method of least squares«, he finds 0.369. Rosén's classification of his results by magnitude is given below.

I cannot find that Ceraski has anywhere employed his extensive series of observations in the various volumes of the Moscow annals, to deduce a value of this element. From an incomplete investigation of his observations I get the following results, combining his stars in pairs, taking for each the measured difference of light logarithms $\Delta \log L$, and the corresponding magnitude difference Δm from the »Durchmusterung«. Only differences of over $1^m.0$ were used, and the results were collected in the following groups, according to the mean of the limiting magnitudes of the pairs.

Mag.	Pairs n	$\Sigma \Delta m$	$\Sigma \Delta \log L$	$\frac{\Sigma \Delta m}{n}$	$\log \varrho$
$5^m.0$-$5^m.4$	6	11.5	3.86	1.9	0.336
5.5 - 5.9	8	15.0	4.93	1.9	0.329
6.0 - 6.4	11	22.0	7.82	2.0	0.355
6.5 - 6.9	37	73.7	25.78	2.0	0.350
7.0 - 7.4	85	153.9	53.94	1.8	0.352
7.5 - 7.9	67	107.9	37.21	1.6	0.345
8.0 - 8.4	13	18.6	6.65	1.4	0.357
8.5 - 8.9	3	5.6	2.18	1.9	0.389
	230	408.2	142.37	1.8	0.349

Collating by magnitudes the values from Rosén's and Ceraski's observations:

DM. mag.	$\log \varrho$ Ceraski	$\log \varrho$ Rosén	
5^m - $5\frac{1}{2}^m$	0.336		0.388
$5\frac{1}{2}$ - 6	0.329		
6 - $6\frac{1}{2}$	0.355		0.388
$6\frac{1}{2}$ - 7	0.350		

Cambridge, Mass., 1886 June 29.

DM. mag.	$\log \varrho$ Ceraski	$\log \varrho$ Rosén	
7^m - $7\frac{1}{2}^m$	0.352		0.363
$7\frac{1}{2}$ - 8	0.345		
8 - $8\frac{1}{2}$	0.357		0.379
$8\frac{1}{2}$ - 9	0.389		

The mean value 0.349 for Ceraski, 0.380 for Rosén, are not unduly incongruous with each other, or their mean 0.365 with that which obtains for the naked eye stars.

This evidence, so far as it goes, seems to afford ground for the expectation that the prevailing system of magnitudes in use among astronomers, of which the Uranometria Nova and the Durchmusterung may be regarded as the archetypes, or rather the exponents, may prove to conform to a uniform light-ratio in the neighborhood of 0.360. In view, however, of the inconsistencies in the work of the various instruments on the brighter stars, we cannot rest with much confidence in such an expectation. In fact signs already appear of similar contradictions, in which instrumental photometry appears so prolific, in the region of the telescopic magnitudes. Thus in the V. J. S. 20.284 Prof. Pickering has stated that the large meridian photometer shows, with the use of Pogson's ratio a correspondence of $7^m.0$ in the DM. with $6^m.7$ in the so-called photometric scale, and a coincidence of the two at $8^m.5$. From this statement it is a legitimate inference that the light-ratio within these limits appears to be

$$\log \varrho = \frac{8.5 - 6.7}{8.5 - 7.0} \times 400 = 0.480$$

which presents a startling inconsistence with Ceraski's and Rosén's reasonably accordant values, obtained from tolerably well distributed groups of stars.

S. C. Chandler, jr.

Catalogue No. 3 of Nebulae discovered at the Warner Observatory.

The following list of nebulae comprising Catalogue No. 3 of my series, includes a few discovered prior to the publication of No. 2 (A. N. 2707), or, even of No. 1 (A. N. 2683), which with many others were withheld in the hope that improved methods of measurement would give more exact positions. A large portion of these are in Draco now in good position for their verification. As will be seen by the descriptive remarks, they mostly are of the last degree of faintness. Astronomers must not however doubt their existence if some are not re-found in many years, as the many favorable conditions for their detection seldom simultaneously occur. Except their excessive faintness they possess no strongly marked or interesting features.

I have just ascertained that the pier (being a new one) has slightly settled since the telescope was brought into adjustment at the beginning of my labors here, which fact will account for any discrepant measures that may be detected. The telescope is now in satisfactory adjustment and no fears of further change in the pier are entertained.

