A PHOTOGRAPHIC SURVEY OF GALACTIC CLUSTERS NGC 6531, 6546, 6469, 6494, 6544, 7127, 7128

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(Communicated by the Director, Norman Lockyer Observatory)

(Received 1953 April 28)

Summary

The methods applied in this paper have been described in previous communications from the Norman Lockyer Observatory. The distance modulus, based on CI, is used for the recognition of cluster members and the determination of the cluster distance. For the clusters NGC 6531, 6546, 6494 corrections for absorption were obtained, after estimations of the CE. This was not possible for the clusters NGC 6469, 7127, 7128. The clusters NGC 6469 and 7127 are assumed to contain giants. For the NGC 6544 a general description is given.

The methods of surveying the galactic clusters, described by G. Alter in previous contributions from the Norman Lockyer Observatory (**1**), have been applied to seven galactic clusters, with the results given in this paper. The material is arranged as in the communications mentioned.

The clusters of the present paper are located in parts of the sky including striking objects, such as conspicuous nebulae, obscuring matter and tufts of filmy light.

The mean deviations of magnitudes of the NPS on the set of plates of the clusters NGC 6531, 6546 was $\pm 0^{m}\cdot 12$ on the photographic scale, and $\pm 0^{m}\cdot 18$ on the photovisual scale. The mean error of the CI is therefore $\pm 0^{m}\cdot 21$. The corresponding numbers for the set of plates of the clusters NGC 6469, 6494 were $\pm 0^{m}\cdot 18$, $\pm 0^{m}\cdot 16$ and $\pm 0^{m}\cdot 22$ respectively; while for the clusters NGC 7127, 7128 they were $\pm 0^{m}\cdot 11$, $\pm 0^{m}\cdot 13$ and $\pm 0^{m}\cdot 17$ respectively. The order of exposure in all cases was: NPS–Cluster.

NGC 6531

R.A. $17^{h} 58^{m}\cdot 6$, Dec. $-22° 30'$ (1900·0)

This cluster shows a strong concentration in the centre, where, on the Sidmouth plates, the stars are almost indistinguishable. Shapley (**2**), Raab (**3**), Trumpler (**4**), Collinder (**5**), C. A. Ricke (**6**), Hayford (**7**) and Zug (**8**) have published results of investigations on this cluster.

The star counting gave 109 stars as the total number within a cluster region of $13'\cdot 6$ diameter. After correction for background the number of cluster stars is 57. The accompanying figure shows the star densities per square degree within the cluster region after correction for background.

Table I gives the CE of some cluster stars after a comparison of CI computed from the spectral types, published by Zug and in the HD Extension (1949), with the CI found in this investigation.

In Table II the coordinates, the magnitudes and the distance moduli of the stars within the cluster area are shown. The distance modulus $m-M$ was obtained from the CI corrected for the CE given in Table I. For the other stars, of unknown spectral type, the assumption of a mean CE $+0{\cdot}43$ was made.

The mean distance modulus of the cluster group is $9{\cdot}34$. This value, according to the formula

$$m-M_0=5\log r+a_{pv}\,.\,r-5 \tag{1}$$

(where $a_{pv}=0^{\mathrm{m}}{\cdot}35$ per kiloparsec was assumed) corresponds to a distance 680 ± 60 parsecs.

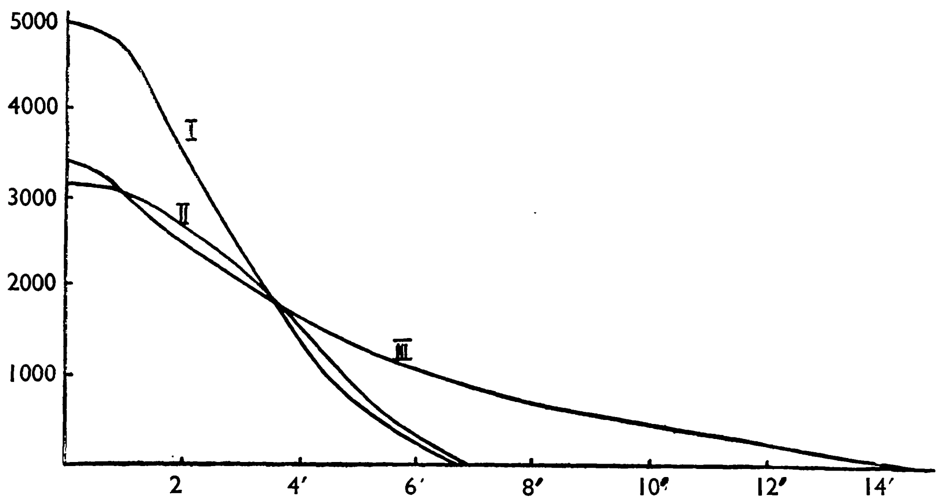

FIG. 1.—*Star density per square degree above background density.* I, *NGC* 6531. II, *NGC* 6546. III, *NGC* 6494.

