ASTRONOMISCHE NACHRICHTEN.

Visual observations of a variable star in the cluster M 3 (NGC. 5272).
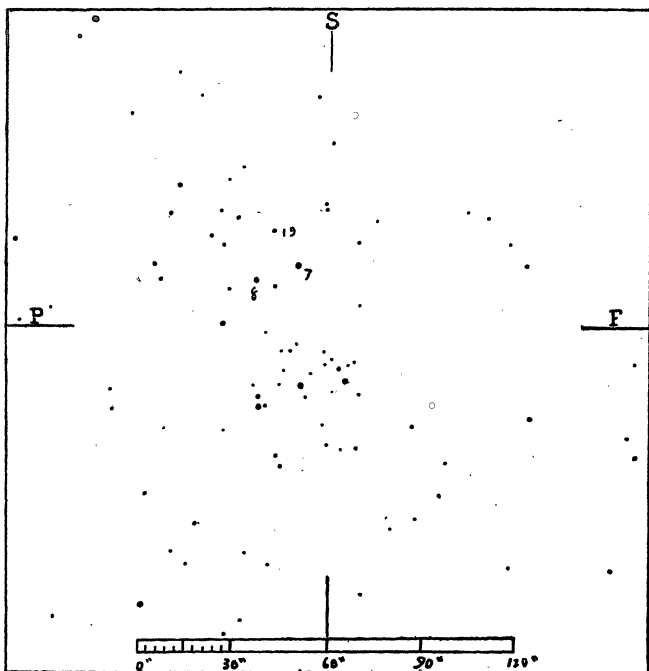
By *E. E. Barnard.*

In March of 1899 while visually measuring the stars in the cluster M 3 (NGC. 5272) I found a variable in the denser part of the cluster (star 7 on the map). I have since secured observations of the light of this star on one hundred and twelve nights. These observations are reserved for publication in another form. A few of the observations, however, are given here to determine the period and light-curve of the variable.

This star is not in the list of variables found in this cluster by Professor Bailey at Harvard College Observatory, which is printed in Annals of H. C. O. Vol. 38. It is therefore a new variable.

The position of the star in the Harvard system of measures given in the above volume p. 238–239 would be

$$x = +0' 1''9 \qquad y = -0' 26''5 .$$

There is no Harvard variable near this place. Its discovery at Harvard was doubtless missed because it is immersed in the brighter part of the cluster which appears to be burned out on the Harvard photographs.

The accurate place of this object from my measures is:

$$1902.0 \quad \alpha = 13^h 37^m 40^s71 \quad \delta = +28° 51' 54''5 .$$

At its greatest brightness it is about 12th magnitude. The light varies through about two magnitudes.

Among the various observations which I have of the star are two at which its light was equal to that of the comparison star 8 (shown on the inclosed map). On both occasions the star was decreasing in brightness. The light change would be greatest at about this time; such observations, therefore would serve best for a determination of the period.

These dates of equality were:

$$1900 \quad April \quad 30.4$$
$$1906 \quad January \quad 27.6$$

In this interval there are contained 133 periods (the period having been approximately determined from shorter intervals).

From these observations, therefore, the period is:

$$P = 15.77594 \text{ days}$$
$$= 15^d 18^h 13^m 32^s2$$

The light-curve was determined from observations extending from 1904 Jan. 3 to 1904 Aug. 6. Though the individual observations are rather discordant, they very definitely determine the light curve when properly combined.

Following are these observations:

HART OF M3 FROM MICROMETER MEASURES.

