PUBLICATIONS OF
THE DAVID DUNLAP OBSERVATORY
UNIVERSITY OF TORONTO

VOLUME I NUMBER 4

A CATALOGUE OF 1116 VARIABLE STARS IN GLOBULAR STAR CLUSTERS

BY

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1939
THE UNIVERSITY OF TORONTO PRESS
TORONTO, CANADA

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BY HELEN B. SAWYER

A. Introduction.

It is now fifty years since the discovery of the first variable star was announced in a globular cluster. The Nova which appeared in the cluster Messier 80 in 1860 can hardly be said to be the beginning of variable star astronomy in clusters, as it is still in a class by itself. In 1902 Bailey gave a summary of the variables in all the clusters which he himself had investigated, and published co-ordinates for the variables. Except for this compilation however, no catalogue of the variable stars in globular clusters has ever been published.

In 1930 Shapley published in *Star Clusters* a summary of the variables known in globular clusters. This summary was brought up to date in 1933 in the *Handbuch der Astrophysik*. Considerable knowledge has been added in the interim, with many new variables discovered, and periods determined. In June, 1938, the writer sent a paper to the Ottawa meeting of the American Association for the Advancement of Science summarizing the present state of our knowledge. As a basis for this paper, a catalogue was made giving the magnitudes, positions, and periods of all the individual variables. There was originally no intention of publishing the actual catalogue of variables, but only a summary of the data contained therein. As the work progressed however, the writer became more and more impressed with the lack of unity in the subject, the wide scattering of the references through the literature, and the various ways observers have published their data. The writer came to the conclusion that one unifying publication of actual lists of variables arranged according to individual cluster would be worth the time spent in preparation and the cost of publication.

The purpose of the catalogue is to enable a worker interested in the subject to get a clear picture of exactly what has been done on variables in clusters, either for clusters as a whole or for any

individual cluster in which he may be interested. For a person intending to work on the variables in any given cluster, the catalogue is not intended to supplant the original papers. The original papers naturally contain much more information than could possibly be carried over into the catalogue. Often it has been difficult to decide what values to excerpt, in the case of slight changes of epoch, period, or other elements.

While the catalogue is almost entirely a reprinting of material which can be located from published sources, its publication may help to prevent overlapping researches. For several clusters, variables have been announced by several observers, when the later worker did not know of the work of the earlier one. Confusion has arisen in the numbering of the variables. It would seem that this will happen more frequently in the future as the list of variable star references lengthens. Furthermore there has been a decided lack of homogeneity in the published results. The co-ordinates for the variables are given in several different units, and sometimes are not given at all. Maximum and minimum magnitudes are often lacking. Epochs are given in almost every possible way, for minimum phase, maximum phase, or an arbitrary point on either the ascending or descending branch of the light curve. It is hoped that, if the available data are gathered together now in a uniform manner for all clusters, observers will be encouraged in the future to publish their results in a more standard form. This should make the material more suitable for statistical investigation.

No attempt has been made to republish marked prints for the clusters. In general cluster variables are most readily identified from prints, although these have not been published for all clusters. For each cluster, however, a publication in which a marked print can be found is indicated. But it is felt that a compilation of the positions, even without the prints, is certainly statistically valuable. As a matter of fact, for some of the crowded clusters where the prints are blurred in the centre, one needs to use the positions anyway, rather than the prints, for identification.

The positions of the variables are most logically given in x and y co-ordinates from the centre of the cluster. As the position of the exact cluster centre is practically never published, it may seem a trifle illogical to publish x and y co-ordinates without identifying the origin. But even though the position of the origin is indefinite, when there are as many as two variables published

in a cluster, the identification from the positions only should not be ambiguous.

B. Summary of Data on Variable Stars in Globular Clusters.

1. Numbers of Variables.

At the present time, 1215 variable stars have been found in 60 globular clusters. There is no printed record of a search in the other 34 clusters. Of these 1215 variables, 99 are listed as unpublished, and so cannot be catalogued with positions and magni-

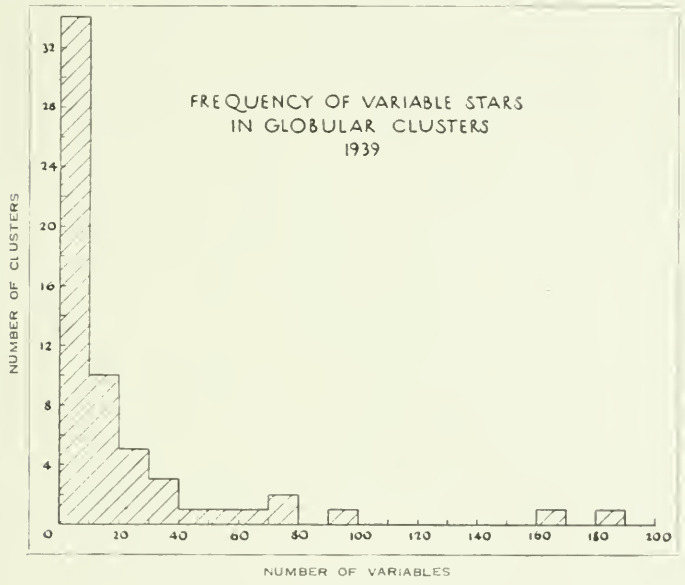

Figure 1

tudes. It is a somewhat startling fact that only recently have the efforts of all other astronomers equalled those of Professor Bailey alone, in the finding of new variables. Bailey found 541 new variables, other observers 774.

Of the 60 globular clusters searched so far, only 4 have been found to be entirely devoid of variables. These four have been searched by only one observer, and it is quite possible that in the future some variables may be found in them. The cluster Messier 3 (NGC 5272) has the largest number of variables, with a total of 185, while ω Centauri (NGC 5139) is a close second with 161. No

other globular cluster has more than 100. Of all the clusters searched, 80 per cent have less than 30 variables. Figure 1 shows the frequency distribution of number of variables per globular cluster.

Table I gives a summary of variable stars in globular clusters, arranged according to NGC number of the cluster. The second column gives the total number of variables known; an italicized number indicates that some unpublished variables have been included in the total. The name of the discoverer is given in the third column, followed by the date on which definite publication of the new variables was made. The numbers in parenthesis indicate the number of variables found by that person. As in some clusters variables have been found independently by several observers, it should not be expected that the numbers in parenthesis will total the exact number now known in the cluster. Stars which were once announced as variable, and since shown to be unvarying, have been omitted from the total. The fifth column gives the total number of periods actually determined. No attempt has been made to include in this table the numbers of stars which have been shown to have periods less than a day, but for which the actual period has not been established. In the sixth column are given the names of the authors who determined periods, and in the seventh the date when the periods were published. The last three columns of the table give the number of cluster type variables, of variables with periods between 1 and 125 days, and with periods greater than 125 days. The grouping of periods from one to 125 days was purposely taken to include a number of stars with periods just over one hundred days. This group seems in rather higher proportion in globular clusters than in the galactic system. There are few variables with periods greater than 125 days; they apparently belong to the class of long period variables.

2. Number of known periods.

Of the known variables, periods have been determined for 656, or about one-half. Periods are known in only 20 globular clusters, or about one-fifth of the total number. Of the 656 periods determined, the four bright clusters investigated by Bailey, Messier 3, Messier 5, Messier 15, and ω Centauri account for 449 periods, or 70 per cent of the total. The other 207 periods known are scattered through 16 clusters. Bailey has determined more periods in globular clusters than all other workers combined; he determined 353 periods, while others have so far determined only 303.

TABLE 1

SUMMARY OF VARIABLE STARS IN GLOBULAR CLUSTERS

NGC	No. Vars.	Found by	Date	Total Periods Determined	Det. by	Date	P <1 day	P 1-125 days	P >125 days
104	8	Bailey	1902	3	Woods	1922	0	0	3
288	*2*	Mt. Wilson							
362	14	Bailey	1902	10	Sawyer	1931	7	3	0
1851	*3*	Bailey (2)	1902						
		Swope (*1*)							
1904	5	Bailey	1902						
2298	*6*	Shapley							
2419	36	Baade	1935						
2808	*4*	Shapley							
3201	61	Woods (56)	1919						
		Bailey (5)	1922						
4147	4	Davis (1)	1917	3	Baade	1930	3	0	0
		Baade (3)	1930						
4372	*8*	Shapley							
4590	28	Shapley and Ritchie	1919-20						
4833	*6*	Swope and Shapley							
5024	40	Shapley and Ritchie (22)	1920	32	Grosse	1932	32	0	0
		Baade (16)	1926						
		Grosse (2)	1932						
5053	9	Baade	1927						
5139	161	Bailey (128)	1902	150	Bailey	1902	135	13	2
		van Gent, Hertzsprung, and Martin (33)	1937		Martin	1937			
					Barnard	1906			
5272	185	Pickering (1)	1889	166	Bailey	1913	164	2	0
		Belopolsky (1)	1895		Larink	1922			
		Bailey (132)	1902		Slavenas	1929			
		(5)	1913						
		Barnard (1)	1905		Müller	1933			
		Shapley (23)	1914		Greenstein	1935			
		Larink (3)	1922						
		Müller, Guthnick and Prager (42)	1933						
		Greenstein (16)	1935						
5286	0	Bailey	1924						

Italicized numbers indicate unpublished data. Sources of data for this summary may be found under individual clusters in the catalogue.

TABLE I—*Continued*

NGC	No. Vars.	Found by	Date	Total Periods Determined	Det. by	Date	P <1 day	P 1-125 days	P >125 days
5466	14	Baade	1926						
5634	*4*	Baade							
5694	0	Baade	1934		Barnard	1898			
5904	92	Common (5)	1890	73	Bailey	1917	70	3	0
		Packer (1)	1890		Shapley				
		Bailey (85)	1902		and Roper	1927			
		(7)	1917						
5986	1	Bailey	1902						
6093	3	Auwers (1)	1860						
		Bailey (2)	1902						
6121	32	Leavitt	1904	20	Sawyer	1931	19	1	0
6171	24	Oosterhoff	1938						
6205	*10*	Barnard (2)	1900, 1914	2	Barnard	1909	0	2	0
		Bailey (2)	1902						
		Shapley (4)	1915						
		Guthnick and Prager (3)							
6218	1	Sawyer	1938	1	Sawyer	1938	0	1	0
6229	*21*	Davis (1)	1917						
		Baade (*20*)							
6254	2	Sawyer	1938	1	Sawyer	1938	0	1	0
6266	26	Bailey	1902						
6293	3	Shapley and Ritchie	1920						
6333	*1*	Mt. Wilson							
6341	16	Woods (1)	1922	13	Hachen-	1939	13	0	0
		Nassau (14)	1938		berg				
		Guthnick and Prager (14)							
		Hachenberg	1939						
6362	17	Woods (16)	1919						
		Bailey (1)	1919						
6366	*6*	Sawyer							
6397	2	Bailey	1902	2	Sawyer	1931	0	1	1
6402	72	Sawyer	1938	*15*	Sawyer	1937	*12*	3	0
6426	*10*	Baade							
6535	*1*	Baade							
6539	*1*	Baade							
6541	1	Woods	1922						
6553	0	Shapley	1920						
6584	0	Bailey	1924						

Italicized numbers indicate unpublished data. Sources of data for this summary may be found under individual clusters in the catalogue.

TABLE I—*Continued*

NGC	No. Vars.	Found by	Date	Total Periods Determined	Det. by	Date	P <1 day	P 1-125 days	P >125 days
6626	9	Bailey	1902						
6656	17	Bailey (16)	1902	8	Shapley and Swope	1927	6	1	1
		Swope (1)	1927						
6712	*4*	Davis (1)	1917						
		Baade (*3*)							
6723	19	Bailey (16)	1902	19	Bailey van Gent	1924 1932-3	19	0	0
		van Gent (3)	1932-3						
6752	1	Bailey	1902						
6760	*2*	Baade							
6779	*6*	Davis (1)	1917						
		Shapley and Ritchie (2)	1920						
		Sawyer (*4*)							
6809	2	Bailey	1902						
6864	11	Shapley and Ritchie	1920						
6934	51	Sawyer	1938	*35*	Sawyer		*35*		
6981	31	Davis (2)	1917	26	Shapley and Ritchie	1920	26	0	0
		Shapley and Ritchie (31)	1920						
7006	*20*	Shapley and Ritchie (2)	1920						
		Shapley, and Mayberry (9) Hubble (9)	1921						
7078	74	Bailey (51)	1902	60	Bailey, Leland and Woods Wemple Levy	1919	59	1	0
		Bailey (15) Guthnick and Prager (8)	1919						
7089	17	Chèvre-mont (1)	1897	17	Chèvre-mont	1898	13	4	0
		Bailey (10)	1902		Sawyer	1935			
		Sawyer (6)	1935						
7099	3	Bailey	1902						
7492	*9*	Shapley and Ritchie (1)	1920						
		Shapley (8)							

Italicized numbers indicate unpublished data. Sources of data for this summary may be found under individual clusters in the catalogue.

3. Distribution of periods.

It is general knowledge that among the stars with known periods the variables of cluster type with periods less than one day greatly predominate. There are 614 cluster type periods in 15 clusters. In many clusters where no definite periods are known, inspection of the changes in magnitudes from a number of plates indicates that most of the variables have periods less than one day. There are 43 variables with periods greater than one day. Of these, 7 have periods greater than 125 days; 27 are long period Cepheids, and the rest are semi-regular variables or belong in the group with periods about one hundred days.

It is a rather amazing fact that while in globular clusters cluster type periods outnumber periods greater than one day in a 15 to 1 proportion, yet the variables with periods greater than one day are distributed as widely among the clusters investigated as are the large numbers of cluster type variables! The 613 cluster type variables are to be found in 15 clusters, while the 43 variables with periods greater than one day are also scattered through 14 clusters.