TABLE I

Colour excess (*NGC* 6531)

Star	CE	Star	CE
24	$+0{\cdot}89$	47	$+0{\cdot}10$
25	$0{\cdot}39$	48	$0{\cdot}39$
29	$0{\cdot}12$	10	$0{\cdot}01$
32	$0{\cdot}20$	16	$1{\cdot}32$
33	$0{\cdot}33$	55	$0{\cdot}44$
45	$1{\cdot}07$	63	$1{\cdot}00$

Therefore the cluster diameter is $d=13'{\cdot}6=2{\cdot}7$ parsecs.

The results of previous observations are

	Distance	Diameter	
Raab	715 pc	19–20′	4·2 pc
Shapley	570–910	10	2·6
Trumpler	980	12	3·4
Collinder	1590	10	4·6
Rieke	1350		

Of the 57 CI stars of Table II, 44 belong to the cluster and the same relation, when applied to 109 stars obtained by counting, gives a total of 84. We may correct the result in the following way. Out of 15 stars fainter than 12·00, 8 belong to the cluster group and the same relation, when applied to 67 stars fainter than 12·00, gives 36 cluster stars. When we add the 36 cluster stars, brighter than 12·00, we get 72 cluster stars. Eleven stars of a nearby area of the cluster size are to be found lying in the $(m-M)$ cluster range. After applying this background correction, we have 61 as the final number of cluster stars. This number agrees with the one obtained statistically. The dispersion is $\sigma = \pm 8$. The magnitude distribution (after correction for background) is given in the following table:

m_v	8	9	10	11	12	>12·5
Number of stars	1	4	4	6	18	28

A comparison of the magnitudes and CI of Table II with that given by Zug showed appreciable differences.

TABLE II

Coordinates, magnitudes and distance moduli of 57 stars (NGC 6531)

Zero point=star number 46, unit=1′·0, X=east, Y=south. Coordinates of the assumed cluster centre $X=-1'·6$, Y=0·0

Star	X	Y	m_p	m_v	$m-M$	Star	X	Y	m_p	m_v	$m-M$
54	+1·2	+4·2	11·45	10·28	5·4	25	−2·6	+2·6	9·68	9·43	9·5
90	−0·1	+7·6	12·79	11·51	6·3	40	−1·7	−1·5	12·58	11·89	9·5
91	+4·8	+4·5	12·79	11·52	6·3	63	+4·1	−0·9	9·80	8·97	9·6
71	−1·4	−6·3	13·02	11·97	6·4	36	−1·4	+1·1	11·62	11·14	9·7
56	+1·7	+4·8	13·11	11·73	6·4	39	−2·0	−0·7	13·28	12·53	9·7
64	+5·3	−2·0	12·69	11·53	6·6	62	+4·3	−0·4	12·28	11·67	9·8
						26	−3·9	+0·7	12·17	11·59	9·8
18	−6·5	+0·1	12·15	11·23	7·3	9	−6·7	+2·3	12·11	11·54	9·8
87	−7·9	−3·2	12·89	11·87	7·4	45	−0·1	−0·9	9·85	8·88	9·9
59	+2·2	−3·0	13·33	12·23	7·5	16	−8·2	−0·8	9·36	8·28	9·9
58	+1·5	−1·8	12·90	11·94	7·7	32	−3·7	−4·2	8·51	8·54	10·2
99	+6·1	+2·1	13·35	12·32	7·8	70	−2·1	−6·3	10·37	9·55	10·2
35	−1·6	+1·5	11·83	11·03	8·0	33	−1·1	+2·4	9·47	9·34	10·3
6	−3·9	+4·7	12·30	11·46	8·0	49	+0·1	+0·9	11·12	11·56	10·3
65	+0·7	−5·1	11·93	11·14	8·1	28	−5·1	−0·3	12·25	11·55	10·3
50	+0·4	+1·0	13·15	12·23	8·3	31	−4·6	−4·1	12·03	11·56	10·3
44	−0·5	−2·4	12·03	11·33	8·3	47	+0·8	+0·3	9·64	9·74	10·7
42	−2·9	−2·2	11·62	10·83	8·4	22	−2·4	+4·8	12·49	12·02	10·7
10	−8·0	+1·9	9·51	9·52	8·4	37	−2·4	+0·3	11·72	11·40	10·8
57	−0·2	−3·0	12·55	11·73	8·5	29	−4·9	−1·5	10·10	10·15	10·8
73	−4·8	−6·5	12·12	11·39	8·7	48	+1·3	+0·4	11·88	11·55	10·8
72	−1·7	−7·3	12·67	11·88	8·9	24	−2·4	+3·7	9·57	8·95	10·9
53	−0·2	+2·4	13·17	12·34	9·0						
11	−7·4	+1·1	10·92	10·44	9·0	51	+0·4	+1·5	13·14	12·82	12·2
21	−3·3	+3·4	12·98	12·16	9·1	19	−5·8	+1·0	12·75	12·53	13·1
41	−3·0	−1·3	12·42	11·69	9·1	89	−9·0	−4·8	12·14	12·12	15·3
55	+1·8	+3·4	10·05	9·78	9·2	52	+0·4	+2·0	13·15	13·15	16·2
30	−4·5	−2·7	12·83	12·08	9·4	23	−1·9	+4·1	12·07	12·20	16·2
46	0·0	0·0	8·54	8·71	9·4	74	−4·5	−5·3	12·52	12·55	17·1
						84	+2·4	−6·7	13·22	13·25	17·8

