ASTRONOMISCHE NACHRICHTEN.

№ 1453.

List of New Nebula seen at the Observatory of Harvard College.

(Communicated by Prof. *G. P. Bond*, Director.)

An examination of the notes relating to the positions and appearance of nebula and star-clusters occurring in the record-books of the Observatory for the last fifteen years, has furnished the accompanying list of objects which have not been identified in published catalogues. As the number of observations compared has amounted to several hundred, most of the nebula of course having been previously seen elsewhere, it is quite possible that a few of those entered on the list may be accounted for by errors in the observed places or by supposing them to be merely groups of a few small stars indistinctly seen. This might the more easily have happened since the nebula have in most instances been met with by accident, while sweeping for comets or in the passage of Zones of stars. In such cases but little time could be given to determining the positions, or to a close scrutiny of the object; the list has therefor been divided into two sections, the second comprising objects more or less doubtful as to their position or identity as nebula.

I. List of new Nebula and Star-clusters seen at the Observatory of Harvard College.

(1) A small faint nebula, 1′ north following a star of the 11th magnitude, seen 1863 Sept. 16, by *G. P. Bond*, with the Great Refractor.

1863,0 $\alpha = 0^h35^m10^s2 \pm 0^s4$, $\delta = +0°\,8'\,54'' \pm 20''$.

(2) A small, round, pretty bright nebula, diameter 45″, seen 1853 Jan. 5, by *G. P. Bond*, with the Great Refractor. In Harvard Zones. Reobserved 1863 Sept. 16.

1863,0 $\alpha = 0^h35^m15^s2 \pm 0^s4$, $\delta = +0°\,5'\,24''0 \pm 15''$.

(3) A faint nebula, 1′30″ south following a star of the 11th magnitude, seen 1853 Jan. 8 with the Great Refractor by *G. P. Bond*. In Harvard Zones.

1853,0 $\alpha = 0^h59^m52^s$, $\delta = +0°\,8'\,52''$.

(4) A faint nebulosity, seen 1860 Jan. 25, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1860,0 $\alpha = 3^h6^m55^s2$, $\delta = +0°\,55'\,32''5$.

(5) A faint nebulosity, seen 1859 Dec. 16, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1860,0 $\alpha = 3^h16^m29^s0$, $\delta = +0°\,40'\,57''0$.

(6) A nebula, seen 1863 Febr. 7 with the Great Refractor by *G. P. Bond*. Diameter 40″ with a faint star or appendage on the north-following side.

1863,0 $\alpha = 5^h21^m18^s2$, $\delta = -5°\,25'\,37''$.

Nebula north preceding star of 8th mag. H. C. 10303. 1863 Sept. 9.

$\Delta\alpha = -0^m34^s10$, $\Delta\delta = +2'\,47''3$.

(7*a*), (7*b*). Two Clusters, seen 1863 March 19 near two stars of the 10.11th magnitude, by *J. H. Safford*, with the Great Refractor. In Harvard Zones.

Positions of stars:

1863,0 $\alpha = 6^h4^m44^s9$, $\delta = +1°\,8'\,37''$
6 5 47,2 +1 10 2

(8) A Cluster, seen 1863 March 19, by *J. H. Safford*, between two stars in the following position. With the Great Refractor. In Harvard Zones.

Star of 10.11 mag. 1863,0 $\alpha = 6^h6^m27^s8$, $\delta = +1°1'10''$
〃 〃 9.10 〃 6 7 12,7 +1 0 27.

(9), (10). Two faint nebula, seen 1853 Febr. 26 with the Great Refractor, by *G. P. Bond*. In Harvard Zones.

1853,0 $\alpha = 7^h22^m15^s$, $\delta = +0°\,5'\,11''$
〃 〃 7 22 15 〃 +0 5 11.

It is not stated to which one of the pair this position belongs. The two are probably quite near each other.

(11) A very faint comet-like nebula, seen 1852 Sept. 1 with the Great Refractor, by *G. P. Bond*.

1852,0 $\alpha = 7^h54^m44^s$, $\delta = +20°35'8$.

Nebula north preceding star of 9th mag. B.Z. 277.

$\Delta\alpha = -0^m27^s05$, $\Delta\delta = +2'42''2$.