This fact lends considerable zest to the hunt for periods in globular clusters; for while one may guess that a cluster with 30 variables may probably have a long period Cepheid, yet one must realize that a cluster with only one or two variables is quite as likely to have one. The relative scarcity of Cepheids with periods greater than one day naturally makes them the more interesting objects. From the point of view of distance determination, the distance as computed from the apparent magnitude of the cluster type Cepheids is probably just as good as the distance computed from the period-luminosity relation of the long period Cepheids. But because periods greater than one day are comparatively rare in globular clusters, these variables are summarized in Table II. A similar table which had 27 entries was published by the writer in 1931 (*H.C.* no. 366). Since then 17 stars have been added, and one dropped. Of these, 11 are Cepheids, 3 found by Martin in ω Centauri, and 8 by the writer in 4 other clusters. A period of 103 days has been determined for Variable 95 in Messier 3, and several variables in ω Centauri have been shown to have semi-regular periods.

TABLE II

PERIODS GREATER THAN ONE DAY IN GLOBULAR CLUSTERS

NGC	Var. No.	Period	Magnitudes Max.	Min.	Med.Mag. Cl. Type	Remarks
104	1	211.3	11.0	14.4	.....	
	2	203.	11.0	14.2		
	3	192.	11.0	14.3		
362	2	105.22	13.0	14.5	15.49	
	8	3.901447	15.0	16.5		Member of Small Mag. Cloud.
	10	4.20519	14.9	16.4		Member of Small Mag. Cloud.
5139	1	58.7027	10.7	12.6	14.65	RV Tauri, formerly thought Cepheid with P=29^d.34
	2	484.	13.06	16.12		
	17	60: irr.	14.18	14.61		
	29	14.72429	12.44	13.50		
	42	119.4	12.5	14.9		
	43	1.1568183	13.41	14.55		
	48	4.474293	13.09	13.95		
	53	87: irr.	13.30	13.87		
	60	1.349464	13.32	14.48		
	61	2.273582	13.72	14.48		
	78	1.1681179	14.17	14.84		Eclipsing variable
	92	1.3450659	14.10	14.58		
	138	74.6: irr.	12.5	13.6		
	148	90: irr.	12.9	13.8		
	152	124: irr.	12.8	13.7		
5272	95	103.19	13.73	14.42	15.57	
	154	15.2828	12.9	14.0		
5904	41	25.74	11.20	12.24	15.11	
	50	106.0	13.00	14.2		
	84	26.5	11.54	12.61		
6121	29	1.097452 ?	13.1	14.1	13.88	
6205	1	6.0	13.7	11.9	15.20	
		5.10	12.85	13.8		
6218	1	15.508	11.9	13.2	.....	

TABLE II—*Continued*

NGC	Var. No.	Period	Magnitudes Max.	Min.	Med.Mag. Cl. Type	Remarks
6254	2	18.754	11.9	13.7	.....	
6397	1	314.6	11.2	16.0	.....	
	2	45 or 60	13.8	14.8		RV Tauri ?
6402	1	18.75	14.3	16.0	16.85	
	2	2.7952	15.4	16.3		
	7	13.59	14.9	16.2		
6656	5	7.097 ?	12.0	12.8	14.06	
	14	200.0	13.8	[15.5		
7078	1	1.437478	14.36	15.54	15.63	
7089	1	15.5647	13.2	14.8	16.1	
	5	17.5548	13.2	14.9		
	6	19.3010	13.2	14.9		
	11	33.600	12.5	13.7		

C. Description of the Catalogue.

The catalogue contains all clusters for which there is a published record of a search for variables, and a few others for which the unpublished data have been kindly supplied to the writer. The clusters are arranged in order of NGC number. If the cluster has a Messier number, it is given. The right ascension and declination are for the equinox of 1950.

The variables are numbered according to the number given by the discoverer except in a few cases where an adjustment has had to be made. The x and y co-ordinates are given in seconds of arc and correspond in direction to right ascension and declination. Whenever they have been published, magnitudes, epochs and periods are given. A blank in these columns indicates lack of published data. Some magnitudes have been followed by colons in the original papers; the colons have been omitted in the catalogue because the writer felt that there was far more uncertainty in many magnitudes in other clusters which had been published without colons. When an observer has given a table of maximum and minimum magnitudes, these have been taken. In many cases

the writer has had to read these values from published measures of many plates; in these cases the brightest and faintest estimates of magnitude for the variable have been taken. Epoch of maximum gives the number of days past J.D. 2,400,000.000.

Suspected variables have not been included in the catalogue except for one or two which had been assigned definite numbers in the midst of list of variables. It was felt that in these cases it would disturb the numbering less to include these suspected variables until they were definitely disproved. Announced variables which are now considered not to vary have been left in the catalogue so that a reader would not think the numbers had been omitted by accident; their non-variable nature has been indicated and they have not been included in the totals of known variables.

When necessary, notes pertaining to the cluster are given at the end of the data on that particular cluster.

D. References to Literature on Variable Stars in Globular Clusters.

To the catalogue is appended a complete bibliography of literature on variable stars in globular clusters. The 39 fundamental references given in Shapley's *Star Clusters*, Table IV, I, have been increased to 118, partly by inclusion of some of the very early references, partly by references since 1930, and partly by somewhat obscure references which had been overlooked earlier. These references have been arranged by years in the hope that the numbering would have some significance and might be reasonably permanent. In any one year the references have been arranged alphabetically by author. References to field variables around a cluster (when published under the name of that cluster) have been included, since there is often ambiguity as to which variables are actually cluster members. Variable star literature has been assumed to start with the first typical variable found in 1889, and not with the early nova of 1860. The list of nova references therefore is not given directly in the bibliography, but can be found in the most recent paper under NGC 6093. At the end of each cluster the list of numbers indicates the references to that cluster, and special note is made of the references in which plates or charts of the clusters giving identification of the variables can be found.

E. Suggestions for Publication of Future Results.

The writer would like to make the following suggestions that

workers in this field might follow in the future. These suggestions arise out of the practice that has been most usual in the past; if the same practice could always be followed in the future it would put the knowledge of variable stars in globular clusters on a uniform basis, as Prager's catalogue has the knowledge of variables in the galactic system.

It is suggested:

1. That for the announcement of new variables, the x and y co-ordinates be published, with an assumed centre of the cluster, with the signs such that an increase in x or in y means an increase in right ascension or north declination. That since most co-ordinates have been published in seconds of arc, this unit should be adopted. That if an observer finds additional variables in a cluster already examined and wishes to change the origin of the co-ordinate system for some good reason, he republish on his system the x and y co-ordinates for all variables.

2. That variables be numbered consecutively from the last known variable in the cluster. (This appears to be a very obvious procedure, but in a number of cases it has not been followed).

3. That observers refrain from numbering suspected variables along with stars considered definitely variable. (The suspects can be lettered or designated in any way that the author wishes; but it is bound to lead to much unnecessary confusion in the future if they are numbered along with well-established variables).

4. That since the maximum and minimum magnitudes of the variables in a cluster may be considered one of the convenient and fundamental quantities in which many astronomers are interested, a table giving these for all variables (including those for which no period has been determined) be published whenever possible.

5. That, for variables whose periods have been determined, a table of well-established epochs of maximum be published. (Although the period may doubtless be computed more accurately from some other point, yet it would seem that a table of epoch of maximum is of general interest and use, and should always be published even when the periods have been computed from points selected on some other part of the light curve.)

Naturally a serious attempt has been made to make the catalogue as complete and as accurate as possible. In a work of this

sort, however, it is almost inevitable that errors will be found, sins both of omission and of commission, and the writer will be very grateful for all that are brought to her attention. She will also be glad to receive additional data as it is accumulated in the future.

The writer wishes to acknowledge with thanks the assistance of Miss Edna Fuller in the preparation of this catalogue, and constructive suggestions regarding the manuscript made by Professor Shapley and Dr. Prager.

March 3, 1939.

CATALOGUE
OF VARIABLE STARS IN GLOBULAR CLUSTERS

NGC 104 (47 Tucanae) α 00^h 21^m.9, δ −72° 21′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+36.8	−112.6	11.0	14.4	12717.	211.3
2	+64.7	−193.9	11.0	14.2	12685.	203.
3	+328.4	+52.8	11.0	14.3	12755.	192.
4	−18.8	−160.4	.....	.....	.....	.....
5	+271.9	−284.6	.....	.....	.....	.....
6	+97.3	−103.8	.....	.....	.....	.....
7	+349.2	−113.0	.....	.....	.....	.....
8	+16.	+57.	.....	.....	.....	.....

Refs. 9, 14, 20, 68. Plate in 20.

NGC 288 α 00^h 50^m.2, δ −26° 52′

2 unpublished variables, Ref. 87. No map.

NGC 362 α 01^h 00^m.6, δ −71° 07′

1	−246.2	−67.6	14.9	16.1	23751.558	0.5850512
2	+41.4	−204.4	13.0	14.5	24391.8	105.22
3	+93.6	−143.2	14.6	16.1	23604.806	0.4744151
4	−50.2	−27.3	14.0	15.8	.....	.....
5	−79.2	−31.9	15.1	16.4	24025.729	0.4900846
6	+82.4	+15.5	14.9	16.3	24461.642	0.5146080
7	+131.1	−21.2	14.8	16.0	24468.687	0.5285492
8	+33.4	−308.5	15.0	16.5	24433.677	3.901447
9	−400.4	+224.4	14.7	16.0	24404.670	0.5476126
10	+282.8	−381.8	14.9	16.4	23315.643	4.20519
11	−136.1	−26.0	15.1	16.0	.....	.....
12	−30.4	−115.4	15.2	16.1	24391.839	0.65254518
13	+14.5	+38.8	14.6	16.3	.....	.....
14	−23.8	−66.8	14.8	16 2	.....	.....

Refs. 11, 14, 20, 90, 94. Plate in 20. Corrected period for No. 12 from ref. F.

NGC 1851 α 05^h 12^m.4, δ −40° 05′

1	+261	−9	14	15½	.....	.....
2	−45	+30	14	15½	.....	.....

1 unpublished variable.
Refs. 72, 87. No map.

CATALOGUE—*Continued*

NGC 1904 (Messier 79) α 05^h $22^m.2$, δ $-24°$ $34'$

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+29.6	−199.6	.....	.....	.....	.....
2	+78.3	−68.3	.....	.....	.....	.....
3	+34.8	−64.6	.....	.....	.....	.....
4	+93.4	−50.3	.....	.....	.....	.....
5	−11.6	+20.2	.....	.....	.....	.....

Refs. 14, 20. Plate in 20.

NGC 2298 α 06^h $47^m.2$, δ $-35°$ $57'$

6 unpublished variables, 5 suspected.
Ref. F.

NGC 2419 α 07^h $34^m.8$, δ $+39°$ $00'$

1	+40	−52	17.59	18.32	.....	.....
2	−4	−19	.....	.....	.....	.....
3	+52	−24	18.66	19.96	.....	.....
4	+80	−15	18.84	19.65	.....	.....
5	+33	+47	18.75	19.72	.....	.....
6	+56	−127	18.86	19.64	.....	.....
7	+91	+87	18.69	19.77	.....	.....
8	−17	+41	17.50	18.10	.....	.....
9	−32	+88	18.59	19.76	.....	.....
10	+20	−51	17.31	17.93	.....	.....
11	+95	−8	18.55	19.81	.....	.....
12	+133	+111	18.69	19.71	.....	.....
13	+101	−10	18.55	19.75	.....	.....
14	−115	−13	18.81	19.62	.....	.....
15	+62	+40	18.62	19.76	.....	.....
16	+47	+72	18.77	19.85	.....	.....
17	+109	+111	18.65	19.75	.....	.....
18	−15	+114	17.84	18.53	.....	.....
19	−107	−40	18.77	19.86	.....	.....
20	−28	+45	17.65	18.16	.....	.....
21	−55	+30	18.76	19.74	.....	.....
22	+109	−5	18.60	19.81	.....	.....
23	+27	+79	.....	.....	.....	.....
24	−117	−10	18.91	19.58	.....	.....
25	−59	+38	18.74	19.81	.....	.....

CATALOGUE—*Continued*

NGC 2419

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
26	−70	−50	.....	.....	.....	.....
27	+19	−103	19.10	19.55	.....	.....
28	−192	+59	18.72	19.78	.....	.....
29	−58	−7	19.01	19.92	.....	.....
30	−26	+23	.....	.....	.....	.....
31	+154	−146	19.08	19.53	.....	.....
32	−19	+48	18.60	19.71	.....	.....
33	+47	−17	19.11	20.13	.....	.....
34	+21	+157	19.00	19.66	.....	.....
35	+43	+8	18.78	19.70	.....	.....
36	+23	+44	19.10	19.83	.....	.....

Ref. 108, with plate.

NGC 2808 α $09^h\ 10^m.9$, δ $-64°\ 39'$
4 unpublished variables, 7 suspected.
Ref. F.

NGC 3201 α $10^h\ 15^m.5$, δ $-46°\ 09'$

1	+59	−118	.....	.....	.....	.....
2	+29	−117	.....	.....	.....	.....
3	+182	−43	.....	.....	.....	.....
4	+155	+3	.....	.....	.....	.....
5	+42	−24	.....	.....	.....	.....
6	−116	−143	.....	.....	.....	.....
7	−91	−189	.....	.....	.....	.....
8	−69	−99	.....	.....	.....	.....
9	−51	−91	.....	.....	.....	.....
10	−181	+235	.....	.....	.....	.....
11	−104	+112	.....	.....	.....	.....
12	−86	+108	.....	.....	.....	.....
13	−160	+92	.....	.....	.....	.....
14	−156	+133	.....	.....	.....	.....
15	−279	−173	.....	.....	.....	.....
16	−197	−238	.....	.....	.....	.....
17	+11	−25	.....	.....	.....	.....
18	+23	−24	.....	.....	.....	.....
19	+23	+317	.....	.....	.....	.....
20	+39	+284	.....	.....	.....	.....
21	+94	+135	.....	.....	.....	.....