NGC 6546

R.A. $18^h 01^m·2$, Dec. $-23° 19'$ (1900·0)

This cluster is a large one, but without appreciable concentration. It is mentioned in the catalogues by Trumpler (4) and Collinder (5). The star counting gave 107 stars within a region of 13′·6 diameter. Correction for the background density results in 50 cluster stars. The accompanying figure gives the star density per square degree within the cluster region.

Table III shows the results of a comparison of the measured CI of 8 stars with the CI computed from the HD Extension (1949). The mean CE is $+0^{m}\cdot12$.

Table III

Colour excess (NGC 6546)

Star	CE	Star	CE
60	−0·07	91	+0·10
61	+0·13	96	−0·19
75	+0·15	100	+0·29
89	+0·01	102	+0·51

In Table IV the distance modulus $m-M$ is given after the correction for CE given in Table III. For the stars which do not appear in Table III, the assumption of a mean CE $+0^{m}\cdot12$ was made. The stars 60 and 89, which are the brightest of the cluster and are also of late spectral types (M2 and K0 respectively), were regarded as giants and the value $M=0$ was assumed for them.

Table IV

Coordinates, magnitudes and distance moduli of 23 stars (NGC 6546)

Zero point=star 96=HD 165554. Unit=1′·0, X=west, Y=north. Coordinates of the assumed cluster centre $X=-2\cdot7$, $Y=+0\cdot5$

Star	X	Y	m_p	m_v	$m-M$	Star	X	Y	m_p	m_v	$m-M$
58	−5·8	+5·3	12·41	10·54	2·1	60	+1·1	+3·7	10·95	9·30	9·3
73	−5·9	+1·4	13·00	11·35	3·6	64	−4·2	+3·7	12·19	11·75	9·3
99	−3·4	−0·4	11·81	10·59	4·2	100	−4·0	−0·1	10·96	10·69	9·6
70	−9·1	+2·4	13·40	12·01	4·9	121	−2·2	−3·9	10·84	10·77	9·9
55	−5·0	+7·5	11·84	10·99	6·1	92	+1·7	−0·4	11·59	11·35	10·0
91	+3·0	−1·9	11·40	10·75	6·7	97	−0·9	+0·4	13·04	12·60	10·1
80	+1·3	+1·8	12·69	11·90	6·9	102	−5·5	−0·3	11·74	11·25	10·2
54	+0·3	+6·4	13·11	12·24	7·3	93	+2·0	−1·3	12·58	12·32	10·7
96	0·0	0·0	9·96	9·85	7·5	78	−2·2	+2·5	12·78	12·52	11·0
						75	−2·9	+1·3	10·74	10·76	11·4
103	−6·1	−1·7	11·81	11·37	8·9						
90	+3·8	−2·5	12·14	11·67	9·0	61	−2·1	+3·4	11·04	11·15	12·7
89	+3·9	−0·5	10·19	9·11	9·1						

The mean distance modulus of the cluster group is 9·90 corresponding to

$$r=830\pm60 \text{ parsecs} \quad \text{and} \quad d=13'\cdot6=3\cdot2 \text{ parsecs.}$$

The results of the previous observations are

	Distance	Diameter	
Trumpler	3000 pc	13′	11·1 pc
Collinder	1800	12	6·3

Trumpler's estimate was not a direct one.

Among the 23 CI stars, 13 belong to the cluster and the same relation when applied to 107 stars, obtained by counting, gives a total of 61 stars. This became 59 after correction for background and agrees with the number of cluster stars obtained statistically. The dispersion is $\sigma=\pm8$.

The magnitude distribution (after correction for background) is given in the following table:

m_v	9	10	11	12	>12·5
Number of stars	2	0	8	1	48

NGC 6469

R.A. $17^{\mathrm{h}} 46^{\mathrm{m}}\!\cdot\!9$, Dec. $-22^\circ 19'$ (1900·0)

This cluster is fairly irregular and not well detached from the environs. It is mentioned by Shapley, Raab, Trumpler and Collinder in their papers.