1904	Central Stand. T.	7—8 Δ mag.	7—19 Δ mag.
Jan. 3	$17^h 15^m$	+0.5	+0.6
Febr. 15	13 0	+1.0	+1.0
16	13 35	+1.0	+1.2
April 4	—	+0.5	+0.7
18	10 10	+0.8	+1.0
19	8 45	+1.2	+1.5
26	13 0	−0.7	−0.5
May 2	7 30	+1.0	+1.2
3	8 15	+1.0	+0.8
16	10 50	+0.4	+0.7
17	8 30	+1.2	+1.5
30	13 20	0.0	0.0
June 6	9 25	+0.6	+0.7
7	11 15	+0.7	+0.5
14	10 10	−0.2	−0.2

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1904	Central Stand. T.	7—8 Δ mag.	7—19 Δ mag.
June 25	10^h 10^m	—0.3	—0.1
27	9 40	—0.8	—0.6
July 4	8 50	+0.6	+0.6
9	—	+0.3	+0.3
16	9 40	+0.3	+0.5
23	9 0	+0.5	+0.7
Aug. 6	8 50	+0.5	—

These observations, by the aid of the period, have been reduced to approximately the same epoch, and, in three cases, means were taken to more definitely locate the curve. From these, therefore the following observations are derived.

Jul. Day	Mag.		
6597.6	—0.7		
6599.0	—0.2		
6600.0	0.0		
6600.52	+0.35	mean of	2
6604.57	+0.92	» »	9
6607.62	+0.56	» »	5
6608.2	+0.8		
6610.0	—0.3		
6612.0	—0.8		

These were plotted and the curve drawn in. I believe the summit of the curve should be slightly higher, for a good many of the observations seem to show that No. 7 at maximum, becomes about one magnitude brighter than No. 8.

I have only used the observations of No. 7 and No. 8, for I have found that No. 19 is itself a variable with a small fluctuation of its light through at most 0^{m}3 or 0^{m}4. I have
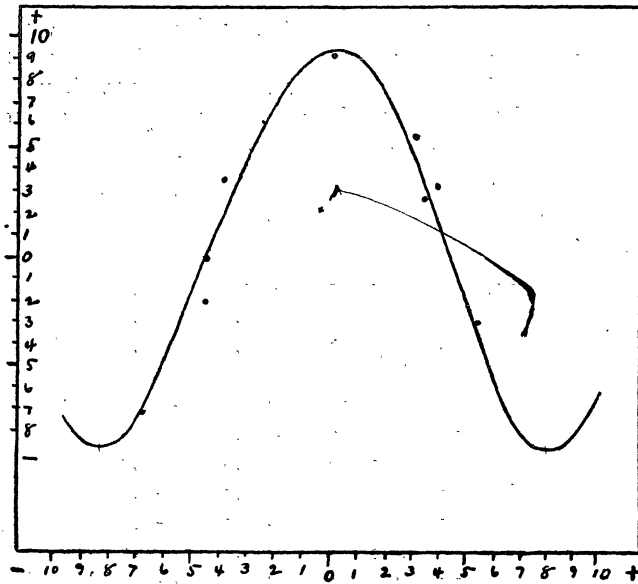
not yet determined the period of No. 19, though I have sufficient observations for the purpose.

The variable (7) is immersed in a part of the brightest portion of the cluster. This fact makes it rather difficult to determine its relative brightness, for poor or indifferent seeing blurs its light with that of neighboring stars, and makes an estimation more or less uncertain. Throughout the observations its light has been compared with that of the stars 8 and 19 (these numbers, with that of 7, are preliminary numbers employed by me in my micrometer measures of the stars in M 3). The mean brightness of the variable (7) is nearly the same as the light of No. 8 and hence that star is well suited for comparison.

It will be seen that the light-curve is a symmetrical one, and thus differs radically from the characteristic curve of the small variables in M 5 as determined by Professor Bailey. The rise and decline in its light seem to be equal. Other peculiarities may develop, however, when the entire list of observations are discussed. This light-curve is similar to that of the variable Scheiner 216 in M 13 (Herculis), which I have determined but not yet published, for observations of which see Astrophysical Journal Vol. XII p. 182 for 1900 October.

The rise and decline of the light of the star each take about 8 days. It does not remain long at either maximum or minimum.

As it may sometime be of use, I give a table of periods of this star up to 30 periods or 473 days.

Table of periods of the variable.