CATALOGUE—*Continued*

NGC 3201

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
22	−100	−56	.....	.....	.....	.....
23	−49	−50	.....	.....	.....	.....
24	−339	+17	.....	.....	.....	.....
25	+93	+173	.....	.....	.....	.....
26	+219	−140	.....	.....	.....	.....
27	+58	−323	.....	.....	.....	.....
28	+66	−48	.....	.....	.....	.....
29	−256	+113	.....	.....	.....	.....
30	−289	+272	.....	.....	.....	.....
31	+182	+131	.....	.....	.....	.....
32	+195	+199	.....	.....	.....	.....
33	+48	−40	.....	.....	.....	.....
34	+296	+285	.....	.....	.....	.....
35	−11	+121	.....	.....	.....	.....
36	−108	−11	.....	.....	.....	.....
37	−68	−74	.....	.....	.....	.....
38	−61	−60	.....	.....	.....	.....
39	+41	+54	.....	.....	.....	.....
40	−96	+68	.....	.....	.....	.....
41	+291	+28	.....	.....	.....	.....
42	−301	+197	.....	.....	.....	.....
43	−377	+15	.....	.....	.....	.....
44	+31	+67	.....	.....	.....	.....
45	+127	−32	.....	.....	.....	.....
46	−396	−510	.....	.....	.....	.....
47	+108	+245	.....	.....	.....	.....
48	−252	+12	.....	.....	.....	.....
49	−38	+151	.....	.....	.....	.....
50	−13	+27	.....	.....	.....	.....
51	−205	−26	.....	.....	.....	.....
52	+14	−812	.....	.....	.....	.....
53	−873	−758	.....	.....	.....	.....
54	+671	−804	.....	.....	.....	.....
55	−338	+767	.....	.....	.....	.....
56	+246	+94	.....	.....	.....	.....
57	+288	−72	.....	.....	.....	.....
58	+346	−80	.....	.....	.....	.....
59	−490	−70	.....	.....	.....	.....
60	−850	+95	.....	.....	.....	.....
61	−1125	+175	.....	.....	.....	.....

Refs. 46, 59. No map.

CATALOGUE—*Continued*

NGC 4147 α 12^h 07^m.6, δ +18° 49′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	−100.1	−45.7	15.90	16.95	25324.68	0.4993
2	−20.2	−28.8	15.95	17.25	25305.541	0.4920
3	−28.5	−35.3	16.32	16.78	25321.528	0.3834
4	+1	+18	16.5	17.1	.....	.....

Refs. 36, 85, 89. Photograph in 85.

NGC 4372 α 12^h 23^m.0, δ −72° 24′

8 unpublished variables, 6 suspected.

Ref. F.

NGC 4590 (Messier 68) α 12^h 36^m.8, δ −26° 29′

1	−280	+109	15.28	16.03	.....	.....
2	−168	−45	15.69	16.39	.....	.....
3	−140	+91	15.54	16.34	.....	.....
4	−117	−131	15.56	16.02	.....	.....
5	−56	+170	15.51	16.14	.....	.....
6	−54	+17	15.64	16.03	.....	.....
7	−50	−79	15.48	16.16	.....	.....
8	−38	−134	15.69	16.14	.....	.....
9	−31	+40	15.43	16.28	.....	.....
10	−25	−16	15.28	16.62	.....	.....
11	−18	−112	15.31	16.11	.....	.....
12	−10	−1	15.07	16.23	.....	.....
13	−6	−56	15.62	16.28	.....	.....
14	−4	+218	15.16	16.29	.....	.....
15	+9	+58	15.65	16.36	.....	.....
16	+11	+80	15.71	16.43	.....	.....
17	+16	−75	15.65	16.60	.....	.....
18	+19	−96	15.59	16.28	.....	.....
19	+33	+70	15.65	16.21	.....	.....
20	+34	−114	15.45	16.02	.....	.....
21	+48	+8	15.82	16.60	.....	.....
22	+61	−22	15.30	16.52	.....	.....
23	+64	+380	15.08	16.34	.....	.....
24	+74	−8	15.74	16.34	.....	.....
25	+141	+123	15.77	16.21	.....	.....
26	+158	−44	15.67	16.35	.....	.....
27	+380	+263	10.88	15.04	.....	.....
28	+440	+160	15.62	16.14	.....	.....

Refs. 44, 49. Photograph in 49.

CATALOGUE—*Continued*

NGC 4833 α 12^h 56^m.0, δ −70° 36′
6 unpublished variables, 2 suspected.
Refs. 65, 87, F. No map.

NGC 5024 (Messier 53) α 13^h 10^m.5, δ +18° 26′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+9.6	−171.0	16.05	16.95	23083.422	0.6098204
2	−78.0	−183.6	16.38	16.88	23113.368	0.3861006
3	−60.6	−138.0	16.14	16 93	23113.383	0.6306142
4	−169.5	−156.6	16.41	16.84	23113.482	0.3851668
5	−237.0	−258.0	15.89	16.98	23143.308	0.6394291
6	+123.6	+13.5	16.08	17.11	23083.448	0.6640180
7	+79.5	+83.5	16.02	16.95	23145.435	0.5448344
8	+72.0	+60.0	16.28	16.95	23143.552	0.6144954
9	+67.5	−40.5	16.03	17.10	23145.500	0.6003745
10	−138.6	+54.0	15.90	16.98	23143.445	0.6082565
11	−143.4	−58.5	16.04	16.82	23113.536	0.6299540
12	+409.5	+187.5	16.05	16.91	23113.548	0.6125865
13	+462.0	−299.7	15.87	17.03	23143.409	0.6274463
14	+354.6	−207.0	15.88	17.00	23143.366	0.5454021
15	+248.4	+228.0	16.39	16.67	23113.458	0.2358820
16	−136.5	−202.5	16.43	16.90	23113.399	0.3031713
17	−214.5	+114.0	16.29	16.80	23113.588	0.3815014
18	−96.0	+12.6	.....	.....	.....	.....
19	+165.6	−42.0	16.34	16.85	23113.534	0.3913751
20	+188.4	−351.6	16.32	16 81	23113.615	0.3844312
21	+437.4	−27.0	16.32	16 81	23113.315	0.3381193
22	−53.4	−288.0	variable ?		.....	.....
23	+96.0	−89 7	16.34	16.88	23113.460	0.3658077
24	−118.5	−29.2	15.71	16.43	.....	.....
25	+130.3	+31.7	16.16	16.90	23113.340	0.7051765
26	−288.0	−279.9	16.29	16.74	23113.337	0.3911181
27	−203.8	−157.9	16.16	16.93	23083.628	0.6710581
28	−181.4	+459.0	15 78	16.94	23113 223	0.6327872
29	+125.4	−79.5	16.61	16.88	22811 132	0.391870
30	+57.7	−482.8	16.18	17 01	23113.398	0.5354915
31	+60.6	−0.1	.....	.....	.....	.....
32	−111 9	−86 6	16.26	16 65	23113.545	0.3900810
33	−165.0	+12 2	.....	.....	.....	.....
34	−144 0	−216.7	.....	.....	.....	.....
35	+104 1	+153 2	16.38	16 88	23113 345	0 3726730

CATALOGUE—*Continued*

NGC 5024

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
36	+120.3	+306.5	16.33	16.71	23113.698	0.3732511
37	−44.0	+62.2	.....	.....	.....	.....
38	+21.3	−143.2	16.08	16.81	23083.777	0.7057845
39	−234.0	+212.5	.....	.....	.....	.....
40	+8.9	+111.5	16.55	16.89	26418.664	0.239250
41	In centre					
42	In centre					

Refs. 51, 58, 79, 92, 97. Photograph in 51, chart in 92.

NGC 5053 α 13^h 13^m.9, δ +17° 57′

1	−380	+158	15.85	16.55	.....	.....
2	−193	−3	15.83	16.46	.....	.....
3	+140	+138	15.84	16.50	.....	.....
4	+31	−114	15.83	16.50	.....	.....
5	+220	−220	15.85	16.50	.....	.....
6	+126	+77	15.99	16.44	.....	.....
7	−87	+169	15.93	16.43	.....	.....
8	+117	+50	15.94	16.50	.....	.....
9	−199	+382	.....	16.46	.....	.....

Ref. 83, with plates.

NGC 5139 (ω Centauri) α 13^h 23^m.8, δ −47° 03′

1	−416.16	+298.89	10.7	12.6	.....	58.7027
2	−340.00	+238.51	13.06	16.12	.....	484.
3	−507.93	+167.43	14.19	15.11	26524.245	0.8412205
4	−337.61	+262.10	13.89	15.18	26473.374	0.6273172
5	−282.75	+328.29	14.06	15.34	26460.409	0.5152828
6	−162.43	+252.95	13.84	15.24	.....	irr.
7	+153.19	+879.15	13.98	15.11	26470.425	0.7130181
8	+629.43	+16.20	13.90	15.29	26472.238	0.5212846
9	−473.17	+137.14	14.35	15.32	26453.421	0.5233358†
10	−397.76	+244.48	14.38	14.90	26524.241	0.374950
11	−158.63	+338.73	14.3	15.0	irr.	0.56481
12	−193.16	+274.34	14.43	14.95	26469.446	0.3867486
13	−487.26	+199.54	13.98	15.12	26438.457	0.6690480
14	−473.51	−627.56	14.40	15.01	26472.456	0.3771799
15	−194.09	+242.62	14.13	14.98	26469.427	0.8106198

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
16	+517.05	−536.81	14.38	14.95	26435.488	0.3301694
17	+522.24	+200.00	14 18	14.61	.....	60:
18	+596.64	+220.15	13.89	15.18	26454.408	0.6216682
19	+444.14	+32.44	14.68	15.22	26434.540	0.2995533
20	+280.88	+32.06	14 01	15.20	26469.388	0.6155547†
21	−355.75	+162 07	14.20	14.81	26469.257	0.3808180
22	+552.18	−330 22	14.43	14.97	irr.	0.39609
23	+2.54	+240.71	14.26	15.39	26470 392	0.5108651
24	+524.71	−336.96	14.41	14.88	26468.520	0.4622108
25	−210.77	+17.48	13.98	15.07	26169.433	0.5885005
26	−229.58	+101.21	14.36	15.06	26459.469	0.7847199†
27	−205.47	+24.11	14.50	15.19	26471.386	0.6156761
28	.....	.....	not variable		.....	.....
29	−193.25	−6 45	12.44	13.50	26465.88	14.72429
30	−307.92	−75 01	14.40	14.86	irr.	0.40418†
31	.....	.....	not variable		.....	.....
32	+174.39	+420 01	13.87	15.20	26469.421	0.6204317
33	−554.54	−24.00	13.88	15.24	26461.436	0.6023262
34	−396.87	−269.04	14.18	15.13	26171.369	0.7339450
35	+71.70	+365.07	14.37	14.94	26468.484	0.3868382
36	+216.11	+789.42	14.38	14.93	irr.	0.37984†
37	.....	.....	not variable		.....	.....
38	+169.10	−170.37	14.36	15.11	26469.456	0.7790480
39	+741.86	−365.80	14.43	14.99	26469.474	0.3933567
40	−220.99	−125.30	13.95	15.15	26471.364	0.6340969†
41	+151.80	−142 18	14.03	15.06	26523.185	0.6629590
42	+0.21	−50 21	12.5	14.9	.....	149.4
43	−119.23	+103.16	13.41	14.55	26470.385	1.1568183
44	−243.40	−351.05	14 24	15.36	26466.380	0.5675440
45	−764.48	+80.97	13 94	15.19	26473.404	0.5891259
46	−770.61	+170.11	14 03	15.17	26454.471	0.6869382
47	−504.32	+269.26	14.27	14.73	irr.	0.48517†
48	−86.54	−104.54	13 09	13 95	26523.70	4.474293
49	−391.98	−553.77	14.16	15.28	26470 407	0.6016505
50	−530.75	+65.40	14.57	15.10	26472 336	0.3861815
51	−36.85	+258.73	13.86	15.16	26441 448	0 5741359
52	−112 85	+36 47	13.60	14 22	26161.348	0.6603737
53	−482 79	−147 74	13.30	13.87	. .....	87:
54	−229.39	+592.76	14.22	15.05	26472.412	0 7728973
55	−617 73	−816 68	14 38	15.39	26471.323	0.5816930
56	−515.93	−541.96	14 37	15.38	26428.437	0.5680030
57	+635 72	−493 26	14.31	15 06	26471.342	0 7941118