Table V gives the coordinates, magnitudes and distance moduli of stars within the cluster region. In the first part of the table the absolute magnitudes were taken from the main sequence. Here appear two ranges in the distance modulus

TABLE VA

Coordinates, magnitudes and distance moduli of 21 *stars* (*NGC* 6469)

Zero point=star number 1=HD 162694. Unit=1′·0, X=west, Y=south. Coordinates of the assumed cluster centre $X=-0·8$, $Y=3·7$

Star	X	Y	m_p	m_v	$m-M$	Star	X	Y	m_p	m_v	$m-M$
40	−4·0	+5·8	12·42	10·81	2·7	25	+2·8	+ 7·0	12·54	12·18	9·4
						28	+4·1	+ 2·4	12·60	12·26	9·6
24	+3·2	+4·4	12·51	11·20	4·0	42	−0·3	+10·8	13·22	12·80	9·6
9	−5·4	−2·9	12·92	11·50	4·0	36	+0·9	+ 4·4	12·90	12·60	10·2
4	−4·6	+2·4	12·83	11·90	6·5	6	+2·9	− 1·3	12·88	12·60	10·4
8	−2·6	−2·2	12·66	11·78	6·6	5	+1·6	− 0·9	12·88	12·63	10·5
35	+1·1	+2·8	12·90	12·00	7·3	7	−0·5	− 4·6	12·69	12·56	11·1
27	+6·7	+5·3	13·20	12·40	7·4	39	−2·8	+ 8·3	12·72	12·70	11·5
52	−4·3	+2·4	13·12	12·41	7·6	3	−3·3	+ 1·1	12·61	12·70	12·2
37	+0·2	+4·0	12·92	12·30	7·8	2	−0·4	+ 0·3	12·65	12·75	12·5
26	+2·9	+7·7	13·10	12·60	8·9						
1	0·0	0·0	10·87	10·73	9·1						

TABLE VB

Star	$m-M$	Star	$m-M$	Star	$m-M$
24	4·0	6	10·4	4	11·9
		5	10·5	35	12·0
26	8·9	40	10·8	3	12·2
1	9·1	7	11·1	37	12·3
25	9·4	39	11·5	27	12·4
28	9·6	9	11·5	52	12·4
42	9·6	8	11·8	2	12·5
36	10·2				

which indicate two cluster formations. The mean distance modulus of the first group is 6·4, its distance 190 ± 20 parsecs; the corresponding values for the second group are, respectively, 10·5, 1260 ± 130 parsecs. But it is not probable that there are two clusters in exactly the same area; so the nearer group is assumed to be a group of giants. This assumption is supported by the fact that in HD Extension two stars appeared with late spectral types; it is corroborated also by Lundmark (**5**) who maintains that the cluster is a Praesepe cluster superposed on a Pleiades cluster.

Using the giant values of M for the stars of the first group, the second part of Table V gives the redistribution of $m-M$. Star 40 has been included in the giant group as it appears in HDE as a G0 star. The contrary happens with the star 24, which appears as A.

The mean value of $m-M$ is 11·02, and consequently $r=1600\pm170$ parsecs, $d=12'{\cdot}4=5{\cdot}8$ parsecs.

In the case of this cluster, where no CE is available, the absorption has not been considered and the distances are computed according to the formula

$$m-M_1=5\log r-5. \tag{2}$$

The results of previous investigations were

	Distance	Diameter	
Shapley	1820–2880 pc	12′	10·1 pc
Raab	...	22–27	...
Trumpler	2370	15	10·4
Collinder	1110	11	3·6
Lundmark	1560	10	4·5

The surrounding of the cluster by a dark nebula suggests the necessity, in the case of the above distance, of correcting for absorption; but no spectral types are available.

The star counting gave 164 stars within a diameter of 12′·4. The surrounding of the cluster by a dark nebula prevents a true background correction. The number of CI cluster stars is 20. The magnitude distribution in the cluster is the following:

m_v	11	12	13
Number of stars	2	9	9

NGC 6494

R.A. $17^{\rm h}\,51^{\rm m}{\cdot}0$, Dec. $-19°\,0'$ (1900·0)

This cluster is a bright, large one. Results of investigations on this cluster have been published by Shapley, Raab, Trumpler, Collinder and Klauder–Lambrecht (**9**).

The star counting gave the total number of stars in the cluster region as 333, and the cluster members as 149 within a cluster region of 27′·2 diameter. Our figure shows the star density per square degree within the cluster region. The density distribution given agrees quite well with that given by Klauder and Lambrecht.

Table VI gives the coordinates, magnitudes and distance moduli of the stars within the cluster region. The cluster range contains 95 out of 165 CI stars. The mean value of $m-M$ for the cluster group is 8·34. This, according to the formula (2), corresponds to a distance of 470 parsecs.