In some cases where many nebulae are in one field or nearly so, identification from imperfect or erroneus description becomes difficult and sometimes impossible. As one instance among many, M. Stephan has three nebulae, 5799, 5809, and 5807 in one field, wherein I see six, but I have been able to identify with certainty only one of them as, when the positions agree the descriptions are at variance.

Now that very few nebulae as bright as H. class II remain to be discovered, it is more than ever important that accurate descriptions of their shape, size, brightness and configuration with stars in the field be given. This if done even to an approach to accuracy, will often be of great assistance in the matter of identification.

No.	Date of discov.	α 1885.0	δ 1885.0	Descriptions and remarks
1	1885 Nov. 10	$0^h\,18^m\,5^s$	$+15°\,50'\,40''$	v F; p S; v E.
2	» » 10	0 41 35	+ 7 16 12	e F; v S; R; in center of 3 st. in form of right angle triangle.
3	» » 10	0 56 18	— 2 33 49	e F; p S; np. of 2.
4	» » 10	0 56 40	— 2 35 21	e F; p S; R; sf. of 2.
5	» » 30	1 21 51	+47 47 30	e F; p S; R; D * nr. s.
6	» » 30	1 26 10	— 7 28 50	v F; p L; R; v l b M; sf. of 363; 351 in field.
7	» » 30	1 26 43	+35 4 0	e F; p S; R; B * nr. sf; l b M.
8	1885 Dec. 2	1 53 5	— 0 2 47	e F; p S; R; B * 32^s f.
9	1885 Nov. 30	2 5 6	+44 2 15	v F; p L; R; nearly bet. a p B * and 3 v F equal mag. st. close together in line.
10	» » 30	2 5 25	+ 3 13 53	e F; p S; R; v diff. Edward.
11	1885 Dec. 2	2 20 30	+11 38 18	v F; v S; R; in vacancy.
12	1885 Nov. 7	2 22 40	+31 7 16	v F; e S; R; B M; 5239 nr; v diff.
13	1885 Oct. 17	2 30 50	+ 1 33 32	e e F; p S; R; v F * close; bet. a p B *, and a F D *; np. of 2; not 5251, 5264 nor 602.
14	» » 17	2 31 40	+ 1 28 17	e e F; e S; p F * v close; sf. of 2.
15	1886 Jan. 1	2 32 6	+ 1 48 32	e e F; p S; R; 9 mag. * sf.; v diff. Edward.
16	1885 Oct. 17	2 34 15	+ 1 0 50	e e F; p S; R.
17	1885 Nov. 10	2 34 48	— 8 56 25	e e F; L; R; np. of 2.
18	» » 10	2 35 0	— 8 39 25	e e e F; p S; R; e diff.; 582 and 589 in field.
19	» » 10	2 35 0	— 9 2 26	e e F; p S; R; sf. of 2.
20	1885 Dec. 29	2 38 10	—15 14 50	v F; p S; R; B * 22^s f.
21	» » 26	2 42 30	—14 26 45	e e F; S; l E; 11 mag. * close f; 15 mag. * involved; e diff. * to see.
22	1885 Oct. 17	2 48 15	+ 2 28 30	v F; p S; R; l b M.
23	1885 Nov. 10	2 51 23	— 8 9 40	e F; p S; R; np. of 2; v diff.
24	» » 10	2 51 55	— 8 13 40	e e F; S; R; v diff.; * nr. s; sf. of 2.
25	» » 10	3 12 18	— 8 3 10	e F; e S; R; 4 B st. in form of arc of circle close s.
26	» » 10	3 22 30	— 8 47 56	v L; v E nearly in meridian; e F.
27	1886 Feb. 24	3 48 0	+68 17 5	v F; v S; R; B * nr.
28	» » 24	3 52 36	+70 42 55	e F; p S; R.
29	1885 Nov. 10	4 20 50	—10 22 29	v F; p L; R; l b M; * nr. s.
30	1885 Dec. 29	4 28 50	— 8 49 55	p F; S; R; l b M.
31	» » 29	4 39 22	— 8 41 24	e e e F; p S; e e diff.; nf. of 895.
32	» » 2	4 53 50	—11 18 14	e F; v S; R; v diff.; 1^{st} of 3.
33	» » 2	4 54 5	—11 18 29	e e F; v S; R; e diff.; 2^{nd} of 3. Tempel's $4^h\,53^m\,52^s$ —11° 9' 24" in field.
34	» » 2	4 54 15	—11 18 14	e F; v S; R; v diff.; 3^{rd} of 3.
35	» » 26	5 5 30	+ 5 3 42	v F; S; R.
36	1886 Feb. 27	6 26 20	+ 5 11 53	e e F; L; i R; e diff. Probably an offshoot of 31 of my catalogue No. 2. Two or three others suspected.
37	1885 Nov. 15	7 52 10	+ 8 18 30	e e e F; p S; i R; B * nr. w; sp. of 2; e diff.
38	» » 15	7 52 25	+ 8 19 50	v F; p S; R; l b M; * close f; nf. of 2.
39	1886 Mar. 9	8 29 50	— 1 27 38	v F; S; R; * nr. nf.; a more distant * in line with both.
40	1886 Feb. 8	8 40 30	—33 25 10	p F; p S; l E.
41	1886 Mar. 10	8 46 30	— 2 11 20	p F; p E; S.
42	1886 Feb. 27	8 50 20	— 2 8 8	v F; p S; v E; * nr. f.
43	» » 27	9 15 10	—16 1 36	e F; p S; v E; 1829, R. nova and 1828 in field w. Did not see 1819 east of 1829.
44	» » 9	9 20 16	—11 30 35	e F; p S; p a coarse D * 17^s; in field with 1854.
45	1886 Mar. 10	9 24 20	+ 4 37 59	e e F; p L; R; in vacancy.
46	» » 10	9 37 22	— 9 14 32	e F; S; R; s of 2; 1908 in field nr.
47	1886 Apr. 21	9 42 45	+32 43 55	e e F; e S; stel; a row of 8 or 10 p B st nr p.
48	1886 Mar. 10	9 43 20	+ 1 7 55	v F; p S; l E; * nr. n; p of 2.
49	» » 10	9 43 35	+ 1 7 55	p F; p L; c E; f of 2.
50	1886 May 22	9 44 25	+29 4 0	e e F; p S; l E; e diff.; in vacancy, found searching for Winnecke's comet.
51	1886 Feb. 8	9 44 40	— 7 24 22	p F; p S; R.
52	» » 27	9 46 15	—32 13 34	p B; p S; R.