(12) A nebula, seen 1859 April 8 with the Comet-seeker, by *H. P. Tuttle*.

1859,0 $\alpha = 8^h36^m53^s$, $\delta = 78°\,44'\,40''$.

Observed by *G. P. Bond* as follows: —

Nebula north following star *a* of 7.8th mag. Oeltzen 9183.

$\Delta\alpha = +5^m0^s88$, $\Delta\delta = +4'15''5$.

Nebula north preceding star *b* of 8.9th mag. Oeltzen 9305.

$\Delta\alpha = -2^m57^s75$, $\Delta\delta = +4'15''5$.

(13) A nebulous object, seen 1859 March 31, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 9^h59^m48^s \pm 4^s$, $\delta = +0°45'0'' \pm 2'$.

(14) A faint nebulous object, seen 1859 March 31, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 10^h16^m11^s$, $\delta = +0°46'31''$.

(15) A star of 12th magnitude in a faint nebulosity, seen 1859 May 3, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 12^h30^m57^s4$, $\delta = +0°57'33''4$.

(16) A star of 12th magnitude in faint nebulosity, seen 1859 April 30, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 13^h24^m29^s9$, $\delta = +0°41'49''0$.

(17) A star of 12th magnitude slightly nebulous, seen 1859 April 30, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 13^h42^m35^s2$, $\delta = +0°46'15''7$.

(18) A small round nebula, seen 1855 June 8, by *G. P. Bond*, with the Great Refractor. In Harvard Zones. Distant 2′ from a star of the 9th mag. in the position:

1855,0 $\alpha = 13^h49^m3^s$, $\delta = +0°30'20''$.

(19) A nebulous star of 12th mag., seen 1859 April 29, by *Sidney Coolidge*, with the Great Refractor. In Harvard Z.

1859,0 $\alpha = 13^h53^m54^s9$, $\delta = +0°46'24''3$.

(20) A nebula, seen 1853 May 9 with the Great Refractor by *G. P. Bond*. In Harvard Zones.

1853,0 $\alpha = 14^h21^m48^s$, $\delta = +0°13'9''$.

(21) A round nebula, seen 1853 May 9, with the Great Refractor, by *G. P. Bond*. In Harvard Zones.

1853,0 $\alpha = 14^h23^m39^s$, $\delta = +0°20'9''$.

(22) An elongated nebula, fainter than the above, seen 1853 May 9, by *G. P. Bond*, with the Great Refractor. In Harvard Zones.

1853,0 $\alpha = 14^h24^m24^s$, $\delta = +0°17'9''$.

(23) An elongated faint nebula, longest diameter 80″, seen 1859 Sept. 1 with the Comet-seeker, by *H. P. Tuttle*.

1859,0 $\alpha = 18^h23^m37^s$, $\delta = +74°30'2$.

The position given is that adopted by *Auwers* in „*William Herschel*'s Verzeichnisse von Nebelflecken und Sternhaufen" pag. 75.

(24) A faint nebula following a star of the 10th mag. 0^m1^s0 and 1′29″ north of it, seen 1852 Nov. 24, by *G. P. Bond*, with the Great Refractor. In Harvard Zones.

1852,0 $\alpha = 19^h56^m14^s5$, $\delta = +0°1'48''$.

(25) A nebula, seen 1848 Febr. 10, by *G. P. Bond*, with the Great Refractor.

1848,0 $\alpha = 21^h44^m46^s$, $\delta = +49°2'9$.

(26) A nebula, seen 1848 Oct. 23 with the Great Refr., by *G. P. Bond*.

1848,0 $\alpha = 23^h24^m56^s$, $\delta = -6°26'10''$.

Nebula north preceding star of 9th mag.

$\Delta\alpha = -0^m18^s19$, $\Delta\delta = +1'12''7$.

II. The following are the positions of objects supposed to be nebula but requiring verification.

(27) A nebula quite faint, 3° 30′ north of γ Cassiopeae and in the same right-ascension with it. Seen 1850 Febr. 27 by *G. P. Bond*, with the Comet-seeker.

1850,0 $\alpha = 0^h47^m41^s \pm 1^m$, $\delta = +63°24' \pm 10'$.