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
58	−335.44	+277.68	14.49	14.74	26524.233	0.3699057
59	−282.90	−65.84	14.20	15.18	26523.231	0.5185176†
60	−108.42	−247.33	13.32	14.48	26473.513	1.349464
61	+280.44	+68.07	13.72	14.48	26468.345	2.273582
62	−199.80	+45.28	13.88	15.10	26424.515	0.6197937
63	−996.82	−491.46	14.47	15.04	26438.567	0.8259507
64	−448.01	−457.49	14.45	15.02	26466.410	0.3444512
65	−454.49	−474.32	14.77	15.22	26523.238	0.06272282
66	−133.37	+375.15	14.46	14.95	irr.	0.40745†
67	−178.11	+593.57	14.18	15.28	26470.377	0.5644551
68	−338.18	+545.12	14.15	14.67	26469.366	0.5344773
69	−965.76	−530.94	14.10	15.25	26438.468	0.6532165
70	+417.83	−304.65	14.45	14.94	26524.219	0.3906091
71	+220.39	+47.13	14.38	14.92	26523.271	0.3574826
72	+477.85	+734.87	14.42	14.94	26471.459	0.3845163
73	−532.49	+750.76	13.87	15.18	26472.358	0.5752184
74	+215.47	+664.83	13.75	15.24	26454.399	0.5032505
75	+341.44	+591.55	14.42	14.87	26456.501	0.4222508
76	+113.31	+511.81	14.40	14.82	26523.135	0.3378438
77	+352.29	+392.42	14.45	14.93	irr.	0.42593†
78	+586.10	+146.68	14.17	14.84	27943.307¶	1.1681179
79	+1000.12	−51.02	13.97	15.27	26456.423	0.6082747
80	.....	.....	not variable		.....	.....
81	+511.36	+228.72	14.46	14.98	26523.110	0.3894022
82	+499.94	+126.98	14.43	14.96	26463.452	0.3358520
83	+226.09	+424.66	14.43	15.00	26471.427	0.3566071
84	−1202.81	−74.70	14.09	14.90	26472.382	0.5798722
85	−1010.51	+307.98	14.23	15.09	26523.243	0.7427555
86	+293.14	+147.26	13.96	15.18	26470.383	0.6478442
87	+113.68	+184.13	14.40	14.90	26454.448	0.3965019
88	+98.13	+203.28	14.01	14.81	26523.273	0.6901992
89	−2.95	+159.29	14.47	14.97	26523.329	0.3748505
90	−5.30	+137.09	13.81	14.73	26460.432	0.6034020
91	+43.72	+144.35	14.25	14.91	26459.480	0.8951422
92	−317.86	+446.38	14.10	14.58	26473.345	1.3450659
93	.....	.....	not variable		.....	.....
94	−504.09	+355.09	14.64	14.95	26463.416	0.2539318
95	−824.80	−11.05	14.49	14.98	26473.448	0.4049213
96	−71.20	+97.06	13.93	14.82	26455.467	0.6245312
97	+225.50	+187.93	14.11	15.16	26523.234	0.6918869
98	+198.25	+102.38	14.57	15.09	26524.265	0.2805657
99	+160.35	+50.36	13.77	14.90	26472.390	0.7660839

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
100	+179.49	+65.68	14.05	15.05	26434.489	0.5527119
101	+444.11	−73.28	14.50	14.94	26523.291	0.3408843
102	+361.83	−94.10	14.16	15.22	26468.445	0.6913841
103	+283.14	+2.35	14.46	14.80	26456.354	0.3288461
104	+822.98	−309.01	14.54	14.95	26471.370	0.8678506
105	+603.23	−246.92	14.57	15.12	26524.300	0.3353375
106	+130.35	+26.92	13.88	15.02	26523.189	0.5699074
107	+279.83	−139.13	14.07	15.39	26466.424	0.5141010
108	+185.66	−46.36	13.84	14.81	26472.360	0.5944533
109	+153.91	−57.13	13.99	15.03	26469.395	0.7440653
110	+158.94	−87.08	14.41	14.96	26524.256	0.3221021
111	+27.26	−0.30	14.18	14.80	26438.498	0.7628923
112	+79.83	−103.36	13.92	14.92	26470.380	0.4743558
113	+99.99	−187.65	13.94	15.22	26523.244	0.5733636
114	+38.08	−101.15	14.00	14.75	26470.416	0.6753065
115	−345.49	−336.14	14.03	15.21	26467.406	0.6304590
116	−109.66	+33.71	14.12	14.77	26472.437	0.7201327
117	−267.73	−40.22	14.40	14.92	26456.506	0.4216653
118	−58.87	−98.67	13.88	15.02	26473.380	0.6116200
119	−82.04	−157.45	14.51	14.83	26472.319	0.3058774
120	−211.29	−247.61	14.26	15.23	26523.264	0.5485722
121	−184.36	−189.58	14.48	14.81	26524.259	0.3041814
122	−162.92	−261.41	13.99	15.17	26437.512	0.6349307†
123	+46.11	−512.55	14.41	14.90	26473.331	0.4739051
124	+78.88	−626.81	14.37	14.97	26524.107	0.3318614
125	+23.74	−742.59	13.87	15.29	26471.408	0.5928902
126	+822.95	−730.44	14.45	14.97	26453.493	0.3418933
127	−880.16	+4.31	14.54	14.92	26524.177	0.3052752
128	−289.77	−92.09	14.25	14.86	26469.401	0.8349748
129	+192.02	−25.83	.....	.....	.....	.....
130	−366.17	+900.99	14.30	15.40	irr.	0.4932377
131	−165.05	−59.95	14.40	14.86	26523.329	0.3921392
132	−72.44	−29.31	13.97	14.96	26469.386	0.6556410
133	−1914.22	+1053.78	.....	.....	.....	.....
134	−942.87	+972.72	13.93	15.20	26466.386	0.6529039
135	−184.88	−37.25	13.87	14.85	26470.314	0.6325795
136	−154.26	+60.08	14.22	14.64	26472.409	0.3919136
137	−149.54	+96.23	14.38	14.90	26473.286	0.3342134
138	−111.12	−187.55	12.5	13.6	.....	74.6
139	−86.94	+65.18	14.00	14.90	26462.404	0.6768666
140	−42.65	−86.60	.....	.....	.....	.....
141	−55.47	−47.46	14.05	14.75	irr.	0.6975651

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
142	−37.35	−2.56	.....	.....	.....	.....
143	−37.45	+71.40	14.24	14.77	26470.394	0.8207020
144	−33.28	+22.44	14.33	14.81	26454.329	0.8353054
145	+49.07	−148.51	14.40	14.87	irr.	0.37315†
146	+65.96	−48.03	13.87	14.77	26469.386	0.6331021
147	+298.70	−151.04	14.35	14.80	26473.333	0.4226945
148	+299.20	+44.21	12.9	13.8	.....	90:
149	+477.33	+894.18	13.92	15.13	26523.256	0.6827332
150	+543.18	−442.23	14.07	14.94	26462.387	0.8991585
151	+1010.06	+753.35	14.42	14.84	26523.333	0.4077805
152	+13.84	−48.83	12.8	13.7	.....	124:
153	+34.46	+136.32	14.48	14.88	26524.176	0.3864509
154	+169.59	−113.20	14.55	14.72	26524.165	0.3223311
155	+75.25	+237.31	14.43	14.88	26473.344	0.4139117
156	+15.06	−191.94	14.41	14.83	26468.432	0.3591887
157	+1.77	+82.58	14.42	14.79	26523.370	0.4064970
158	−10.58	−119.80	14.32	14.74	26472.442	0.3673350
159	−2039.94	−891.45	.....	.....	.....	.....
160	−711.13	+969.21	14.46	14.98	26473.439	0.3972932
161	−96.81	−129.27	13.3	13.8	.....	irr.
162	−392.40	−252.39	12.9	13.6	.....	irr.
163	−575.24	+499.91	14.51	14.78	26472.451	0.3132294
164	+152.75	+478.38	.....	.....	.....	.....
165	−69.92	+104.59	.....	.....	.....	.....
166	−2.89	+144.71	.....	.....	.....	.....
167	−352.63	−321.43	.....	.....	.....	.....

†Two periods given by Martin. ¶Epoch of minimum.

Variables Nos. 28, 31, 37, 93 are said by Bailey to be not variable.

Epochs of maximum from ref. D.

Refs. 14, 17, 20, 31, 40, 62, 67, 90, 99, 113, 116, 118, 119. Plates in 20 and 118.

NGC 5272 (Messier 3) α 13^h $39^m.9$, δ $+28°$ 38′

1	−5.2	−128.5	14.80	16.14	15021.378	0.5206324
2	+15.8	+52.6	.....	.....	.....	.....
3	+57.9	−66.0	14.91	16.16	15021.225	0.5590333
4	−43.5	−8.8	14.9	16.0	.....	.....
5	+261.0	−22.3	14.76	16.09	15021.239	0.50618
6	−123.9	+60.1	14.75	16.19	15021.452	0.5143207
7	−4.8	+87.2	14.69	16.25	15021.064	0.4974290

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
8	−81.7	−23.4	not variable		.....	.....
9	−291.4	−207.8	14.84	16.22	15021.111	0.5415672
10	+153.6	+138.0	15.03	16.17	15021.270	0.5695127
11	−152.6	−209.7	14.89	16.22	15021.131	0.5078921
12	−3.8	−145.4	15.35	15.98	15021.015	0.3178890
13	−26.0	−137.5	15.08	16.14	15021.323	0.4830535
14	−49.0	−161.0	15.01	16.10	15021.179	0.6358993
15	−90.8	−273.2	14.83	16.24	15021.299	0.5300771
16	−301.4	−93.1	14.73	16.24	15021.418	0.5115124
17	+142.4	−440.4	15.24	16.37	15021.265	0.5761344
18	+97.6	−295.3	15.08	16.34	15021.142	0.5163462
19	+350.5	−245.6	15.64	16.20	.....	0.630971
20	+333.5	−271.6	14.74	16.13	15021.289	0.4912607
21	+346.9	+17.9	14.88	16.29	15021.171	0.5157165
22	+190.2	−10.7	14.83	16.25	15021.200	0.481364
23	−113.0	+279.2	14.79	15.70	15021.082	0.5953756
24	−147.6	+10.4	15.07	16.09	15021.563	0.6633499
25	−124.4	−31.4	14.77	16.23	15021.089	0.480048
26	−177.4	−43.0	14.89	16.15	15021.239	0.5977479
27	−110.2	−102.8	15.17	16.21	15021.566	0.5790981
28	−25.0	−105.8	15.03	16.28	24290.335	0.47123
29	−65.2	−73.6	.....	.....	.....	.....
30	−36.5	+58.0	14.88	16.19	22760.635	0.5120891
31	+33.1	+65.1	14.73	16.25	15021.542	0.5807218
32	+11.8	+60.1	14.86	16.38	15021.108	0.4953526
33	+70.5	−89.0	15.01	16.22	15021.217	0.5252255
34	+135.4	+170.2	14.89	16.16	15021.136	0.5591078
35	−107.3	−278.2	15.04	16.24	15021.032	0.530608
36	+172.0	−35.4	14.86	16.26	15021.272	0.5455861
37	−236.7	+164.7	15.14	16.02	15021.218	0.3266402
38	−203.0	+127.7	15.06	16.26	24290.304	0.5580326
39	−243.6	+121.4	15.07	16.17	15021.073	0.5870732
40	−271.2	+112.4	14.93	16.18	15021.609	0.5515422
41	−93.3	+54.0	15.04	16.21	15021.441	0.4850291
42	−78.6	+41.0	14.85	16.27	15021.515	0.5902069
43	+99.9	+24.7	14.86	16.23	15021.191	0.5405023
44	+170.0	+99.4	14.75	16.21	15021.368	0.506443
45	−241.2	−129.9	14.93	16.30	15021.349	0.5368966
46	−128.1	−51.5	15.46	16.24	15021.261	0.6123751
47	−117.5	−73.2	14.98	16.20	15021.459	0.5410201
48	+126.9	−102.7	15.16	15.99	15021.088	0.6278087
49	+140.0	−100.7	15.19	16.23	15021.266	0.5482222

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
50	+8.8	−234 0	15.15	16.09	15021.327	0.5131155
51	+30.8	−226.4	15.08	16.21	15021.486	0.5839856
52	−76.8	+152.0	14.99	16.16	15021.485	0.5174045
53	−7.4	+122.8	14.70	16.13	15021.006	0.5048891
54	−32.6	+106.4	14.94	16.22	15021.193	0.506493
55	−204.2	+324.4	14.85	16.21	15021 699	0.5298114
56	−141.1	+358.6	15.20	15.94	22760.623	0.247931
57	+155.2	−0.2	14.97	16.22	15021.618	0.5122311
58	−86.2	+46.2	14.78	16.16	22760.621	0.517101
59	−109.8	−228.4	15.22	16.24	15021.332	0.5888026
60	−297.4	−315.4	15.20	16.14	15021.389	0.7077216
61	+190.2	+363.0	14 88	16.20	15021.076	0.5209267
62	+90.2	+417.0	15.21	16.10	15021.331	0.6524059
63	+37.2	+341.9	14.93	16.14	15021.094	0.5704204
64	+114.8	+330.4	15.05	16.10	15021.324	0.6054592
65	+125.4	+327.5	14.74	16.09	15021.503	0.6683397
66	−101.4	+121.4	15.20	16.01	15021.323	0.6201973
67	−131.4	+123.0	15.21	16.12	15021.411	0.5683681
68	+21.9	+174.8	14.8	16.3	.....	.....
69	+80.6	+141.0	15.09	16.18	15021.553	0.5665806
70	+37.6	+152.2	15.12	15.70	15021.315	0.3268207
71	+160.6	−2.0	15.12	16.20	15021.168	0.5490517
72	+445.5	−2.2	14.61	16.37	15021.327	0.4560721
73	+438.5	+62.2	15.0	16.0	.....	.....
74	+88.2	+151.0	14.87	16.26	15021.452	0.4921415
75	+49.0	+159.5	15.23	15.99	15021.411	0.3140813
76	−14.4	−88.2	14.72	16.41	15021.293	0.5017529
77	−94.4	+27.8	14.85	16.36	15021.451	0.4593422
78	+47.5	+66.4	15.10	16.13	15021.249	0.6119228
79	+43.4	+349.4	14.81	16.24	15021.229	0.4832979
80	+416.8	+284.6	15.05	16.27	15021.433	0.5385169
81	+342.8	+351.1	14.67	16.28	15021.325	0.5291108
82	−102.6	−601.8	14.92	16.27	15021.527	0.5245027
83	−441.6	+113.4	14.66	16.25	15021.046	0.5012348
84	+64.0	+165.2	15.20	16.14	15021.248	0.5957289
85	+306.2	+225.8	15.00	15.83	22760.517	0.2623439
86	+513.0	−114.2	15.31	16.13	15021.016	0.2928977
87	+110.6	+60.2	15.31	15.91	22760.535	0.3571320
88	−35.0	−70.2	14.9	16.0	24290.324	0.3012792
89	+28.0	−110.8	14.86	16.15	15021.507	0.5484778
90	+97.2	−188 2	14.80	16.24	15021.461	0.5170344
91	−14.3	−550.0	15.65	16.27	15021.259	0.5301710