Correction for absorption can be estimated for the 17 cluster stars for which the spectral types are available from HD Extension (1949). Table VII gives both $m-M_0$ and CE. The average $m-M$ is 9·63 and the distance, according to formula (1), is 770 parsecs. The mean CE is $+0{\cdot}52$. No assumption can be made for the CE of the other stars. First, because the number of cluster stars with known CE is relatively too small and no investigation of the value of CE in the other stars is possible. Second, it is not possible to apply mean CE as the cluster covers quite

TABLE VI

Coordinates, magnitudes and distance moduli of 165 *stars* (*NGC* 6494)

Zero point=star number 152=HD 163426. Unit=1′·0, *X*=west, *Y*=south. Coordinates of the assumed cluster centre *X*=−0·1, *Y*=−2·4

Star	X	Y	m_p	m_v	$m-M$	Star	X	Y	m_p	m_v	$m-M$
133	−5·3	−4·2	10·76	10·17	1·3	150	−1·8	+0·8	12·51	11·66	6·6
200	−1·2	−2·9	11·49	9·81	1·4	172	+12·3	−4·6	11·82	11·17	6·6
158	+7·0	+1·3	9·73	8·53	1·7	63	+8·6	+8·3	11·37	10·71	6·7
244	+10·4	−10·9	10·84	9·48	2·2	211	−0·3	−8·8	13·46	12·45	6·7
54	+4·3	+8·0	12·48	10·85	2·8	145	−5·4	−1·0	13·21	12·27	6·9
92	+1·4	+5·8	11·50	10·20	3·0	210	−0·1	−8·3	11·93	11·36	7·2
219	−4·5	−8·7	11·81	10·57	3·2	100	−4·2	+6·7	10·10	9·76	7·2
226	−3·3	−11·8	12·03	10·64	3·2	206	+2·7	−5·7	10·70	10·32	7·2
94	+0·8	+4·6	12·27	10·86	3·4	107	−9·0	+4·4	12·71	12·00	7·2
159	+8·7	+1·2	12·94	11·35	3·5	128	−11·1	−3·0	13·30	12·45	7·2
220	−5·3	−8·2	12·25	10·88	3·6	176	+11·6	−6·8	13·10	12·25	7·2
108	−9·8	+5·0	12·81	11·34	3·7	207	+2·9	−8·3	10·27	9·94	7·3
227	−2·6	−11·1	12·46	11·12	3·8	51	−0·5	+7·7	12·89	12·15	7·3
193	+1·7	−2·5	12·00	10·79	3·8	56	+6·7	+7·3	12·77	12·05	7·3
148	−2·9	−1·2	12·56	11·21	3·9	140	−9·2	−0·4	13·75	12·80	7·3
151	−1·2	+0·1	12·36	11·06	3·9	225	−6·3	−12·0	11·91	11·37	7·4
110	−11·1	+6·2	13·72	12·11	4·0	165	+6·6	−1·1	12·40	11·79	7·4
192	+2·1	−3·0	12·89	11·53	4·2	202	−0·9	+3·6	12·71	12·05	7·4
62	+8·6	+9·4	12·71	11·43	4·3	55	+6·5	+7·7	10·90	10·51	7·5
208	+1·6	−8·4	12·22	11·10	4·6	85	+6·2	+6·7	13·11	12·40	7·6
105	−7·7	+3·5	13·37	12·30	4·7	185	+5·2	−5·4	12·88	12·22	7·6
216	−3·2	−5·7	11·41	10·44	4·8	113	−12·3	+2·6	13·41	12·65	7·8
129	−8·8	−9·6	13·50	12·18	5·0	141	−8·3	−0·3	13·45	12·69	7·8
81	+6·5	+3·8	12·01	10·98	5·1	233	+5·2	−14·1	12·21	11·69	7·8
198	+0·4	−2·5	12·70	11·67	5·1	157	+5·9	+1·4	13·80	13·00	8·0
229	+0·7	−12·4	12·02	10·80	5·2	222	−9·0	−8·5	12·57	12·04	8·0
149	−2·5	+0·4	11·21	10·33	5·2	104	−7·4	+2·2	13·43	12·76	8·1
203	0·0	−5·0	11·36	10·49	5·3	218	−3·5	−7·9	12·66	12·13	8·1
228	−2·2	−9·2	13·34	12·13	5·3	52	+0·7	−7·6	13·46	12·81	8·2
123	−10·1	−5·9	13·34	12·14	5·3	127	−9·7	+4·9	13·59	12·90	8·2
131	−7·7	−4·4	13·27	12·07	5·3	147	−3·3	+1·5	13·21	12·64	8·3
217	−2·9	−6·9	11·38	10·52	5·4	241	+6·2	−7·2	14·05	13·29	8·3
173	+13·7	−4·8	13·91	12·68	5·7	82	+5·3	+3·7	11·66	10·43	8·4
205	+1·3	−6·3	11·57	10·76	5·7	90	+0·5	+7·1	14·16	13·36	8·4
231	+4·2	−12·5	12·43	11·45	5·9	201	+0·3	−3·8	11·69	11·32	8·4
						246	+15·8	−15·6	13·51	12·91	8·5
168	+10·9	−3·0	10·79	10·24	6·1	130	−7·3	−5·9	11·21	10·91	8·5
191	+2·6	−3·7	10·63	10·10	6·1	53	+2·2	+8·1	14·11	13·40	8·6
154	−0·1	+2·6	11·91	11·12	6·1	103	−5·8	+2·0	10·71	10·35	8·6
161	+5·3	−0·1	11·33	10·69	6·1	194	+1·5	−1·9	11·30	10·17	8·7
164	+4·3	−1·7	11·66	10·94	6·1	243	+12·1	−9·2	13·80	13·22	8·9
163	+4·8	−1·2	11·61	10·90	6·1	74	+12·7	+1·8	13·72	13·16	9·0
177	+11·3	−7·2	13·65	12·54	6·1	83	+4·7	+4·4	13·20	12·70	9·0
152	0·0	0·0	10·40	9·89	6·1	224	−7·8	−12·4	11·84	11·52	9·0
187	+3·5	−4·2	11·60	10·92	6·2	236	+4·2	−9·6	13·45	12·94	9·1
122	−10·7	−6·9	9·97	9·54	6·2	242	+10·5	−9·2	14·08	13·52	9·3
153	+1·0	+0·4	11·03	10·45	6·2	49	−2·2	+9·6	13·14	12·72	9·5
138	−7·1	−1·1	13·01	12·02	6·3	124	−10·2	−5·2	11·08	10·95	9·5
212	−1·2	−7·6	10·35	9·90	6·4	84	+5·5	+5·4	12·95	12·57	9·6
155	+1·1	+2·5	12·32	11·48	6·4	169	+12·7	−2·0	13·76	13·28	9·6
91	+2·0	+6·0	11·88	11·16	6·4	204	+0·3	−5·8	11·40	11·30	9·9
125	−9·1	−5·0	12·48	11·62	6·4	247	+14·8	−15·6	12·79	12·46	9·9
106	−7·9	+4·0	13·31	12·30	6·5	86	+5·7	+6·8	14·10	13·62	10·0
183	+7·0	−6·6	12·26	11·46	6·5	162	+5·6	−0·7	13·40	13·02	10·0
143	−6·1	+0·4	11·69	11·06	6·6	64	+9·6	+8·1	13·05	12·72	10·1