Looked for but could not be found 1863 Sept. 9.

(28) A faint, small, round nebula, 8° north preceding Capella, seen by *G. P. Bond*, with the Comet-seeker, 1851 Febr. 18.

1851,0 $\alpha = 4^h33^m \pm 3^m$, $\delta = +53°0' \pm 30'$.

(29) A very small nebula, seen near α Orionis 1850 Oct. 6, by *G. P. Bond*, with the Comet-seeker.

1850,0 $\alpha = 5^h37^m43^s \pm 20^s$, $\delta = -10°8'39'' \pm 5'$.

(30) A nebulous object (?), seen 1859 May 3, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 12^h12^m$, $\delta = +0°56'$.

(31) A faint rather large nebula, one third of the distance from Arcturus to α Coronae Borealis and in a line with the last named star. Seen by *G. P. Bond* with the Comet-seeker 1850 Dec. 30.

1850,0 $\alpha = 14^h37^m \pm 3^m$, $\delta = +23°0' \pm 30'$.

Looked for but could not be found 1863 Aug. 17.

(32) A nebulous star, seen 1859 Nov. 15, by *Sidney Coolidge*, with the Great Refractor. In Harvard Zones.

1859,0 $\alpha = 22^h46^m$, $\delta = +0°44'$.

(33) A nebula resembling a comet, seen 1850 Nov. 7, by *G. P. Bond*, with the Comet-seeker.

1850,0 $\alpha = 23^h50^m46$, $\delta = -33°24'$.

Positions of nebula mistaken at the time for comets have been observed as follows: —

Nebula h. 555, faintly seen in the Comet-seeker 1852 March 25. Compared by *G. P. Bond* with a star of 9,5 mag., Argel. Sternverzeichniss, +60°, № 1175.

Nebula south following star:

$\Delta\alpha = +0^m26^s25$, $\Delta\delta = -1'57''8$.

Nebula h. 90. Compared with a star of 7th magnitude. B. A. C. 357, by *G. P. Bond*.

Nebula north preceding star:

$\Delta\alpha = -0^m43^s00$, $\Delta\delta = +2'44''5$.

The nebula discovered by *Schönfeld* in 1858 and numbered 17 in *Auwers'* catalogue of new nebula, was also discovered independently by *H. P. Tuttle*, 1859 February 5, as „a nebulosity attached to a star of the 9.10th mag. which follows its centre six seconds and is two minutes north of it." It was visible in the Comet-seeker and in the finder of the Great Refractor. № 45 of the same catalogue discovered by *Winnecke* in 1853 was also discovered independently by *H. P. Tuttle* 1859 July 27. It appeared as a faint cometary object in the Comet-seeker but in the Great Refractor as a cluster just resolved of 2′ or 3′ in diameter.

The nebula H. IV-33- in the position 1830,0: $5^h28^m7^s$, $\delta\ -6°51'$, described by *W. Herschel* as „a star with a milky chevelure or v. B. nucleus with milky nebulosity" appears in the Great Refractor as a fine annular nebula or cluster, very much concentrated on the following side almost to a stellar centre. —

Observatory of Harvard College, Oct. 1863.

Ueber Polhöhenbestimmung durch circummeridiane Beobachtungen mittelst des Passageninstruments.

Ein Beitrag zur Erweiterung der *Bessel*'schen Methode.

Von Herrn *J. J. Åstrand*, Observator an der Sternwarte zu Bergen in Norwegen.

Es ist wohl bekannt, dass man, um die Polhöhe zu bestimmen, nicht so viele Beobachtungen in dem ersten Verticale mit einem Passageninstrument, als Circummeridianbeobachtungen mit einem feiner eingetheilten Instrument in gleicher Zeit anstellen kann. Eine Methode, durch welche die Polhöhe mittelst des Passageninstruments in kürzerer Zeit, aber eben so genau wie durch die *Bessel*'sche Methode, bestimmt werden kann, würde daher besonders für reisende Astronomen und in Gegenden mit häufig überwölktem Himmel von Nutzen sein. Der folgende kleine Aufsatz enthält die theoretische Begründung einer solchen Methode, sowie einige Andeutungen über die Möglichkeit einer praktischen Benutzung derselben.