1	15.78	11	173.54	21	331.29
2	31.55	12	189.31	22	347.07
3	47.33	13	205.09	23	362.85
4	63.10	14	220.86	24	378.62
5	78.88	15	236.64	25	394.40
6	94.66	16	252.42	26	410.17
7	110.43	17	268.19	27	425.95
8	126.21	18	283.97	28	441.73
9	141.98	19	299.74	29	457.50
10	157.76	20	315.52	30	473.28

In the diagram of the light curve the scale to the left is in tenths of a magnitude, above and below the magnitude of star No. 8. The horizontal scale is in days before and after maximum.

The positions of stars 8 and 19 with reference to the variable (No. 7) are

$$7-8 \qquad\qquad 7-19$$
$$287°3 \quad 13''6 \qquad 216°3 \quad 12''9$$

The variable was at maximum about 1906 April 21; maxima will therefore occur in the present year on June 23, July 9, July 25, Aug. 10 etc.

In the accompanying chart the places of the stars shown are accurately located, but the magnitudes may not be so well represented.

LIGHT-CURVE OF M 3 No. 7

Yerkes Observatory, 1906 May 5.

E. E. Barnard.

Veränderliche Sterne in der Umgebung von β Cygni.

Von *M.* und *G. Wolf*.

[Mit 3 Tafeln].

Die im folgenden mitgeteilten 31 neuen Veränderlichen sind auf den folgenden mit dem Bruce-Teleskop aufgenommenen Platten verglichen und geschätzt worden:

Platte	M. Z. Königstuhl				Belichtung
B 10	1900	Aug.	31	11ʰ39ᵐ4	180ᵐ
11	»	»	31	11 39.5	»
772	1903	Mai	31	12 13.1	220
773	»	»	31	12 13.4	»
1046	1904	Aug.	6	11 27.5	186
1047	»	»	6	11 27.7	»
1223	1905	Mai	27	11 26.8	150
1224	»	»	27	11 27.0	»
1330	»	Okt.	26	8 19.9	204
1331	»	»	26	8 20.1	»

Wie früher wurden alle Objekte ausgeschlossen, die kleinere Schwankungen als eine volle Größenklasse zeigten. Die zwei hellen Veränderlichen TY und SU Cygni wurden zur Kontrolle mitgemessen. Von TY wurde auch ein Kärtchen gezeichnet. Die Vermessung erfolgte am parallaktischen Meßapparat; nur 118.1906 ist roh an zwei Sterne (AG. Cambr. 10197 und 10217) angeschlossen worden, weil er auf den beiden am parallaktischen Meßapparat ausgemessenen Platten zu lichtschwach war. Die Anschlußsterne für die Ausmessung am parallaktischen Meßapparat waren:

AG. Berlin B 6961, 7062, 7095, 7198; AG. Cambr. 9805, 9813, 9861, 9908, 9935, 9945, 10009, 10044, 10058, 10070, 10159, 10195, 10262, 10292, 10298, 10324; AG. Leiden 7314, 7401, 7449, 7522, 7600.

