The lack of intermediate observations between January 21 and February 16, 1931, precludes an accurate determination of the period for testing its variability. It appears, however, from a close study of the above graphs, that the variation may consist of two waves, of practically the same amplitude, one of a period approximately $2^h\ 45^m$, followed by another of $2^h\ 30^m$.

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New Variable Stars in Centaurus and Circinus. — The study of the variables in MWF 169, centered at $14^h\ 02^m$, $-68°.3$, has now been completed. In 1928 Miss Edna B. Florence examined the field for variables. Forty MF plates taken with the 10-inch Metcalf telescope were compared with five glass positive contacts. One hundred and thirty four new variables were found. Previously only three variables had been known in the field, including T Circini, an eclipsing binary with a period of 3.2984 days, and VW Centauri, a Cepheid of 15.037 days, median magnitude 10.1 Miss Florence also measured the positions of the variables she had discovered.

Mr. A. L. Bunting, Mr. C. C. Sherman, Miss Mary L. Miller, and the writer estimated the magnitudes on the MF plates and computed the periods for the short period variables. Miss Frances W. Wright measured the long period variables on early Harvard plates and computed their periods.

There are fifty five MF plates, eleven A plates, and twenty four B plates, all taken since 1924 specially for this field. The number of early B and A plates that Miss Wright was able to use on the long periods varied from thirty five to seventy, depending on the brightness of the variable. For a few of the very brightest stars AM and AX plates were also used. The sequences in the field were derived from the Carte du Ciel sequence at $14^h\ 00^m$, $-65°$, extrapolated to $16^m.5$, presumably the limit of a good quality forty five minute exposure MF plate.

The table gives in successive columns the Harvard variable number, the position for 1900, the maximum and the minimum magnitude, and the type of variation. The seventh and eighth columns give the Julian day of a well observed maximum for long period and cluster type variables, or of a minimum for eclipsing variables, on the recent plates, and the period. The last column gives (for long period variables) the number of epochs, which serves as an indication of the number of

Variables in MWF 169

H.V.	R.A. (1900) h m s	Dec. (1900) ° ′	Max. m	Min. m	Type	Epoch J.D. 2420000.00	Period d	Remarks
4999	13 06 48	−71 13.5	14.0	[16.5	Long	5430	194.6	76 epochs
5000	13 01	−69 46.5	15.2	16.4	Cluster			
5001	13 09	−68 32.8	13.8	[16.5	Long	6150	246.0	60 epochs
5002	15 55	−72 04.6	14.4	16.0	Cluster	5434.26	0.5742	
5003	18 27	−69 22.0	13.7	15.4	Cluster	4173.06	0.60562	Note 1
5004	19 40	−69 53.3	14.5	[16.5	Long	6150	241.8	56 epochs
5005	20 23	−70 13.3	14.0	15.0	Cluster			
5006	20 44	−64 32.7	12.0	13.3	Long?	6030	193	77 epochs, Note 2
5007	23 10	−70 15.1	12.3	14.0	Long	3960	111	19 epochs, Note 3
5008	23 16	−68 21.1	13.5	15.3	Short			Red star following a pair of bright stars
5009	24 05	−67 10.7	14.6	[16.5	Long	6000	238	63 epochs
5010	24 37	−70 52.7	13.3	[16.5	Long	6060	213	69 epochs
5011	26 08	−70 02.1	14.0	[16.5	Long	5440	284	8 epochs, Note 3
5012	26 50	−67 10.6	12.8	14.5	Eclipsing	5412.365	0.96494	
5013	26 54	−70 07.5	13.4	15.0	Cluster	5379.36	0.51578	
5014	27 02	−69 10.1	15.1	[16.5	Long	6110	230	65 epochs
5015	27 10	−69 54.7	12.0	14.4	Long	6030	169	88 epochs, Note 4
5016	27 33	−66 15.3	14.7	[16.5	Long	5670	174.2	77 epochs
5017	27 37	−66 47.6	13.6	16.0	Eclipsing			3 minima
5018	27 44	−68 45.9	13.6	[16.5	Long	6145	369	40 epochs, Note 5
5019	29 35	−64 02.8	10.5	11.8	Cepheid	5382.0	34.02	445 epochs, 284 obs.
5020	31 11	−72 06.4	12.0	[16.5	Long	5340	444	33 epochs
5021	31 18	−71 32.9	14.9	15.3	Short			
5022	32 10	−64 31.6	10.8	11.8	Eclipsing	5327.50	3.17	700 epochs, 170 obs.
5023	32 38	−71 16.2	14.5	[16.5	Long	6090	167	88 epochs
5024	33 11	−69 14.0	13.5	[15.5	Eclipsing			6 minima
5025	33 35	−67 01.1	14.9	16.0	Long?	6010	187.6	12 epochs, Note 6
5026	34 12	−67 18.0	13.7	14.7	Eclipsing?			
5027	34 56	−70 45.8	13.4	16.7:	Long	6120	176	86 epochs
5028	35 09	−63 29.7	13.8	15.2	Short?			At edge of field
5029	36 32	−68 46.3	15.2	[16.5	Long	5395	275	54 epochs
5030	37 06	−68 39.0	14.0	15.5	Eclipsing	5409.33	2.2655	
5031	37 16	−67 58.6	14.0	16.2	Cepheid	3960	26.425	Resembles X Puppis
5032	38 42	−67 21.5	13.6	15.4	Eclipsing	5413.30	4.76	
5033	38 47	−66 51.6	14.0	15.4	Cluster	5355.51	0.6103	
5034	39 22	−70 08.1	15.0	15.6	Short			
5035	41 40	−67 42.5	14.5	[16.5	Long	5440	247	59 epochs
5036	41 41	−68 05.1	12.5	16.0	Long	5330	99	136 epochs, Note 7
5037	43 07	−69 58.4	12.0	14.1	?			Note 8