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
92	−29.0	−408.4	14.88	16.23	15021.083	0.5035579
93	−319.4	−396.6	15.30	16.22	15021.177	0.6023041
94	−488.4	−224.6	14.84	16.21	15021.118	0.5236921
95	−154.7	+15.4	13.73	14.42	.....	103.19
96	−164.2	−234.0	14.78	16.13	15021.019	0.4994538
97	−130.0	−196.7	15.53	16.01	15021.524	0.2509695
98	+132.4	−3.2	not variable		.....	.....
99	+201.8	−55.0	14.8	15.8	.....	.....
100	+69.9	+97.3	15.3	16.2	.....	.....
101	+46.4	+83.7	15.50	16.14	15021.101	0.6438557
102	+58.4	+114.9	15.2	15.9	.....	.....
103	+58.1	+120.4	not variable		.....	.....
104	−25.8	+145.5	14.74	16.09	15021.288	0.5699246
105	−20.9	+191.6	15.17	15.66	15021.315	0.2877445
106	−48.0	+168.0	15.17	16.20	15021.310	0.5471636
107	−75.8	+335.0	15.02	15.99	15021.443	0.3090344
108	−219.0	+310.9	14.77	16.21	15021.083	0.5196047
109	−89.3	+2.7	14.86	16.31	15021.033	0.5339259
110	−99.4	−15.8	15.02	16.24	15021.397	0.5353700
111	−92.7	+21.9	14.96	16.18	15021.402	0.5101921
112	−144.6	−719.4	not variable		.....	.....
113	+199.8	−689.8	14.90	16.43	15021.241	0.5130031
114	+11.8	+622.0	15.08	16.24	15021.515	0.5977254
115	+445.0	+664.7	14.69	16.25	15021.297	0.5133533
116	−491.8	+465.2	14.80	16.22	15021.441	0.5148090
117	+89.6	−467.6	15.26	16.23	15021.579	0.6005122
118	+144.4	−292.2	14.73	16.28	15021.272	0.4993795
119	+253.4	+106.2	14.73	16.16	15021.460	0.5177376
120	−295.8	+231.4	15.36	16.05	15021.284	0.6401377
121	−43.6	+56.1	15.41	16.25	22760.550	0.5351935
122	−33.5	−46.4	14.6	16.1	.....	0.5017
123	−259.	−985.	15.16	16.75	15021.395	0.5454116
124	−66.4	−201.4	15.3	16.2	.....	.....
125	+186.3	−132.8	15.41	16.08	15021.029	0.3498185
126	−15.4	−146.4	15.50	16.03	15021.208	0.3484044
127	+95.6	−63.6	not variable		.....	.....
128	+114.6	+131.4	15.07	15.97	.....	0.2922661
129	−43.6	+77.2	15.2	16.1	.....	0.3059594
130	+4.2	+84.6	15.10	16.13	22760.347	0.5688389
131	−73.2	+27.4	15.18	15.94	15021.318	0.2976902
132	−53.6	−22.0	15.3	16.1	24290.387	0.3398479
133	−58.6	+43.5	14.89	15.96	15021.482	0.5507230

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
134	−22.4	+52.4	14.9	16.3	24290.282	0.6190
135	−27.0	+38.0	15.0	16.5	.....	0.56843
136	−25.4	+33.4	15.6	16.2	.....	.....
137	+53.0	−18.8	14.9	16.2	15021.155	0.5742061
138	−263.6	+41.9	not variable		.....	.....
139	+34.5	+28.0	15.25	16.12	22760.465	0.5608270
140	−15.7	+108.9	15.10	15.88	22760.216	0.3331259
141	−1497.5	−249.9	14.9	16.4	.....	.....
142	−30	−59	15.6	16.6	24290.397	0.56783
143	−34	+16	15.4	16.4	24290.337	0.51111
144	+54	−100	14.8	16.7	24290.565	0.59674
145	+29	+8	14.9	16.5	24290.528	0.5004
146	+96	−59	14.6	16.5	24290.563	0.37308
147	−21	+46	15.1	16.3	24290.005	0.34644
148	−7	+37	15.3	16.4	24290.170	0.46777
149	+34	+52	14.7	16.5	24290.228	0.54985
150	+69	+37	14.8	16.7	24290.359	0.52397
151	+4	−40	14.9	16.3	24290.191	0.51705
152	+77	+50	15.0	16.3	24290.355	0.32641
153	−38	+60	not variable		.....	.....
154	+2	−29	12.9	14.0	24647:	15.2828
155	−64	−74	.....	.....	.....	.....
156	−21	−42	not variable		.....	.....
157	−17	+35	14.2	15.7	24647.650:	0.59713
158	−16	−41	15.2	16.5	24647.564:	0.50809
159	−15	+16	14.9	16.6	24647.602:	0.56594
160	−9	−44	14.9	16.1	24647.446	0.64792
161	+17	−58	15.4	16.4	24647.567:	0.49871
162	+28	−32	not variable		.....	.....
163	−16	−32	not variable		.....	.....
164	+21	−36	15.3	15.9	.....	.....
165	+73	+20	14.7	16.5	24647.544	0.49
166	−97	−8	15.1	16.2	.....	.....
167	−78	−37	15.4	16.5	24647.448	0.69245
168	−45	+7	14.9	16.0	24647.617	0.37740
169	−29	−35	not variable		.....	.....
170	−28	+32	15.1	16.1	24647.716:	0.57187
171	−27	+16	15.0	16.1	24647.864	0.30095
172	−21	+25	14.9	16.5	24647.700	0.59400
173	−13	+39	15.2	16.6	24647.670:	0.4988
174	−9	−34	15.1	16.1	24647.710	0.4082
175	+42	+26	14.9	16.2	24647.914	0.60780

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
176	+46	+32	14.8	16.4	24647.621	0.58118
177	+63	−29	15.0	16.3	24647.953	0.34835
178	+79	+46	15.2	16.5	24647.755	0.26480
179	+39	−774	not variable		.....	.....
180	−19	−27	not variable		.....	.....
181	−30	−14	not variable		.....	.....
182	−19	+60	not variable		.....	.....
183	+29	+7	not variable		.....	.....
184	−25	−14	14.9	16.4	24647.841	0.517
185	−15	+32	15.2	16.1	.....	.....
186	+12	−64	15.1	16.1	24647.670	0.675
187	−23	+9	14.9	16.2	24647.961	0.3927
188	−27	+24	15.0	16.0	24647.615:	0.3677
189	−25	−21	15.2	16.0	24647.964	0.668
190	−8	+28	14.8	16.5	24647.936	0.501
191	0	+24	15 1	16.1	24647.981	0.512
192	−2	+3	15.0	16.1	24647.933:	0.525
193	+15	−7	14.8	16.3	24647.777	0.630
194	+17	−13	15.1	16.4	24647.758	0.549
195	−13	−29	15.0	16.2	24647.470:	0.600
196	+47	+ 1	.....	.....	.....	.....
197	+58	+10	15.1	16.5	24647.689	0.499
198	−23	+15	15.2	16.0	24647.923:	0.3617
199	−19	+13	14.8	16.3	24647.699:	0.488
200	−4	+21	.....	.....	.....	.....
201	+4	−9	.....	.....	.....	.....

Refs. 1, 8, 10, 11, 14, 17, 19, 20, 22, 25, 28, 31, 32, 38, 40, 43, 45, 50, 55, 56, 61, 76, 84, 86, 98, 101, 105, 109, 110, 111, 115. Plates in 20 and 25.

The data for this cluster have had to be collected from several sources, as follows: Positions: Nos. 1-137 Bailey, 138-141 Larink, 142-183 Müller, 184-199 Greenstein. Magnitudes and periods from Greenstein. Epochs: 1-153 from Müller, 154-199 Greenstein.

Shapley's publication in 1914 of 23 new stars in this cluster as definitely variable (Ref. 28) appears to have been confused with his several lists of suspected variables. Accordingly several observers have announced as new, variables which Shapley had definitely found earlier. The writer's careful checking of all Shapley's variables against variables 142-199 results in the conclusion that all but two of Shapley's variables have later been announced by some one else. These two are therefore numbered 200 and 201. Shapley's co-ordinates were published in right ascension and declination. Using von Zeipel's value of the cluster centre, the writer has transformed these to x and y in seconds of arc, for purposes of comparison. As the identification of Shapley's variables with those announced later is not always a positive one, a table giving the comparison of Shapley's computed x and y with the variables is given. A correction to Shapley's origin of $+2''$ in x, and $-4''$ in y appears to bring the two sets of co-ordinate systems into correspondence. Eight of the stars suspected variable by Shapley in 1914 are to be found on the lists of variables announced later.

CATALOGUE—*Continued*

NGC 5272

IDENTIFICATIONS OF SHAPLEY'S ANNOUNCED VARIABLES

Shapley's Variables	Shapley's Positions x″	y″	Permanent No.	x″	y″
1	−66	−70	155	−64	−74
2	−32	−55	142	−30	−59
3	−29	+21	171	−27	+16
4	−27	−17	189	−25	−21
5	−23	−25	? 180	−29	−27
6	−22	−38	156	−21	−42
7	−18	+40	157	−17	+35
8	−17	−36	158	−16	−41
9	−16	+20	159	−15	+16
10	−11	−40	160	−9	−44
11	−10	+33	190	−8	+28
12	−6	+25	200	−4	+21
13	−4	+7	192	−2	+3
14	+2	−5	201	+4	−9
15	+12	−3	193	+15	−7
16	+15	−9	194	+17	−13
17	+16	−53	161	+17	−58
18	+25	+13	183	+29	+7
			145 prob.	+29	+8
19	+26	−27	162	+28	−32
20	+32	+31	139	+34.5	+28.0
21	+45	+5	196	+47	+1
22	+57	+14	197	+58	+10
23	+92	−57	? 146	+96	−59

NGC 5286 α 13^h 43^m.0, δ −51° 07′

No variables found in this cluster. Ref. 71. No map.

NGC 5466 α 14^h 03^m.2, δ +28° 46′

No.	x″	y″	Magnitudes Mag.	Min.	Epoch of Maximum	Period
1	+858	−95	15.66	16.68	.....	.....
2	−62	−110	15.68	16.59	.....	.....
3	−31	−8	15.48	16.55	.....	.....
4	−80	+9	15.76	16.63	.....	.....
5	−64	+112	15.58	16.57	.....	.....
6	+122	−24	.....	.....	.....	.....
7	−210	−225	15.91	16.59	.....	.....
8	+23	−6	15.76	16.59	.....	.....
9	+31	+15	15.72	16.67	.....	.....
10	+85	+46	15.96	16.62	.....	.....
11	+117	+68	.....	.....	.....	.....
12	+17	−88	16.14	16.39	.....	.....
13	−49	−73	16.01	16.51	.....	.....
14	−47	+52	15.80	16.47	.....	.....

Refs. 78, 79. Chart in 78.

CATALOGUE—*Continued*

NGC 5634 α 14^h $27^m.0$, δ $-05°$ 45′
4 unpublished variables. Ref. A.

NGC 5694 α 14^h $36^m.7$, δ $-26°$ 19′
No variables found. Ref. 104. No map.

