	15·02	4	...	...	15·02	14·97
366	+1·34	−4·06	14·84	3	...	...	14·84	...
368	+1·36	−2·65	15·32	3	...	...	15·32	...
369	+1·37	+2·90	15·49	3	...	...	15·49	...
370	+1·39	+1·00	15·69	2	...	...	15·69	...
378	+1·57	+0·54	13·51	3	13·41	8	13·46	...
380	+1·61	−4·19	15·80	2	...	...	15·80	...
385	+1·73	−5·09	...	...	13·28	2	13·28	...
386	+1·74	+0·26	...	...	10·62	11	10·62	10·52
387	+1·75	+4·42	13·02	5	12·95	6	12·98	...
388	+1·76	+4·14	14·98	2	...	...	14·98	...
389	+1·78	−1·98	13·11	6	13·09	13	13·10	...
391	+1·79	−2·01	14·15	6	...	...	14·15	...
393	+1·82	+5·55	13·93	1	...	...	13·93	...
398	+2·01	−4·56	13·06	2	13·15	5	13·10	...
399	+2·10	+4·78	14·14	3	...	...	14·14	...
400	+2·11	+5·72	15·01	1	...	...	15·01	...
401	+2·13	+0·78	14·10	6	...	...	14·10	...
402	+2·14	+0·10	15·43	3	...	...	15·43	...
403	+2·16	+0·37	14·22	6	...	...	14·22	...
404	+2·19	+3·67	15·48	2	...	...	15·48	...
405	+2·21	+1·02	15·59	1	...	...	15·59	...
408	+2·32	−2·42	...	...	11·26	12	11·26	11·26
409	+2·33	−4·07	12·04	1	12·00	6	12·02	...
410	+2·34	−0·43	15·07	4	...	...	15·07	...
412	+2·36	+4·79	15·03	1	...	...	15·03	...
413	+2·37	+3·84	14·84	4	...	...	14·84	...
417	+2·39	+1·54	15·30	5	...	...	15·30	...
418	+2·40	−3·61	14·55	3	...	...	14·55	...
419	+2·42	−3·15	...	...	11·12	8	11·12	...
420	+2·43	+2·87	8·71	6	8·86*	23	8·83	8·89
421	+2·45	+3·23	14·99	3	...	...	14·99	...
424	+2·48	−1·58	14·13	6	...	...	14·13	...
426	+2·53	−2·02	13·36	6	13·37	8	13·36	...
427	+2·53	−1·37	12·68	6	12·63	13	12·65	...
430	+2·58	+3·34	...	...	11·57	13	11·57	...
431	+2·59	+2·29	15·46	2	...	...	15·46	...

* From diffraction images with grating II. (see next paper).

Magnitudes of 262 Stars within 25′ of North Pole—Continued.

Harvard No. (48).	*x*.	*y*.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (Mean).	Harvard Mag.
433	+2·62	+1·62	15·70	1	...	...	15·70	...
435	+2·64	+0·52	15·52	1	...	...	15·52	...
436	+2·67	+2·58	13·12	6	13·19	12	13·16	...
437	+2·67	−2·23	14·74	6	...	...	14·74	...
439	+2·71	−1·57	14·11	5	...	...	14·11	...
441	+2·76	+5·27	...	...	12·28	6	12·28	...
442	+2·79	−2·56	14·23	6	...	...	14·23	...
444	+2·89	+0·81	15·49	1	...	...	15·49	...
446	+2·93	−4·32	...	...	13·04	6	13·04	...
447	+2·93	−3·72	...	...	10·69	8	10·69	...
451	+3·00	+1·01	13·01	6	12·88	12	12·95	...
452	+3·00	+4·39	13·94	3	...	...	13·94	...
455	+3·06	+3·60	15·37	1	...	...	15·37	...
456	+3·08	−2·63	13·35	3	13·33	9	13·34	...
458	+3·12	−0·60	15·30	1	...	...	15·30	...
459	+3·15	+0·40	13·93	6	...	...	13·93	...
460	+3·15	−2·56	14·50	2	...	...	14·50	...
462	+3·23	+2·49	15·40	1	...	...	15·40	...
464	+3·23	+1·50	15·22	3	...	...	15·22	...
468	+3·28	+0·08	14·95	6	...	...	14·95	...
472	+3·33	+3·04	14·96	2	...	...	14·96	...
477	+3·41	+3·44	...	...	10·66	7	10·66	...
479	+3·44	−0·35	12·85	6	12·93	13	12·89	...
480	+3·46	−0·24	14·33	6	...	...	14·33	...
481	+3·47	−0·98	14·85	6	...	...	14·85	...
482	+3·51	−0·97	15·60	1	...	...	15·60	...
485	+3·54	+0·36	14·85	4	...	...	14·85	...
488	+3·65	+1·86	15·46	2	...	...	15·46	...
489	+3·65	−1·37	12·82	6	12·82	13	12·82	...
490	+3·65	−4·56	...	...	12·56	2	12·56	...
491	+3·66	−0·61	15·29	6	...	...	15·29	...
494	+3·70	+0·31	12·10	5	12·14	13	12·12	...
495	+3·71	+2·26	15·55	1	...	...	15·55	...
496	+3·71	+2·75	14·81	3	...	...	14·81	...
498	+3·75	−0·99	14·82	6	...	...	14·82	...
499	+3·76	−0·96	14·70	6	...	...	14·70	...
502	+3·78	+1·01	14·94	3	...	...	14·94	...
504	+3·81	−0·62	14·63	6	...	...	14·63	...
506	+3·86	−4·46	...	...	12·56	2	12·56	...