TABLE VI (*Continued*)

Coordinates, magnitudes and distance moduli of 165 *stars* (*NGC* 6494)

Zero point=star number 152=HD 163426. Unit=1′·0, X=west, Y=south. Coordinates of the assumed cluster centre $X=-0·1$, $Y=-2·4$

Star	X	Y	m_p	m_v	$m-M$	Star	X	Y	m_p	m_v	$m-M$
178	+10·8	− 6·7	13·75	13·33	10·1	237	+ 4·8	− 9·6	12·55	12·76	11·7
184	+ 6·6	− 5·4	12·09	11·89	10·1	160	+ 7·1	+ 0·2	13·20	13·13	11·7
57	+ 7·0	+ 6·8	12·40	12·16	10·2	215	− 2·3	− 5·0	13·53	13·37	11·8
139	− 9·4	− 1·0	13·15	12·96	10·2	209	+ 0·6	− 8·1	12·27	12·35	11·8
114	−11·9	− 1·0	13·68	13·29	10·3	88	+ 4·3	+ 6·7	12·95	12·96	11·8
188	+ 3·3	− 2·4	13·15	12·83	10·3	179	+ 9·6	− 5·8	13·35	13·52	11·8
121	−12·6	− 7·0	11·65	11·63	10·4	181	+ 7·5	− 3·2	13·27	13·19	11·8
156	+ 3·1	+ 2·5	12·73	12·48	10·4	196	− 1·8	− 1·3	10·39	10·61	11·9
245	+10·6	−12·2	12·57	12·37	10·6	50	− 1·6	+ 8·1	12·76	12·82	12·0
180	+ 9·0	− 3·4	12·65	12·46	10·7	77	+10·9	+ 6·5	13·71	13·59	12·1
80	+ 7·9	+ 4·0	13·59	13·27	10·8	240	+ 7·4	− 7·5	13·62	13·62	12·6
195	+ 0·1	− 1·4	13·06	12·82	10·8	186	+ 5·2	− 4·2	12·99	13·08	12·6
134	− 6·5	− 3·4	12·35	12·29	11·0	213	− 2·4	− 6·3	12·20	12·32	12·6
142	− 7·6	− 0·3	13·20	12·96	11·0	199	− 0·4	− 2·6	12·54	12·68	12·7
238	+ 5·8	− 9·1	13·30	13·10	11·0	60	+ 6·9	+ 8·6	13·39	13·56	13·0
87	+ 4·8	+ 7·1	14·03	13·70	11·1	135	− 5·8	− 3·1	13·86	14·08	13·0
101	− 3·4	+ 3·0	13·55	13·28	11·1	276	− 5·8	−14·9	13·16	13·29	13·3
230	− 0·1	−12·8	12·47	12·46	11·1	59	+ 7·7	+ 8·0	12·72	12·89	13·5
170	+ 9·9	− 3·5	12·27	12·28	11·2	182	+ 6·9	− 3·7	12·40	12·58	13·5
93	+ 2·9	+ 4·8	12·56	12·50	11·2	197	− 1·1	− 1·6	12·27	12·48	13·7
235	+ 6·9	−10·4	12·77	12·69	11·3	136	− 5·5	− 3·1	13·83	13·95	13·8
						221	− 6·1	− 8·3	12·77	12·98	14·1
166	+ 6·7	− 1·8	13·00	12·87	11·6	89	+ 2·2	+ 7·9	12·20	12·52	15·3
102	− 4·8	+ 2·6	12·99	12·90	11·6	272	− 4·4	−13·5	12·57	12·88	15·6
95	− 1·9	+ 4·0	13·16	13·03	11·6	190	+ 3·5	− 1·4	12·94	13·24	15·7
47	− 2·6	+10·9	12·96	12·91	11·6	167	+10·0	− 1·9	12·73	13·05	15·9
214	− 1·0	− 5·8	13·59	13·39	11·6	322	−10·0	− 1·5	13·20	13·49	15·9
78	+ 9·5	+ 6·8	12·99	12·90	11·6	239	+ 6·4	− 8·4	12·84	13·23	16·4
96	− 2·4	+ 5·3	13·18	13·09	11·7						