NGC 5904 (Messier 5) α 15^h $16^m.0$, δ $+02°$ 16′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+28.3	+161.3	14.21	15.57	15021.106	0.5217858
2	−345.0	−29.9	14.58	15.51	15021.508	0.526344
3	+160.9	+113.1	14.68	15.54	15021.575	0.6001873
4	−11.9	+74.2	14.20	15.53	15021.130	0.4496387
5	−7.6	+52.0	14.29	15.60	15021.191	0.545903
6	+27.1	−46.3	14.20	15.20	15021.039	0.5488300
7	−5.0	−191.4	14.26	15.80	15021.478	0.4943870
8	+134.3	−133.8	14.26	15.61	15021.205	0.5462242
9	+196.2	+87.3	14.40	15.50	15021.473	0.6988919
10	+107.9	+381.8	14.17	15.47	15021.353	0.5306634
11	−155.2	+85.3	14.13	15.42	15021.484	0.5958924
12	−175.9	−16.2	14.20	15.76	15021.060	0.4677208
13	+11.8	−65.4	14.20	15.26	15021.418	0.513121
14	−146.4	+104.7	14.50	15.41	15021.466	0.4872364
15	+193.2	+2.9	14.79	15.30	15021.372	0.507743
16	+91.6	+83.7	14.20	15.50	15021.366	0.6476222
17	−27.7	+43.7	14.17	16.4	.....	0.60186?
18	+151.9	−108.8	14.60	15.48	15021.436	0.4640011
19	+237.0	−130.8	14.30	15.75	15021.034	0.4699535
20	−256.9	−23.7	14.30	15.31	15021.537	0.6094762
21	+324.1	+72.8	14.54	15.48	15021.469	0.6048955
22	−206.2	+384.2	14.63	16.15	.....	.....
23	−254.6	−9.6	14.71	15.3	.....	.....
24	−46.8	−71.5	14.40	15.50	15021.398	0.4783750
25	−29.6	−127.9	13.83	14.73	.....	.....
26	+22.2	+101.8	14.34	15.40	15021.591	0.622562
27	−6.6	−58.9	14.48	15.58	15021.381	0.4703355
28	+132.9	−121.8	14.45	15.72	15021.460	0.5439475
29	−376.0	−75.1	14.50	15.49	15021.339	0.4514423
30	+23.3	−213.0	14.60	15.50	15021.307	0.5921773
31	+152.0	−142.5	14.66	15.38	15021.193	0.2309690?
32	+202.7	−151.7	14.16	15.60	15021.220	0.4577848
33	−21.1	+127.8	14.34	15.75	15021.296	0.5014729
34	+84.8	+59.2	14.41	15.48	15021.425	0.5681454

CATALOGUE—*Continued*

NGC 5904

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
35	−12.1	−114.7	14.62	15.23	15021.096	0.3083788
36	−7.5	−51.7	14.17	15.78	.....	.....
37	+44.7	+67.2	14.10	15.76	15021.256	0.4887962
38	−44.0	+117.2	14.34	15.51	15021.414	0.4704310
39	−126.1	−249.5	14.13	15.57	15021.512	0.5890323
40	+125.5	+113.2	14.51	15.78	.....	.....
41	+19.5	+231.4	14.10	15.68	15021.279	0.4885745
42	−123.8	−120.1	11.20	12.24	15032.48	25.74
43	−202.7	+155.1	14.68	15.43	15021.122	0.660235
44	−102.8	+31.0	14.66	15.23	15021.240	0.2478988
45	−117.5	+65.9	14.37	15.40	15021.080	0.6166379
46	−80.2	+69.6	15.11	16.0	.....	variable?
47	−75.4	+58.2	14.28	15.78	15021.050	0.5397330
48	−62.8	+106.4	14.56	15.47	.....	variable?
49	+53.1	+177.4	15.16	15.78	.....	variable?
50	+38.5	+109.5	13.00	14.20	15101.0	106.0
51	−0.1	+136.2	not variable		.....	.....
52	+108.7	+35.0	14.25	15.40	15021.216	0.5017575
53	+68.8	+19.2	not variable		.....	.....
54	+27.1	+56.8	13.83	16.10	.....	.....
55	+80.3	−163.1	14.75	15.25	15021.106	0.4907365
56	−68.8	+96.9	14.34	15.60	15021.015	0.5346931
57	−30.3	+99.7	14.39	15.47	.....	.....
58	−608.	+163	14.10	15.56	15021.467	0.4915684
59	−150.9	−34.8	14.26	15.44	15021.229	0.5420250
60	−110.1	+8.6	14.40	15.47	.....	0.45?
61	−255.7	−30.2	14.46	15.52	15021.298	0.5686140
62	+167.6	−217.9	14.70	15.34	15021.012	0.2814092
63	+214.0	+50.6	14.23	15.57	15021.412	0.4976776
64	−51.6	−249.2	14.40	15.70	15021.000	0.5445091
65	−160.7	−93.6	14.36	15.52	15021.057	0.4806628
66	+219.7	+405.9	14.69	15.18	15021.194	0.3510465
67	−102.3	−60.	14.17	16.0	.....	.....
68	+896.	+50.	14.75	15.23	15021.217	0.502136
69	+654.	+751.	14.17	15.44	15021.205	0.4948754
70	+393.	+626.	14.40	15.50	15021.153	0.5585215
71	+661.	+292.	14.26	15.60	15021.027	0.5024678
72	+689.	+38.	14.59	15.49	15021.505	0.5621279
73	+18.3	+605.0	14.22	15.32	21425.710	0.340116
74	+205.6	+162.2	13.45	14.17	.....	.....
75	+78.6	−413.8	14.70	15.40	15021.501	0.6868916
76	+80.9	−309.8	14.40	15.42	.....	.....

CATALOGUE—*Continued*

NGC 5904

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
77	−172.7	−184.5	14.50	15.27	15021.108	0.8451077
78	+65.7	+159.4	14.61	15.37	.....	.....
79	−134.3	−31.7	14.60	15.15	15021.089	0.2498925
80	−48.7	+111.8	14.73	15.25	15021.059	0.2516290
81	−72.5	−121.5	14.57	15.65	15021.510	0.5573287
82	−68.3	+13.1	14.69	15.31	15021.349	0.556012
83	−84.9	−87.6	14.50	15.70	15021.538	0.5533048
84	+43.0	−32.8	11.54	12.61	15027.5	26.5
85	+37.9	−35.1	14.50	15.60	15021.409	0.527046
86	+34.7	−31.6	14.40	15.40	15021.050	0.567901
87	+122.3	−2.3	14.80	15.29	15021.511	0.7383832
88	+65.4	+61.4	14.87	15.38	15021.189	0.2468705
89	+60.4	+64.3	14.53	15.70	15021.518	0.558430
90	−44.8	+15.3	14.31	15.47	15021.070	0.557151
91	−35.9	+35.5	14.60	15.49	15021.172	0.585855
92	−57.0	−122.5	13.83	15.26	.....	.....

Co-ordinates, magnitudes and epochs from Bailey; periods as determined by Bailey and revised by Shapley and Roper.

Refs. 2, 3, 4, 5, 6, 7, 11, 12, 14, 15, 17, 20, 21, 26, 31, 33, 40, 42, 53, 54, 60, 82. Plates in 20 and 33.

NGC 5986 α 15^h 42^m.8, δ −37° 37′

1 variable at a radial distance of 1′.7 from center.

Refs. 14, 20. No map.

NGC 6093 (Messier 80) α 16^h 14^m.1, δ −22° 52′

1	−137.6	+79.7	.....	.....	.....	.....
2	+22.5	−19.0	.....	.....	.....	.....
Nova	+4.0	+2.7	6.8	.....	.....	.....

Refs. 20, 69, 122. Plate in 20. Ref. 122 contains a complete bibliography of references on the nova.

NGC 6121 (Messier 4) α 16^h 20^m.6, δ −26° 24′

1	−281	+42	13.73	14.19	.....	.....
2	−248	−195	13.87	14.36	.....	.....
3	−208	−507	13.04	14.37	20681.736	0.5066293
4	−185	−340	11.43	12.25	.....	.....

CATALOGUE—*Continued*

NGC 6121

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
5	−185	−93	14.08	14.24	.....	.....
6	−115	+318	13.65	14.18	.....	.....
7	−113	+231	13.88	14.72	23307.556	0.5347988
8	−110	+111	13.01	14.38	23221.536	0.5081713
9	−104	+105	13.76	14.64	.....	.....
10	−68	+159	13.03	14.64	23914.687	0.4823935
11	−64	−297	13.42	14.59	22105.782	0.4930734
12	−53	−207	14.03	14.79	26178.679	0.4461313
13	−47	+270	12.37	13.08	.....	.....
14	−47	−244	13.82	15.16	23593.585	0.4635316
15	−32	+436	13.98	14.71	23877.741	0.4438676
16	−29	+69	13.58	14.47	23249.656	0.5425413
17	−8	+20	not variable		.....	.....
18	+4	+27	13.54	14.78	20685.714	0.470
19	+11	+358	13.37	14.37	23610.551	0.4678131
20	+13	−63	13.7	14.3	.....	.....
21	+19	−4	12.90	14.18	22163.683	0.4719722
22	+34	+80	13.72	14.20	.....	.....
23	+38	−26	13.37	14.17	.....	.....
24	+49	+48	13.37	14.77	20626.811	0.5174238
25	+70	+70	13.45	14.18	.....	.....
26	+94	−72	13.64	14.77	20685.714	0.5412222
27	+118	+255	13.38	14.24	23280.513	0.6120161
28	+259	+84	13.37	14.18	20685.714	0.5223606
29	+326	+598	13.19	14.61	23249.555	1.097452
30	+340	−69	13.28	14.06	23249.656	0.3697670
31	+353	+45	12.98	14.18	23914.686	0.5053175
32	+746	−40	13.51	14.31	.....	.....
33	+805	+630	13.3	14.1	21078.568	0.6148267

Refs. 21, 90, 93. Plate in 90. Magnitudes from B.

NGC 6171 α $16^h\ 29^m.7$, δ $-12°\ 57'$

1	−112.8	−522.0	]14.16	[16.75	.....	.....
2	+148.8	−388.8	15.62	16.29	.....	.....
3	−224.4	−183.6	15.55	16.14	.....	.....
4	−99.6	−156.6	15.64	16.14	.....	.....
5	+231.0	−161.4	15.74	16.21	.....	.....
6	−10.8	−67.2	15.68	16.15	.....	.....
7	+42.0	−61.2	15.57	16.64	.....	.....
8	+12.0	−42.0	15.57	16.52	.....	.....

CATALOGUE—*Continued*

NGC 6171

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
9	−26.4	−19.8	15.91	16.33	.....	.....
10	−57.0	+8.4	15.48	16.65	.....	.....
11	+9.6	+33.0	15.69	16.46	.....	.....
12	+58.8	+61.2	15.27	16.48	.....	.....
13	−27.0	+72.0	15.45	16.59	.....	.....
14	+17.4	+82.2	15.35	16.45	.....	.....
15	+19.2	+120.0	15.57	16.12	.....	.....
16	−67.2	+113.4	15.69	16.51	.....	.....
17	−99.0	+71.4	15.35	16.45	.....	.....
18	+77.4	+215.4	15.75	16.46	.....	.....
19	+232.8	+162.6	15.77	16.25	.....	.....
20	+31.2	+51.0	15.66	16.40	.....	.....
21	+81.0	−144.6	16.33	16.78	.....	.....
22	−1354.2	−183.0	.....	.....	.....	.....
23	−263.4	+19.2	15.61	16.13	.....	.....
24	0.0	+8.4	15.66	16.46	.....	.....

Ref. 121, with chart.

NGC 6205 (Messier 13) α 16^h 39^m.9, δ +36° 33′

1	+91.1	−24.9	13.7	14.9	.....	6.0
2	−67.4	−3.0	12.85	13.8	.....	5.10
3	−159.2	+16.5	15.2	16.11	.....	.....
4	−59.0	+58.2	15.33	15.86	.....	.....
5	+89.3	−14.1	14.6	15.8	.....	.....
6	+115.5	+76.6	14.0	14.74	.....	.....
7	−49.6	−82.7	14.7	15.16	.....	.....

3 unpublished variables.

Co-ordinates of variables taken from Ludendorff's Catalogue (*Potsdam Pub.*, v. 15, no. 50, 1905).

Refs. 11, 18, 20, 23, 27, 29, 30, 37, 40, 76. Plate in 20.

NGC 6218 (Messier 12) α 16^h 44^m.6, δ −01° 52′

1	+34	−62	11.9	13.2	27306.708	15.508

Refs. 11, 102, 113, 123, 124. Plate in 123.

NGC 6229 α 16^h 45^m.6, δ +47° 37′

1	−5	−38	15.4	15.8	.....	.....

20 unpublished variables.

Refs. 36, 113, A. No map.

CATALOGUE—*Continued*

NGC 6254 (Messier 10) α 16^h 54^m.5, δ −04° 02′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+5	+22	13.2	13.8	.....	.....
2	+30	+120	11.9	13.7	26607.712	18.754

Refs. 14, 102, 113, 123, 124. Plate in 123.

NGC 6266 (Messier 62) α 16^h 58^m.1, δ −30° 03′

1	+41.0	+6.1	.....	.....	.....	.....
2	−26.6	−68.9	.....	.....	.....	.....
3	−89.2	−5.8	.....	.....	.....	.....
4	−94.6	−39.6	.....	.....	.....	.....
5	−163.4	+123.4	.....	.....	.....	.....
6	−81.2	+33.1	.....	.....	.....	.....
7	+22.6	+169.1	.....	.....	.....	.....
8	−94.6	+163.4	.....	.....	.....	.....
9	−92.7	+214.0	.....	.....	.....	.....
10	−452.7	+160.0	.....	.....	.....	.....
11	−456.2	+128.3	.....	.....	.....	.....
12	−203.4	+268.9	.....	.....	.....	.....
13	+1.6	+30.2	.....	.....	.....	.....
14	−92.2	+264.7	.....	.....	.....	.....
15	+122.8	+303.0	.....	.....	.....	.....
16	−74.8	+94.1	.....	.....	.....	.....
17	−21.4	+102.7	.....	.....	.....	.....
18	−33.4	+91.4	.....	.....	.....	.....
19	−15.3	+65.2	.....	.....	.....	.....
20	+131.4	+159.8	.....	.....	.....	.....
21	+105.4	+80.6	.....	.....	.....	.....
22	+62.6	+12.6	.....	.....	.....	.....
23	−74.3	−37.4	.....	.....	.....	.....
24	+62.6	−39.0	.....	.....	.....	.....
25	+150.4	−73.4	.....	.....	.....	.....
26	−186.8	−302.1	.....	.....	.....	.....

Refs. 14, 20. Plate in 20.

NGC 6293 α 17^h 07^m.1, δ −26° 30′

1	+81.0	+49.5	.....	.....	.....	.....
2	−135.6	+64.5	.....	.....	.....	.....
3	+48.6	+18.6	.....	.....	.....	.....

Ref. 51. No map.

CATALOGUE—*Continued*

NGC 6333 (Messier 9) α 17^h 16^m.2, δ −18° 28′
1 unpublished variable. Ref. 87.