No.	Date of discov.	α 1885.0	δ 1885.0	Descriptions and remarks
53	1886 Feb. 27	$9^h\,56^m\,25^s$	−31° 7′ 50″	e F; p L; R; coarse D * nr. p; 2002 in field.
54	1886 Apr. 2	10 20 20	− 2 3 29	v F; S; l E; bet. a p B and a v F *.
55	» » 27	10 22 15	+13 16 18	v F; p S; R.
56	1886 Mar. 5	10 26 45	−21 42 46	e F; v S; middle one of 3 e F st. involved in neby. Two B st. point to it.
57	1886 Apr. 27	10 31 0	+13 13 18	F; S; R; sf. of 2147.
58	1886 Mar. 5	10 54 5	+18 11 38	e e F; p S; R; e diff.; in vacancy.
59	1883 Apr. 26	11 0 15	+20 42 10	p F; v S; l E; in starless field.
60	1886 Mar. 5	11 16 15	+21 19 55	e F; S; R; bet. 2 st.
61	1886 Apr. 27	11 50 15	− 2 6 14	p B; v S; R.
62	» » 27	12 11 40	−10 40 57	p B; e S; p B * nr. p; Looks at first like a D *. Curious object.
63	1886 May 6	12 13 45	−11 37 5	v F; p S; R.
64	» » 6	12 14 25	−11 4 3	e e F; v S; R; 1st of 3.
65	» » 6	12 14 30	−11 3 33	e e e F; v S; R; 2nd of 3.
66	» » 6	12 14 45	−11 0 33	e F; p S; R; 3rd of 3.
67	1886 June 3	13 12 50	−11 58 10	e e F; e S; v F * v close; Looks like a D * at first; Another nr.; 6 in field, H.III.117 (N5076), II.193 (N5077), III.118 (N5078), R. nova and
68	» » 3	13 14 59	−11 54 40	e F; e S; R; stellar; nearly bet. 2 st.
69	» » 3	13 15 15	−12 28 55	e F; e S; R.
70	» » 3	13 15 43	−12 37 10	e F; p S; l E; D * in field.
71	» » 3	13 16 45	−12 24 10	e F; p S; R; in line with 2 p B st.
72	1886 Jan. 1	13 29 25	+48 30 5	e F; L; v E; v diff.
73	1886 Mar. 29	13 31 15	− 7 54 58	p F; e S; v F * v close.
74	1886 Apr. 8	13 44 25	+70 54 18	v F; e S; stellar; An e F * v close; the 2 components of a D * point to it.
75	1886 May 6	13 47 5	+73 12 33	e F; S; R.
76	» » 6	13 48 20	+74 29 35	v F; S; R.
77	1884 June 18	13 55 30	+74 8 50	p F; S; R; D * nr. p.
78	1886 Apr. 8	13 55 45	+71 17 48	e F; v S; R; forms a triangle with 2 F st.
79	1886 June 6	14 6 55	+13 49 22	v F; p S; bet. a single and a D *.
80	» » 4	14 16 15	+13 44 22	v F; p S; R; p B * nr; also a F one.
81	» » 4	14 16 35	+13 42 37	e F; v S; R; nearly bet. 2 B st.
82	» » 4	14 16 55	+14 12 22	e F; S; R; p B * nr. sf.
83	» » 6	14 41 25	+14 7 22	e F; p S; R; B * f 22^s.
84	1886 May 22	14 43 25	+12 55 20	v F; S; R; p of 2.
85	» » 22	14 43 50	+12 57 20	e e e F; p S; e e diff.; f of 2.
86	1886 June 8	16 0 15	+18 26 58	e e e F; S; R; e e diff.; 1st of 4.
87	» » 8	16 0 20	+18 26 58	e e e F; S; R; e e diff.; 2nd of 4.
88	» » 8	16 0 25	+18 14 57	e e e F; p S; R; e e diff,; 3rd of 4.
89	» » 6	16 0 30	+18 26 30	e e e F; e S; R.
90	» » 8	16 1 3	+18 33 30	e e e F; S; R; e e diff.; 4th of 4; 4 B st. s with the neb., form a cross like cross in Cygnus. Neb. placed as is Deneb Cygni.
91	1886 May 6	16 1 5	− 6 6 10	v F; S; R.
92	1886 June 6	16 8 0	+18 3 15	e e e F; p S; R; e e e diff.
93	1886 May 27	16 9 15	+61 32 4	e F; p S; R; in line with 2 st.
94	» » 30	17 33 45	+74 26 5	e e e F; p S; R; e e diff.; bet 2 st.; 4 F st. nr. p in form of arc of circle.
95	» » 30	17 45 45	+51 10 10	p B; S; e E; spindle.
96	» » 28	17 53 30	+62 39 20	e F; p S; v E; np. of 2.
97	» » 28	17 53 50	+62 40 20	e e F; v S; R; p B * nr. p; sf. of 2.
98	» » 28	17 54 20	+62 36 20	e F; p L; 2 B st. nr. f.
99	1884 July 2	17 54 44	+50 45 15	v F; v S; R; 2 B st. nr.; in finder field with γ Draconis.
100	1885 Oct. 25	18 33 30	+67 0 55	e F; e S; bet. a * v close, and a v F D *.