TABLE VII

Distance modulus and colour excess (*NGC* 6494)

Star	$m-M$	CE	Star	$m-M$	CE
122	8·1	+0·33	124	9·7	+0·06
100	8·5	+0·41	55	9·9	+0·47
152	8·8	+0·53	130	10·0	+0·35
168	9·1	+0·57	163	10·0	+0·76
82	9·3	+0·25	164	10·0	+0·77
153	9·4	+0·60	125	10·5	+0·88
103	9·5	+0·41	225	10·5	+0·59
63	9·6	+0·68	233	11·1	+0·60
161	9·6	+0·66			

a big area in which sudden changes of absorption are obvious even at a first glance at the area. This is also borne out by Klauder's and Lambrecht's investigation of the density distribution.

Therefore we get from Tables VI and VII respectively:

$$r = 470 \pm 40 \text{ parsecs}, \quad d = 27'·2 = 3·7 \text{ parsecs}$$

and (corrected for absorption)

$$r = 770 \pm 50 \text{ parsecs}, \quad d = 27'·2 = 6·1 \text{ parsecs}.$$

The results of previous investigations were

	Distance	Diameter	
Shapley	870–1380 pc	25′	10·0 pc
Raab	400	43–51	5·5
Trumpler	660	27	5·9
Collinder	957	25	7·0

The CI method gives a different result for the star number from the statistical method. Among the 165 CI stars, 95 belong to the cluster modulus range, and the same relation, when applied to the 333 stars obtained by counting, gives, after correction, 169 cluster stars. This number is different from the number 149 obtained statistically. The dispersion is $\sigma = \pm 13$. The difference is due to deviations in CI. As the stars in the area of this particular cluster appear in chains, some fainter stars located in the haloes of bright stars appear brighter than they are. The modulus range, and hence the star number, depends on a statistical behaviour, so that a few faint stars having larger deviations are not included within the right range of $m-M$ in Table VI.

The magnitude distribution in this cluster, after correction for background, is in the following table:

m_v	10	11	12	13	>13·5
Number of stars	12	17	24	20	96

NGC 6544

R.A. $18^{\mathrm{h}}\,01^{\mathrm{m}}\!\cdot\!2$, Dec. $-25°\,01'$ (1900·0)

This cluster is a very faint object mentioned in Shapley's catalogue of open clusters, but, according to Collinder (**5**), it "seems to be a globular cluster or anagalactic nebula". NGC 6544 appears on Sidmouth plates as a very compact conglomeration, not resolved, of very faint stars. The unresolved central part is of about 1′·5 diameter. Around that there are about seven stars in a diameter of about 2′·7.

NGC 7127

R.A. $21^{\mathrm{h}}\,40^{\mathrm{m}}\!\cdot\!5$, Dec. $+54°\,09'$ (1900·0)

This cluster is a small and poor one, mentioned in Shapley's catalogue. It is located in the middle of a small area, extremely poor in stars. On account of its particular situation the star counting was not done in the usual way, but a comparison of the cluster's region with some neighbouring regions of the same size was made. Within a diameter 2′·8 of the cluster's region there are 15 stars. After the correction the number of cluster stars is 8.

Table VIII gives the distribution of $m-M$ and it is given in two parts, of which the first shows the stars separated in two ranges, and the second is a rearrangement of the first, treating the first group of stars as giants (as was done in the case of NGC 6469). In this table we see that the giants fit well into the dwarf range.

Table VIII shows that the mean distance modulus is 10·28 in case A and 10·55 in case B corresponding to

Case A $r = 1120 \pm 120$ pc, $d = 2'\!\cdot\!8 = 1\!\cdot\!0$ pc.
Case B $r = 1300 \pm 120$ pc, $d = 2'\!\cdot\!8 = 1\!\cdot\!1$ pc.