Nimmt man an, dass aus einem Puncte, dessen Polhöhe $\varphi+\Delta\varphi$ ist, die Verlängerung der Achse des in der Nähe des ersten Verticals aufgestellten Passageninstruments die scheinbare Himmelskugel nach Norden zu in einem Punkte trifft, dessen scheinbare Höhe über dem Horizont $= b$ und dessen nördliches Azimuth $= k$ ist, das Fernrohr mit der Achse nach dem Kreis-Ende zu den Winkel $90°+c$ bildet und auf einen Stern gerichtet ist, dessen Decl. $= \delta$ und dessen Stundenwinkel $= t$ ist, so gilt bekanntlich die strenge Gleichung:

$$\sin c = \begin{cases} -\sin b \sin\delta \sin(\varphi+\Delta\varphi) - \sin b \cos\delta \cos t \cos(\varphi+\Delta\varphi) \\ -\cos b \cos k \sin\delta \cos(\varphi+\Delta\varphi) + \cos b \cos k \cos\delta \cos t \cos(\varphi+\Delta\varphi) \\ +\cos b \sin k \cos\delta \sin t \end{cases}$$

oder

$$\sin c = \begin{cases} -(\cos\varphi \sin\delta - \sin\varphi \cos\delta \cos t)(\sin b \sin\Delta\varphi + \cos b \cos k \cos\Delta\varphi) \\ -(\sin\varphi \sin\delta + \cos\varphi \cos\delta \cos t)(\sin b \cos\Delta\varphi - \cos b \cos k \sin\Delta\varphi) \\ +\cos b \sin k \cos\delta \sin t \end{cases}$$

Dividirt man diese Gleichung mit $\sin\varphi \sin\delta \cos b \cos k \cos\Delta\varphi$, so erhält man:

$$\frac{\sin c}{\sin\varphi \sin\delta \cos b \cos k \cos\Delta\varphi} = \begin{cases} (\operatorname{cotg}\delta \cos t - \operatorname{cotg}\varphi)(\operatorname{tang} b \operatorname{tang}\Delta\varphi + 1) \\ -(1+\operatorname{cotg}\varphi \operatorname{cotg}\delta \cos t)\left(\frac{\operatorname{tang} b}{\cos k} - \operatorname{tang}\Delta\varphi\right) \\ +\frac{\sin t \operatorname{tang} k}{\sin\varphi \operatorname{tang}\delta \cos\Delta\varphi} \end{cases}$$

Weil c, k, $\Delta\varphi$ stets sehr kleine Bögen sind, und nur solche Sterne beobachtet werden, die in der Nähe des Zeniths culminiren, so kann man in allen Fällen

$$\frac{\sin c}{\sin\varphi \sin\delta \cos b \cos k \cos\Delta\varphi} = \frac{c}{\sin\varphi \sin\delta \cos b},$$
$$\operatorname{tang} b \operatorname{tang}\Delta\varphi = 0$$

$$\frac{\operatorname{tang} b}{\cos k} - \operatorname{tang}\Delta\varphi = \operatorname{tang} b - \Delta\varphi,$$
$$\frac{\sin t \operatorname{tang} k}{\sin\varphi \operatorname{tang}\delta \cos\Delta\varphi} = \frac{\sin t . k}{\sin\varphi \operatorname{tang}\delta}$$

setzen. — Dann wird:

$$\operatorname{cotg}\delta \cos t - \operatorname{cotg}\varphi - (1+\operatorname{cotg}\varphi \operatorname{cotg}\delta \cos t)(\operatorname{tang} b - \Delta\varphi) = \frac{1}{\sin\varphi \sin\delta \cos b} \cdot c - \frac{\sin t}{\sin\varphi \operatorname{tang}\delta} \cdot k.$$

Hieraus erhält man nach einigen Reductionen:

$$\operatorname{cotg}(\varphi+\Delta\varphi-b) = \operatorname{cotg}\delta \cos t - \frac{1}{\sin(\varphi-b)\sin\delta} \cdot c + \frac{\sin t \cos b}{\sin(\varphi-b)\operatorname{tang}\delta} \cdot k.$$