NGC 6341 (Messier 92) α 17^h 15^m.6, δ +43° 12′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+127.5	+41.3	14.44	15.48	27340.211	0.702807
2	+91.2	+69.2	14.56	15.51	27340.329	0.643886
3	+53.7	+252.7	14.57	15.59	27340.344	0.637494
4	−76.0	+58.0	14.52	15.43	27340.111	0.628911
5	+81.6	−53.7	14.55	15.43	27340.302	0.619707
6	+38.7	+43.3	14.53	15.40	27340.360	0.600001
7	+1.6	−50.5	14.14	14.58	27340.373	0.515075
8	+208.9	+208.0	14.73	15.43	27340.366†	0.401895
9	+18.0	−48.1	14.73	15.43	27340.218	0.377949
10	+83.0	+36.3	14.75	15.29	27340.283	0.377315
11	+71.2	−67.1	14.74	15.29	27340.301	0.235734
12	−29.9	−97.8	14.80	15.16	27340.009	0 225130
13	+153.4	−60.1	14.93	15.08	.....	.....
14	−316.0	+245.7	14.80	15.10	27340.089	0.346178*
15	+30	−102	14.6	15.2	.....	.....
16	−2	+77	14.0	14.5	.....	.....

†Two epochs given.

*Variable No. 14 is of the W UMa type.

Refs. 64, 76, 114, 120, 125, C. Plate in 120, but the numbers of the variables marked on the plate are those assigned by Nassau and do not correspond with the numbers as listed here, which were assigned by Hachenberg. Most of the variables were discovered independently by Guthnick and Prager, and by Nassau. The numbering of the German astronomers has been adopted, since they first published references to the variables and the periods, although the identification was first published by Nassau.

The correspondence in numbering is as follows:

Hachenberg	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nassau....	7	3	1	8	6	2	5	4	9	13	11	..	14	..

Variable No. 11 was first found by Miss Woods in 1922.

Nassau's variables 10 and 12 were not found by the German observers and I have assigned them numbers 15 and 16 respectively.

NGC 6362 α 17^h 26^m.6, δ −67° 01′

1	00	00	....	.....	.....
2	−29	−100	....	.....	.....
3	−83	−89	....	.....	.....

CATALOGUE—*Continued*

NGC 6362

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
4	−79	−88	.....	.....	.....	.....
5	+81	−14	.....	.....	.....	.....
6	+54	+175	.....	.....	.....	.....
7	+22	+104	.....	.....	.....	.....
8	−263	+108	.....	.....	.....	.....
9	−207	+138	.....	.....	.....	.....
10	+186	+352	.....	.....	.....	.....
11	−28	+48	.....	.....	.....	.....
12	−245	−104	.....	.....	.....	.....
13	−234	−120	.....	.....	.....	.....
14	+370	+28	.....	.....	.....	.....
15	+51	+2	.....	.....	.....	.....

2 unpublished variables.
Refs. 47, 87. No map.

NGC 6366 α 17^h 25^m.1, δ −05° 02′
6 unpublished variables. Ref. E.

NGC 6397 α 17^h 36^m.8, δ −53° 39′

1	+210.7	+448.4	11.2	16.0	13727.6	314.6
2	−279.0	−424.6	13.8	14.8	.....	45. or 60. ?

Refs. 11, 20, 66, 90. Plate in 20.

NGC 6402 (Messier 14) α 17^h 35^m.0, δ −03° 13′

1	+17	+47	14.3	16.0	.....	18.75
2	−116	−119	15.4	16.3	.....	2.7952
3	−3	−90	16.2	17.0	.....	.....
4	+169	+73	16.3	17.5	.....	.....
5	−136	+90	16.1	17.5	.....	.....
6	+34	−77	15.8	16.4	.....	.....
7	+62	−97	14.9	16.2	.....	13.59
8	+96	+35	16.6	17.7	.....	.....
9	+151	−39	16.3	17.5	.....	.....
10	−51	−205	16.3	17.4	.....	.....
11	+196	−223	16.0	17.3	.....	.....
12	+224	−177	16.2	17.6	.....	.....
13	−29	−118	16.3	17.6	.....	.....

CATALOGUE—*Continued*

NGC 6402

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
14	+54	+1	16.2	17.5	.....	.....
15	−135	+147	16.1	17.5	.....	.....
16	−79	−36	16.2	17.4	.....	.....
17	−228	+122	14.8	15.7	.....	.....
18	+61	−22	16.1	17.7	.....	.....
19	−128	+2	16.3	17.6	.....	.....
20	−145	+98	16.3	17.4	.....	.....
21	+72	+125	16.3	17.4	.....	.....
22	+70	+95	16.4	17.6	.....	.....
23	+74	+281	15.9	17.4	.....	.....
24	−2	+75	16.1	17.6	.....	.....
25	−28	−312	16.4	17.5	.....	.....
26	−85	+27	16.5	17.5	.....	.....
27	−421	+151	15.4	16.2	.....	.....
28	−465	+372	15.0	16.0	.....	.....
29	−68	−152	15.7	16.2	.....	.....
30	+76	−12	16.2	17.5	.....	.....
31	−41	+32	16.0	17.0	.....	.....
32	+36	+147	16.2	17.1	.....	.....
33	−138	+12	16.2	17.3	.....	.....
34	−70	+26	16.4	17.6	.....	.....
35	−112	−49	16.2	17.4	.....	.....
36	+204	−346	16.4	17.5	.....	.....
37	+5	+18	16.4	17.7	.....	.....
38	+11	−17	16.0	17.0	.....	.....
39	+46	−2	16.1	17.6	.....	.....
40	+253	+310	16.4	17.1	.....	.....
41	−13	−3	16.0	17.1	.....	.....
42	+36	+12	15.9	17.1	.....	.....
43	+68	+23	16.2	17.3	.....	.....
44	+20	+116	16.3	17.5	.....	.....
45	−90	+94	15.7	16.4	.....	.....
46	+91	−66	16.4	17.4	.....	.....
47	−89	+26	16.5	17.6	.....	.....
48	−4	+40	16.3	17.7	.....	.....
49	−98	−19	16.0	16.9	.....	.....
50	−15	−38	16.1	17.0	.....	.....
51	+104	−305	16.5	17.5	.....	.....
52	+82	+39	16.5	17.0	.....	.....
53	+134	+129	16.4	17.3	.....	.....
54	+121	+113	16.6	17.6	.....	.....
55	+33	+106	16.5	17.5	.....	.....

CATALOGUE—*Continued*

NGC 6402

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
56	−68	−184	16.4	17.4	.....	.....
57	+134	−116	16.3	17.6	.....	.....
58	−123	−34	16.4	17.3	.....	.....
59	−32	+30	16.4	17.7	.....	.....
60	+41	+54	16.2	17.7	.....	.....
61	+12	−43	16.1	17.7	.....	.....
62	−232	−154	16.5	17.6	.....	.....
63	+122	−63	16.5	17.4	.....	.....
64	−51	−169	16.5	17.5	.....	.....
65	−125	+13	16.4	17.2	.....	.....
66	−133	+37	16.6	17.4	.....	.....
67	+34	+14	16.1	17.5	.....	.....
68	+10	−19	16.6	17.5	.....	.....
69	+140	+26	16.6	17.3	.....	.....
70	+43	−23	16.0	17.2	.....	.....
71	−116	−50	16.5	17.7	.....	.....
72	+122	−119	16.5	17.5	.....	.....

Refs. 102, 113, 117, 123. Plate in 123.

NGC 6426 α 17^h 42^m.4, δ +03° 12′
10 unpublished variables. Ref. A.

NGC 6535 α 18^h 01^m.3, δ −00° 18′
1 unpublished variable. Ref. A.

NGC 6539 α 18^h 02^m.1, δ −07° 35′
1 unpublished variable. Ref. A.

NGC 6541 α 18^h 04^m.4, δ −43° 44′

1	−54	−100:	12.5	[16.	.....	.....

Ref. 63, 70. No map.

NGC 6553 α 18^h 06^m.3, δ −25° 56′
2 suspected variables. Ref. 51. No map.

NGC 6584 α 18^h 14^m.6, δ −52° 14′
No variables in cluster. Ref. 71. No map.

CATALOGUE—*Continued*

NGC 6626 (Messier 28) α 18^h $21^m.5$, δ $-24°$ 54′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+174.0	+188.5	.....	.....	.....	.....
2	−47.3	+63.1	.....	.....	.....	.....
3	−32.9	+111.0	.....	.....	.....	.....
4	−34.5	+33.6	.....	.. ..	.....	.....
5	−44.8	+16.4	.....	.....	.....	.....
6	+34.1	+50.4	.....	.....	.....	.....
7	+172.2	+102.7	.....	.....	.....	.....
8	+227.3	−222.3	.....	.....	.....	.....
9	−158.6	−252.4	.....	.....	.....	.....

Refs. 11, 14, 20. Plate in 20.

NGC 6656 (Messier 22) α 18^h $33^m.3$, δ $-23°$ 58′

1	−54.0	−10.0	13.8	14.75	.....	0.615542
2	+158.6	+69.2	13.8	14.35	.....	0.6128+
3	+214.7	+420.2	14.55	[15.0	.....	0.340+
4	−4.0	−68.0	13.6	14.5	.....	0.6±
5	−178.2	−33.8	12.0	12.8	... .	7.097?
6	−74.4	−100.0	13.3	14.5	.....	0.6±
7	−342.4	+411.2	13.3	14.5	....	0.6495191
8	−39.5	−64.8	12.0	12.7	.....	.....
9	−211.2	−35.0	12.7	13.3	.....	.....
10	−39.0	−125.0	13.3	14.6	.....	0.6±
11	−14.4	+14.0	12.65	13.9	.....	.....
12	+0.8	−77.8	14.2	14.5	.....	variable ?
13	+76.4	+158.9	13.4	14.55	.....	0.6725203
14	+250.8	+486.4	13.8	[15.5	.....	200.0
15	+115.3	−83.2	14.0	14.55	.....	0.3+
16	+185.0	−17.8	14.0	14.45	.. ..	0.324+
17	−138.0	+126.0	14.6	15	....	.....

Refs. 11, 14, 20, 48, 81. Plate in 20.

NGC 6712 α 18^h $50^m.3$, δ $-08°$ 47′

1	−67	−8	15.9	16.7	.....	.....

Several unpublished variables.
Ref. 36, A. No map.

CATALOGUE—*Continued*

NGC 6723 α 18^h 56^m.2, δ −36° 42′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+75.6	−197.4	15.10	15.80	23618.56	0.5384149
2	+135.2	−76.9	14.45	16.05	23618.68	0.5048
3	−244.9	+6.0	14.70	15.80	23618.90	0.4949
4	+17.1	+77.4	14.55	15.90	23618.79	0.4524
5	−4.8	+50.8	15.20	16.00	.....	0.49
6	+7.1	+46.2	14.90	16.05	23618.80	0.4812
7	+197.9	−70.1	15.20	15.75	23618.91	0.4675
8	+15.9	+10.8	14.75	15.60	.....	0.53
9	+73.6	+17.2	14.70	15.80	23618.71	0.5779
10	+149.6	+84.2	15.10	15.60	23618.60	0.33855
11	+133.3	+228.8	14.85	15.65	23618.70	0.5342935
12	+45.1	−45.0	14.95	15.85	23618.53	0.5333
13	−46.8	−70.8	14.80	16.00	23618.18	0.5078
14	−37.9	−43.0	14.95	15.80	23618.91	0.6190
15	−93.4	+165.7	14.40	15.80	23618.71	0.4355162
16	−46.4	+91.6	14.75	15.65	23618.67	0.4114
17	+43.9	−102.0	14.4	15.7	.....	0.5301595
18	−139.2	−21:	14.6	15.3	.....	0.5263801
19	−174.0	−120:	14.6	15.5	.....	0.5347108

The three variables found by van Gent have been given numbers 17, 18, 19.
Refs. 14, 20, 73, 74, 91, 96. Plate in 20, charts in 96.

NGC 6752 α 19^h 06^m.4, δ −60° 04′
1 variable, 4′ from cluster centre.
Refs. 11, 14, 20. No map.

NGC 6760 α 19^h 08^m.6, δ +00° 57′
2 unpublished variables. Ref. A.

NGC 6779 (Messier 56) α 19^h 14^m.6, δ +30° 05′

1	+51.0	+75.6	.....	.....	.....	.....
*2	+21.0	+54.4	.....	.....	.....	.....
3	+33.0	+124.5	14.43	15.20	.....	.....

*Suspected. Several unpublished variables.
Refs. 35, 51, E. Plate in 51.

CATALOGUE—*Continued*

NGC 6809 (Messier 55) α 19^h 36^m.9, δ −31° 03′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+304.2	−55.6	.....	.....	.....	.....
2	−214.9	−26.0	.....	.....	.....	.....

Refs. 20, 75, 77. Plate in 20.

NGC 6864 (Messier 75) α 20^h 03^m.2, δ −22° 04′

1	+15.6	−83.4	.....	.....	.....	.....
2	−9.0	+54.0	.....	.....	.....	.....
3	+18.0	+85.5	.....	.....	.....	.....
4	−18.0	−84.6	.....	.....	.....	.....
5	+108.0	−36.0	.....	.....	.....	.....
6	+8.4	−81.0	.....	.....	.....	.....
7	−24.6	+78.0	.....	.....	.....	.....
8	−13.5	−41.4	.....	.....	.....	.....
9	+45.6	−24.0	.....	.....	.....	.....
*10	−43.5	+50.4	.....	.....	.....	.....
11	+121.2	+84.0	.....	.....	.....	.....
12	+39.6	+75.0	.....	.....	.....	.....

*Suspected. Four additional suspected variables, numbered 13-16, are omitted.

Ref. 51, with plate.