Since spectral types are not available it is not possible to suggest a correction for the interstellar absorption.

The data in Shapley's catalogue are

$$r = 1820\text{–}2880 \text{ parsecs}, \quad d = 1'{\cdot}0 = 0{\cdot}8 \text{ parsecs}.$$

The number of cluster stars is 10 (among them 3 giants), against 8 obtained by counting.

The magnitude distribution is given in the following table :

m_v	10	11	12	13	14	15
Number of stars	1	1	5	1	1	1

TABLE VIII

Coordinates, magnitudes and distance moduli of 15 *stars* (*NGC* 7127)

Zero point=star 13. Unit=1′·0, X=east, Y=north. Coordinates of the assumed cluster centre $X=-0{\cdot}5$, $Y=+0{\cdot}4$

A Normal distribution						B Giants included	
Star	X	Y	m_p	m_v	$m-M$	Star	$m-M$
14	+0·5	+0·7	12·26	11·53	6·6	7	9·2
13	0·0	0·0	10·49	10·06	6·8	11	9·4
9	−0·5	+0·5	12·75	11·92	6·8	15	9·7
7	−0·7	+1·1	12·27	11·92	9·2	13	10·1
11	−0·3	+1·0	13·95	13·41	9·4	10	10·1
15	+0·6	−0·6	12·54	12·22	9·7	3	10·7
10	−0·5	−0·9	11·51	11·47	10·1	1	11·4
3	−1·2	+0·5	12·42	12·28	10·7	12	11·5
1	−1·5	+0·5	13·88	14·20	11·4	14	11·5
12	−0·3	+1·6	14·12	14·56	11·5	9	11·9
2	−1·2	+1·5	13·19	13·34	13·6	2	13·6
6	−0·9	+1·4	13·69	13·84	14·1	6	14·1
8	−0·5	+1·8	13·26	13·47	14·6	8	14·6
4	−1·1	−0·3	14·13	14·35	15·7	4	15·7
5	−1·1	−0·8	14·22	14·50	16·5	5	16·5

NGC 7128

R.A. $21^h 40^m{\cdot}7$, Dec. $+53° 15'$ (1900·0)

This cluster is a small one mentioned in the catalogues of Shapley, Trumpler and Collinder. It is located within a small area of low star density, like the previous cluster. So the star counting and the correction for background were done in the same way as with NGC 7127. Within a diameter 3′·1 of the cluster's region there are 16 stars. After correction the number of cluster stars is 9. In Table IX we find the mean distance modulus of the cluster group (without correction for absorption) to be 10·99, corresponding to

$$r = 1570 \pm 170 \text{ parsecs}, \quad d = 3'{\cdot}1 = 1{\cdot}5 \text{ parsecs}.$$

The results of the previous investigations were

	Distance	Diameter	
Shapley	1820–2880 pc	2′	1·7 pc
Trumpler	3650	3·2	3·5
Collinder	6670	2·3	5·3

Trumpler's distance was not measured but computed.

The number of cluster stars after reduction is 9, coinciding with the number obtained by counting.

The magnitude distribution is given in the following table:

m_v	12	13	>13·5
Number of stars	1	2	6

Table IX

Coordinates, magnitudes and distance moduli of 14 *stars* (*NGC* 7128)

Zero point=star 15. Unit=1′·0, X=east, Y=north. Coordinates of the assumed cluster centre $X=-0·8$, $Y=+0·6$

Star	X	Y	m_p	m_v	$m-M$	Star	X	Y	m_p	m_v	$m-M$
15	0·0	0·0	11·33	9·94	2·5	14	−0·2	+0·5	12·34	12·37	11·3
7	−1·3	+0·5	11·89	10·37	2·7	8	−1·2	+0·9	13·96	13·83	12·3
11	−0·9	−0·1	12·61	11·14	3·5	6	−1·4	−0·2	13·64	13·64	12·4
12	−0·6	+1·0	12·88	12·52	9·7	13	−0·4	+1·2	13·42	13·60	14·3
4	−1·5	−0·4	14·19	13·66	9·7	16	+0·3	−0·3	13·73	13·95	15·3
10	−1·0	+1·3	12·81	12·58	10·6	5	−1·4	+1·5	13·35	13·70	16·9
1	−2·0	+1·3	13·30	13·70	10·7						
3	−1·5	+1·9	13·55	13·86	11·2						

The plates used in this investigation were taken by Dr G. Alter when he was in Sidmouth, between the years 1939 and 1944, and I am also indebted to him for his papers which proved most helpful to me. I am grateful to Professor F. J. M. Stratton and the I.A.U. for the grant which enabled me to carry out my work at the Norman Lockyer Observatory. I should like also to express my thanks to Mr D. L. Edwards, Director of the Norman Lockyer Observatory, and to Mr D. R. Barber for their interest and helpful discussions throughout the course of my work at the Norman Lockyer Observatory.

Norman Lockyer Observatory,
Sidmouth:
1953 *April* 23.

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