Magnitudes of 262 Stars within 25′ of North Pole—Continued.

Harvard No. (48).	x.	y.	Mag.	No. of Plates.	Mag.	No. of Plates.	Mag. (Mean).	Harvard Mag.
507	+3·90	−1·93	14·67	4	...	...	14·67	...
509	+3·93	+2·17	14·92	3	...	...	14·92	...
511	+4·00	+0·91	14·98	4	...	...	14·98	...
512	+4·02	+2·67	15·01	3	...	...	15·01	...
513	+4·04	−2·49	15·04	1	...	...	15·04	...
514	+4·06	+1·93	15·50	2	...	...	15·50	...
515	+4·16	−0·12	15·04	4	...	...	15·04	...
516	+4·24	−0·17	15·18	3	...	...	15·18	...
522	+4·32	+2·34	13·91	4	...	...	13·91	...
526	+4·39	+2·83	15·40	1	...	...	15·40	...
532	+4·50	−1·18	15·17	1	...	...	15·17	...
535	+4·57	+2·81	15·00	1	...	...	15·00	...
536	+4·59	+1·92	15·29	1	...	...	15·29	...
540	+4·61	+1·26	15·01	5	...	...	15·01	...
543	+4·66	−0·39	14·26	4	...	...	14·26	...
545	+4·73	+0·39	15·63	2	...	...	15·63	...
551	+4·87	+2·23	14·98	2	...	...	14·98	...
554	+4·89	−1·91	13·51	1	13·55	5	13·53	...
556	+4·92	+1·68	14·01	2	...	...	14·01	...
557	+4·94	+0·47	15·61	2	...	...	15·61	...
561	+4·98	−2·32	...	...	13·60	3	13·60	...
562	+5·01	−0·52	14·82	1	...	...	14·82	...
564	+5·03	+0·86	15·46	2	...	...	15·46	...
565	+5·04	0·00	15·66	1	...	...	15·66	...
572	+5·36	−1·54	14·88	1	...	...	14·88	...
574	+5·48	+0·76	...	...	13·12	6	13·12	...
576	+5·62	−1·68	14·54	1	...	...	14·54	...
577	+5·62	+1·64	12·09	2	11·96	5	12·03	...
579	+5·73	+0·41	...	...	12 99	7	12·99	...
582	+5·82	−0·07	...	...	14·03	2	14·03	...
583	+5·88	−0·59	14·87	1	...	...	14·87	...
584	+5·88	−0·62	15·38	1	...	...	15·38	...

On the Application of Parallel Wire Diffraction Gratings to Photographic Photometry. By S. Chapman, B.A., D.Sc., and P. J. Melotte.

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1. The use of parallel wire diffraction gratings in photographic photometry is to enable magnitude *intervals* to be measured on a plate. Schwarzschild, Hertzsprung, and others have previously used diffraction gratings for this purpose (*A.N.*, vol. clxxxvi., No. 4452). The grating placed in front of the object-glass produces (by diffraction) auxiliary images on each side of the ordinary image of a star, diverting a definite proportion of the light into each image; the proportion is a constant, depending only on the dimensions of the grating; thus there is a constant magnitude interval between the central image and the diffraction images on either side of it.* There is this magnitude interval also, therefore, between the given star and any other star whose *central* image is equal in size and greyness to the diffraction images of the former star. By utilisation of this fact a simple method is obtained of determining the magnitudes of all the stars on a plate, apart from a constant zero correction, when the magnitude interval of the grating is known; and if the magnitudes of some of the brighter stars on the plate are also known, the zero correction to all the magnitudes is at once determinable.†

2. The special advantage of a diffraction grating for measuring magnitude intervals is that the auxiliary images are produced at the same time as the central images, a definite amount of the light always going to each. The magnitude interval is therefore independent of the constancy of the transparency of the atmosphere during the exposure of the plate, an advantage not shared by any method which depends on an auxiliary exposure with the objective partly screened off or obscured in some way.

A theoretical disadvantage of the diffraction method, which can, however, be rendered of no practical importance by suitably designing the grating, lies in the fact that the auxiliary images are really small spectra, light of different wave-lengths being dispersed in slightly different directions, so that the diffraction images are a trifle elongated, and consequently not strictly comparable with the round central images of fainter stars. This will be considered in more detail later, but for the present it may be stated that sensibly round images are obtained with the second of the two gratings

* Theoretically there is an infinite series of images on each side of the central one, but most of these are much too faint to appear. Generally only the brighter stars on a plate show any diffraction images at all, and rarely are more than two seen, with the gratings and exposure times adopted at Greenwich.

† See the previous paper on "Photographic Magnitudes."