Erratum to Catalogue No. 1: No. 3. All except v F; c E refers to No. 2. — Errata to Catalogue No. 2: No. 89. Erase ? and the last sentence entire. No. 100, lower line: Erase a.

Warner Observatory, Rochester N. Y., 1886 June 7.

L. Swift.

A Correction to Dr. Swift's list of New Nebulae in A. N. 2746.

In Dr. Swift's Catalogue No. 3 of Nebulae discovered at the Warner Observatory, published in A. N. 2746 p. 155 there are three nebulae Nos. 32, 33 and 34 that have evidently crept into his catalogue by mistake. These three nebulae were discovered by me on the night of Nov. 10th 1885. They were in field with a nebula, that Dr. Swift afterwards informed me was discovered by Tempel. I wrote to Dr. Swift of my discovery and on Nov. 15 1885 he wrote to me thus: »I made a search for your trio near Rigel and saw all three. ... I don't see how you ever saw them. ... I attempted to measure the east one and made it (roughly of course) $\alpha = 4^h\,54^m\,1^s$ $\delta = -11°\,17'\,58''$. They certainly exist. ...«

I sent these three nebulae among others to Dr. Dreyer for his new suplement within a few days after their discovery and sent also a description of them to the Siderea! Messenger on Nov. 30 1885. See Sid. Mess. No. 41, Jan. 1886, p. 25, where the position of the preceding nebula of the group is given as

$$\alpha\,(1886.0) = 4^h\,54^m\,7^s$$
$$\delta\,(1886.0) = -11°\,18'.3$$

from mean of three equatorial pointings.