NGC 6934 α 20^h 31^m.7, δ +07° 14′

1	−45	−39	15.9	17.3	.....	.....
2	−40	−14	16.0	17.4	.....	.....
3	0	+58	15.9	17.3	.....	.....
4	+39	+58	15.6	17.2	.....	.....
5	+59	+221	15.9	17.2	.....	.....
6	−27	−33	16.1	17.5	.....	.....
7	+92	+59	16.2	17.3	.....	.....
8	+100	+50	16.3	17.1	.....	.....
9	+63	+18	15.9	17.4	.....	.....
10	−135	+72	15.8	17.2	.....	.....
11	+17	+28	16.6	17.5	.....	.....
12	+29	−44	15.6	17.1	.....	.....
13	−47	+25	16.0	17.2	.....	.....
14	−7	−90	15.8	17.4	.....	.....
15	+10	−53	15.2	15.8	.....	.....

CATALOGUE—*Continued*

NGC 6934

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
16	+36	+18	16.1	17.4	.....	.....
17	−73	−107	16.2	17.4	.....	.....
18	+49	−8	16.1	17.1	.....	.....
19	+30	+1	15.9	17.4	.....	.....
20	−26	+17	16.0	17.3	.....	.....
21	−35	−3	16.1	17.5	.....	.....
22	−240	−173	16.0	17.2	.....	.....
23	−31	−16	16.4	17.4	.....	.....
24	+37	−53	16.3	17.3	.....	.....
25	+50	+37	15.9	17.4	.....	.....
26	+31	−196	16.4	17.2	.....	.....
27	−148	+180	16.2	17.2	.....	.....
28	−234	+100	15.7	17.3	.....	.....
29	−85	−183	15.7	17.3	.....	.....
30	+161	+127	16.2	17.2	.....	.....
31	+146	−101	16.0	17.3	.....	.....
32	−10	+51	15.8	17.1	.....	.....
33	+37	+12	16.0	17.2	.....	.....
34	−21	+16	16.1	17.4	.....	.....
35	+157	−142	16.0	17.5	.....	.....
36	+10	−35	15.6	17.0	.....	.....
37	+23	+10	16.0	17.3	.....	.....
38	+12	−18	16.2	17.3	.....	.....
39	+8	−16	16.1	17.3	.....	.....
40	−8	+26	15.7	16.3	.....	.....
41	+30	−39	16.2	17.5	.....	.....
42	+55	+20	15.9	17.3	.....	.....
43	+21	+27	15.9	17.4	.....	.....
44	−43	−30	15.8	17.3	.....	.....
45	−32	−9	15.8	17.2	.....	.....
46	+14	−24	16.4	17.4	.....	.....
47	+10	−26	16.3	17.3	.....	.....
48	+33	+52	16.0	17.4	.....	.....
49	+13	−55	16.2	17.3	.....	.....
50	+15	−37	16.4	17.3	.....	.....
51	+7	−25	15.4	16.1	.....	.....

Ref. 102, 107, 113, 123. Plate in 123.

CATALOGUE—*Continued*

NGC 6981 (Messier 72) α $20^h\ 50^m.7$, δ $-12°\ 44'$

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	+43.5	−54.0	16.40	17.27	22162.97	0.61974
2	+99.0	+194.4	16.00	17.32	22162.817	0.46561
3	−52.5	−58.5	16.25	17.35	22162.968	0.48965
4	−106.5	+37.5	16.16	17.34	22162.90	0.3619
5	−38.4	−21.6	16.40	17.43	22163.738	0.4991
*6	+78.0	+78.6	.....	.....	.....	.....
7	−3.6	+55.5	16.20	17.29	22163.896	0.52463
8	−6.6	+89.4	16.40	17.32	22163.835	0.5743
9	+11.4	+50.4	16.30	17.34	22162.61	0.5902
10	−48.6	−73.5	16.23	17.32	22163.63	0.5483
11	+57.0	−36.6	16.35	17.32	22162.736	0.3345
12	+9.0	−21.6	16.31	17.17	22163.90	0.4111
13	+13.5	+17.4	16.10	17.15	22161.907	0.54182
14	−13.5	+36.0	16.40	17.06	22163.90	0.5904
15	−64.5	−21.0	16.15	17.30	22163.83	0.5499
16	−4.5	−19.5	16.30	17.37	22163.83	0.5641
17	+3.6	−43.5	16.35	17.32	22162.845	0.56308
18	−26.4	−37.5	15.70	16.28	22162.88	0.52016
*19	+3.0	+112.5	.....	.....	.....	.....
20	−54.6	+15.0	16.42	17.42	22162.92	0.59555
21	−82.5	+12.6	16.32	17.37	22162.583	0.5310
22	−113.4	+1.5	.....	.....	.....	.....
23	−99.0	+116.4	16.20	17.25	22163.90	0.5969
24	−15.6	−24.0	16.20	16.55	22161.92	0.4973:
25	−133.5	+67.5	16.45	17.06	.....	.....
26	−91.5	−45.0	.....	.....	.....	.....
27	+209.4	−234.0	15.72	17.15	22162.981	0.65885
28	−65.4	+81.0	16.48	17.21	22162.94	0.36381
29	+36.0	−52.5	16.40	17.37	22161.83	0.36895
30	+71.4	−97.5	16.38	16.91	.....	.....
31	+5.4	+36.6	16.50	17.22	22162.02	0.55465
32	−138.0	−42.0	16.50	17.22	22163.73	0.50544
*33	+2.4	−60.6	.....	.....	.....	.....
34	−6.0	+7.5	16.06	16.73	.....	.....

*Suspected.

The two variables first discovered by Miss Davis in 1917 are probably the same as Nos. 3 and 18.

Refs. 36, 51, 52. Plate in 51.

CATALOGUE—*Continued*

NGC 7006 α 20^h 59^m.1, δ +16° 00′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
1	−177.6	+113.8	.....	.....	.....	.....
2	−38.0	−38.0	.....	.....	.....	.....
3	−27.6	+32.8	.....	.....	.....	.....
4	−24.2	−42.2	.....	.....	.....	.....
5	−24.2	+36.2	.....	.....	.....	.....
6	−15.5	−44.8	.....	.....	.....	.....
7	0.0	−38.0	.....	.....	.....	.....
8	+31.0	+13.8	.....	.....	.....	.....
9	+36.2	+15.5	.....	.....	.....	.....
10	+38.0	−13.8	.....	.....	.....	.....
11	+141.4	+48.3	.....	.....	.....	.....

Variables Nos. 2 and 5 were first announced by Shapley and Miss Ritchie in 1920.

Numerous unpublished variables.

Refs. 51, 57, A. No map.

Note added in proof: Hubble reports that one of the stars in this cluster is a long period variable. Ref. G.

NGC 7078 (Messier 15) α 21^h 27^m.6, δ +11° 57′

1	−118.6	+24.4	14.36	15.54	15021.990	1.437478
2	−171.7	+6.0	15.14	15.95	15021.078	0.684270
3	−248.0	−46.8	15.34	16.03	15021.097	0.3891545
4	−112.6	−163.6	15.31	16.08	15021.277	0.3135750
5	−100.3	−212.5	15.33	16.00	15021.291	0.384619
6	+24.4	+76.5	15.20	16.29	15021.603	0.665971
7	+10.1	+73.2	15.56	16.16	15021.134	0.367586
8	−0.6	+126.8	15.22	16.14	15021.330	0.646251
9	+15.6	+138.7	15.12	15.98	15021.425	0.715284
10	+125.6	+1.7	15.50	16.04	15021.370	0.386395
11	+172.3	−21.8	15.28	16.07	15021.243	0.3435678
12	+163.0	−50.7	15.22	16.13	15021.090	0.592934
13	+126.6	−68.8	15.12	16.20	15021.365	0.574961
14	+84.1	−256.2	15.44	16.00	15021.128	0.381999
15	+81.7	−304.1	15.22	16.16	15021.064	0.584386
16	+101.9	+129.8	15.50	15.97	15021.556	0.69464
17	+83.7	+110.6	15.40	15.90	15021.216	0.666979
18	+77.3	+100.4	15.50	16.00	15021.331	0.37816
19	+111.3	+160.4	14.85	16.10	15021.552	0.572293
20	+81.2	−9.8	15.27	16.17	15021.261	0.700570
21	+34.4	−57.5	15.25	16.20	15021.322	0.624690

CATALOGUE—*Continued*

NGC 7078

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
22	−330.8	−45.8	15.18	16.04	15021.566	0.721728
23	+192.0	+256.1	15.07	15.95	15021.198	0.632690
24	−106.7	−6.1	15.42	16.17	15021.055	0.369697
25	+302.9	−10.7	15.10	16.00	15021.499	0.665329
26	+23.5	+331.9	15.33	15.97	15021.272	0.402326
27	+222.5	+248.2	variable ?		.....	.....
28	+309.9	+534.2	15.19	16.15	15021.632	0.670640
29	+163.3	+212.2	15.13	16.06	15021.281	0.574062
30	−165.0	−3.4	15.42	16.00	15021.293	0.405976
31	−112.6	+245.6	15.30	16.07	15021.375	0.435693
32	−50.4	+107.8	15.14	15.98	15021.066	0.605400
33	−41.2	−29.4	.....	.....	.....	.....
34	−55.4	−54.5	variable ?		.....	.....
35	−34.0	−163.6	15.40	16.11	15021.278	0.383997
36	−27.7	−81.6	15.18	16.26	15021.371	0.624142
37	−25.2	−77.4	.....	.....	.....	.....
38	+7.6	−146.2	15.29	16.16	15021.328	0.375274
39	+20.5	−124.8	15.34	16.14	15021.259	0.389984
40	+131.8	−116.7	15.34	16.00	15021.320	0.377390
41	+62.9	−55.4	.....	.....	.....	.....
42	+227.5	−36.8	15.34	16.07	15021.110	0.360167
43	+416.7	+103.2	15.25	15.88	15021.041	0.406744
44	+91.3	+3.0	15.20	16.11	15021.373	0.595568
45	+66.9	−31.0	15.19	16.14	15021.521	0.66210
46	+56.0	+33.2	15.40	16.32	15021.210	0.692730
47	+45.7	−4.3	15.32	16.04	15021.604	0.662900
48	+59.7	+150.6	15.35	16.17	15021.266	0.378881
49	+40.3	+166.6	14.75	15.35	15021.037	0.417972
50	+165.0	+100.0	15.35	16.00	15021.262	0.29850
51	+6.2	+91.4	15.51	16.03	15021.158	0.397757
52	+192.4	−22.6	15.12	16.21	15021.106	0.575608
53	−92.6	−111.0	15.28	15.91	15021.301	0.414135
54	+10.8	+88.4	15.58	16.13	15021.210	0.398325
55	+65.3	−18.8	15.49	16.30	15021.675	0.719615
56	+57.4	0.0	15.19	16.11	15021.249	0.570307
57	+75.2	−56.4	15.26	15.97	15021.243	0.348935
58	−55.6	+8.8	15.64	16.32	15021.388	0.420463
59	+41.3	+41.5	15.50	16.10	15021.117	0.565260
60	+53.4	−59.3	15.29	16.00	15021.118	0.691852
61	−67.3	−40.2	15.43	16.16	15021.526	0.61030
62	−71.6	+39.6	15.65	16.26	15021.161	0.38818
63	+49.8	+31.0	15.54	16.41	15021.076	0.67370

CATALOGUE—*Continued*

NGC 7078

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period
64	−46.2	+19.1	15.61	16.24	15021.207	0.351695
65	−102.4	−38.7	15.43	16.18	15021.377	0.756048
66	−68.4	−112.4	15.41	16.10	15021.191	0.379330

8 additional variables without published data (Ref. 74).
Refs. 14, 17, 20, 34, 39, 41, 45, 76, 95, 100. Plates in 20 and 41.

NGC 7089 (Messier 2) α 21^h 30^m.9, δ −01° 03′

1	+25.6	+79.4	13.2	14.8	26607.800	15.5647
2	−45.8	+71.1	14.6	16.1	21454.971	0.527858
3	+222.9	−39.6	15.1	16.4	26921.936	0.619705
4	−26.8	+31.5	15.2	16.6	26628.644	0.564247
5	−44.4	+2.1	13.2	14.9	26628.644	17.5548
6	+11.8	−45.4	13.2	14.9	22162.928	19.3010
7	+153.0	−189.2	15.1	16.4	27274.901	0.594857
8	−66.9	−56.8	15.1	16.4	27273.896	0.643677
9	−173.2	−128.2	15.2	16.4	27274.901	0.609291
10	+90.6	+38.8	15.2	16.4	27275.909	0.466910
11	+85	+8	12.5	13.7	26607.800	33.600
12	−62	+43	15.1	16.5	26628.776	0.665616
13	−77	+73	15.1	16.4	26921.972	0.706616
14	+83	−68	15.4	16.4	20749.843	0.693785
15	+80	−76	15.7	16.4	26944.880	0.430152
16	−31	−27	15.3	16.5	27275.950	0.655917
17	+2	−63	15 2	16.3	27274.901	0.636434

Refs. 11, 13, 14, 16, 20, 88, 102, 106, 112, 123. Plates in 20 and 112.

NGC 7099 (Messier 30) α 21^h 37^m.5, δ −23° 25′

1	+30.0	−60.6	.....	.....	.....	.....
2	+58.6	−126.2	.....	.....	.....	.....
3	−96.7	−39.6	.....	.....	.....	.....

Refs. 11, 14, 20. Plate in 20.

NGC 7492 α 23^h 05^m.7, δ −15° 54′

1	+1.2	+96.6	.....	.....	.....	.....

Variables numbered 2-5 are only suspected of varying.
8 unpublished variables.
Refs. 51, 87. Plate in 51.

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