Variabilis	Bezeichnung auf Platte	Karte	α 1900.0	δ 1900.0	α 1855.0	δ 1855.0	Meßplatte	Nr. der Karte	Aufsuchungssterne BD.
									* I =
89.1906 Lyrae	772.01	1	19ʰ13ᵐ43ˢ8	+27°56′37″	19ʰ11ᵐ56ˢ	+27°51′9	773	1	+27°3328
90.1906 Vulpec.	1046.04	2	19 14 52.3	+25 11 34	19 13 1	+25 6.9	1047	2	+25 3791
91.1906 Lyrae	772.02	3	19 15 25.8	+27 4 11	19 13 37	+26 59.4	773	3	+25 3822
92.1906 Cygni	10.04	4	19 15 41.1	+28 55 43	19 13 54	+28 50.8	1047	4	+28 3296
93.1906 »	772.03	5	19 16 46.8	+29 21 16	19 15 1	+29 16.4	773	5	+29 3561
94.1906 Vulpec.	1046.05	6	19 16 52.2	+24 48 19	19 15 1	+24 43.4	1047	6	+24 3720
95.1906 »	10.03	7	19 16 57.7	+26 49 43	19 15 8	+26 44.7	1047	7	+26 3524
96.1906 Cygni	10.05	8	19 18 6.4	+29 8 13	19 16 20	+29 3.2	1047	8	+29 3569
97.1906 »	1330.01	9	19 18 13.9	+29 55 56	19 16 28	+29 50.9	773	9	+29 3567
98.1906 Vulpec.	1046.06	10	19 18 36.5	+24 28 46	19 16 44	+24 23.8	1047	10	+24 3725
99.1906 »	1223.01	11	19 18 49.8	+26 46 32	19 17 1	+26 41.5	773	11	+26 3536
100.1906 Cygni	1046.03	12	19 19 16.7	+28 0 10	19 17 29	+27 55.1	1047	12	+27 3370
101.1906 Vulpec.	1330.02	13	19 19 26.2	+26 46 56	19 17 37	+26 41.8	773	11	+26 3536
102.1906 Cygni	1330.03	14	19 20 4.7	+30 49 19	19 18 20	+30 44.2	773	13	+30 3542
103.1906 »	1046.02	15	19 20 37.0	+28 14 19	19 18 49	+28 9.2	1047	14	+28 3319
104.1906 Vulpec.	1046.07	16	19 21 53.8	+26 12 43	19 20 4	+26 7.5	1047	15	+26 3549
105.1906 Cygni	772.06	17	19 24 31.4	+26 54 41	19 22 42	+26 49.3	773	16	+26 3561
106.1906 »	1330.05	18	19 25 36.8	+26 52 59	19 23 47	+26 47.5	773	17	+26 3570
107.1906 Vulpec.	1330.06	19	19 25 44.7	+25 2 22	19 23 53	+24 56.9	1047	18	+24 3764
108.1906 »	1330.07	20	19 25 49.9	+25 10 52	19 23 58	+25 5.4	1047	18	+24 3764
109.1906 Cygni	1223.02	21	19 26 8.9	+29 52 58	19 24 23	+29 47.5	1047	19	+29 3618
110.1906 »	772.08	22	19 26 49.8	+29 53 41	19 25 4	+29 48.2	773	19	+29 3618
111.1906 »	772.17	23	19 28 33.6	+29 21 17	19 26 48	+29 15.7	773	20	+29 3632
112.1906 »	772.14	24	19 29 50.4	+27 51 52	19 28 2	+27 46.1	773	21	+27 3433
TY »	TY	TY	19 29 50.4	+28 6 40	19 28 2	+28 0.9	1047	22	+27 3433
113.1906 »	1330.09	25	19 29 54.5	+30 41 57	19 28 8	+30 36.2	773	23	+30 3623
114.1906 »	1330.10	26	19 31 4.9	+29 54 4	19 29 19	+29 48.2	1047	24	+29 3655
115.1906 »	1223.03	27	19 31 54.8	+29 55 40	19 30 8	+29 49.8	1047	24	+29 3655
116.1906 »	772.15	28	19 32 46.5	+27 54 9	19 30 58	+27 48.3	773	25	+27 3446
117.1906 »	1046.13	29	19 34 4.6	+28 22 52	19 32 17	+28 16.9	1047	26	+28 3416
118.1906 »	1223.04	30	19 34 10.9	+29 26 54	19 32 24	+29 20.9	1224	27	+29 3672
119.1906 »	1046.19	31	19 39 58.1	+27 31 43	19 38 8	+27 25.3	1047	28	+27 3489
SU »	SU*)	—	19 40 48.2	+29 1 16	—	—	1047	—	—

*) SU Cygni = BD. +28°3460 = AG. Cambr. 10353; dort steht: α 1875 = 19ʰ39ᵐ48ˢ46 δ 1875 = +28°57′50″5.

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