Of course their being in Dr. Swift's catalogue as new on Dec. 2nd is purely accidental. I am very glad to see that he has observed them and his description of them with the great Warner telescope shows what can be done with a small glass as they were discovered here with the 6 in. Cook equatorial. I see that Dr. Swift calls them round. With power = 120 I was decidedly of the impression that they were all slightly elongated north and south. These three nebulae are very close together and lie about 9′ = south and slightly p. the Tempel nebula mentioned by Dr. Swift.

The great number of new nebulae discovered at the Warner Observatory shows well the industry of its keen-sighted Director.

Nashville 1886 Oct. 12. *E. E. Barnard.*

Anwendung der Photographie zu Meridian-Beobachtungen.

Die Anwendung der Photographie zu Meridian-Beobachtungen hat zuerst — wenn ich mich nicht irre — Faye vorgeschlagen. Dr. O. Lohse in Potsdam und Edward C. Pickering in Cambridge haben die hohe Bedeutung der Spuren, die die Sterne beim Anhalten des Uhrwerkes auf der photographischen Platte erzeugen, für die Ortsbestimmung nachgewiesen; der Letztere hat sogar in einem Artikel: An investigation in stellar photography (Extr from Vol. XI of the memoirs of the American Academy 1886) pag. 204, zwei Methoden der photographischen Beobachtungen angegeben.

Ich verfolgte den Gedanken weiter und habe auf folgende Weise am 29. September ganz befriedigende Resultate erzielt.

Ich befestigte eine in Quadratmillimeter eingetheilte Glasplatte, deren Theilstriche mit dem feinsten Graphit eingeschwärzt waren, in der Cassette meines photographischen Apparates, dicht vor der empfindlichen Schicht der Emulsions-Trockenplatte, so dass die Gelatin-Schicht und die Theilung fest auf einander lagen. Ich exponirte dann die Platte bei feststehendem Fernrohr, so dass die Sterne Spuren hinterliessen. Die Spuren waren, wie ich erwartete, mit sehr feinen Linien in Millimeter getheilt, die den geschwärzten Theilstrichen entsprechen.

Bei den eigentlichen Beobachtungen ist es natürlich viel zweckmässiger, gruppirte Netze anzuwenden, um die Orientirung zu erleichtern und den Winkelwerth der Abstände, so wie es bei den Meridian-Instrumenten üblich ist, zu bestimmen. Die Antritte der Sterne an den Strichen sind durch sehr feine Unterbrechungen der Spuren sehr leicht und genau zu erkennen.

Zur Bestimmung der Zeit des Antrittes wählte ich die von E. C. Pickering angegebene Methode. Ich richtete die Cassette so ein, dass sie sich zwischen zwei Anschlagstiften in der Richtung des Declinationskreises um 1^{mm} hin und herbewegen liess; in je 20 Secunden verschob ich dann die Cassette bis an den Anschlag, so dass ich 2 Spuren mit gleichen Intervallen erhielt, deren jedes Glied 20 Secunden Zeit entsprach. Mit einem feinen Mikrometer-Apparat lässt sich die Antrittszeit leicht bestimmen. Ueber die Genauigkeit kann ich bei der Unvollkommenheit der Handbewegung kein Urtheil fällen; da aber bei dem Versuch (α Lyrae) 1 Minute circa 6.5^{mm} lang war, konnten die ganzen Secunden schon mit einer Lupe ohne Messapparat bestimmt werden; ich hoffe, dass ich mit einer Mikrometerschraube noch die Zehntel Secunden ganz sicher ablesen kann.

Ich beabsichtige jetzt einen vollkommeneren Apparat zu verfertigen und die Versuche mit demselben weiter zu verfolgen.

Ich werde ein gruppirtes Netz, welches mit einem Positionskreis genau orientirt werden kann, anwenden und die Cassette mit elektrischer Auslösung versehen, welche die Bewegung automatisch von der Uhr überträgt.

Ich will nicht behaupten, dass diese Methode die Beobachtung mit dem Auge übertrifft; ich beabsichtige nur die Möglichkeit der Anwendung der Photographie bei sämmtlichen Zweigen der beobachtenden Astronomie zu beweisen, hoffe aber, dass ich meine Methode bei den Beobachtungen der Jupiters-Trabanten-Verfinsterungen mit Vortheil anwenden kann.

Sternwarte Herény 1886 Sept. 30.

Eugen v. Gothard.