H.V.	R.A. (1900)	Dec. (1900)	Max.	Min.	Type	Epoch J.D. 2420000	Period	Remarks
	h m s	° ′	m	m			d	
5038	13 43 09	−66 27.7	12.0	13.0	Eclipsing			2 minima
5039	44 06	−68 22.3	13.5	15.7	Long	5320	120.2	119 epochs
5040	44 08	−69 40.6	14.2	15.5	Cluster	5355.50	0.48373	
5041	45 14	−69 00.0	13.4	[16.5	Long	6015	278	53 epochs
5042	45 55	−64 54.2	13.5	14.6	Cluster?			
5043	46 00	−68 21.5	14.9	[16.5	Long	5670	310	41 epochs
5044	46 26	−69 24.2	12.8	14.2	Cluster	5327.50	0.46098	Companion star at $14^m.0$
5045	47 58	−66 47.8	13.7	[16.5	Long	5780	415	36 epochs
5046	49 34	−64 28.5	14.1	15.2	Eclipsing	5384.34	3.6933	
5047	50 04	−65 24.6	13.2	14.7	Cluster?			
5048	52 00	−64 06.1	14.0	15.5	Short			
5049	53 26	−69 02.1	12.4	16.0:	Long	5410	193.8	58 epochs
5050	53 30	−65 17.4	14.9	[16.5	Long	6100	224.3	66 epochs
5051	53 58	−67 12.5	13.0	15.0	Eclipsing			3 minima
5052	54 04	−70 00.6	14.4	[16.5	Long	5390	109.5	19 epochs
5053	54 06	−65 23.2	14.3	[16.5	Long	6130	206	72 epochs
5054	55 40	−69 08.1	12.2	15.0	β Lyrae	5328.0	46.36	Note 9
5055	56 07	−71 05.0	14.0	[16.5	Long	5670	240	62 epochs
5056	56 47	−70 05.7	13.0	[16.5	Long	4000	273	47 epochs
5057	56 48	−67 57.0	14.0	[16.3	Long	3960	326	45 epochs
5058	57 26	−71 54.1	14.2	[16.5	Long	6090	247.5	60 epochs
U Cir	57 58	−66 31.8	12.0	13.5	Long?	3950	145	51 epochs, Note 3
5059	58 07	−65 19.3	12.8	[16.5	Long	6030	303	49 epochs
5060	58 28	−70 53.5	10.0	12.5	Irregular			Note 10
5061	58 59	−70 33.8	13.4	16.5:	Long	5720	124.0	120 epochs
5062	59 05	−69 03.2	15.0	[16.5	Long	5660	294	40 epochs
5063	59 55	−71 56.9	14.5	16.0	Cluster	5327.48	0.5652	
5064	14 00 13	−69 40.9	13.0	14.3	Eclipsing	5356.41	1.11015	Secondary min. $13^m.3$
5065	00 27	−66 52.8	14.9	[16.4:	Long	5810	425	35 epochs, Note 11
5066	00 36	−71 07.8	12.6	[16.5	Long	5345	252	24 epochs, Note 3
5067	01 04	−67 46.1	12.5	13.5	Short			
5068	03 14	−68 10.4	14.0	[16.5	Long	6030	169.7	89 epochs
5069	03 26	−66 35.2	13.5	[16.5	Long	5400	132.5	107 epochs
5070	04 38	−68 12.9	13.2	14.5	Short			
5071	04 50	−67 29.7	13.0	14.8	Long?	6150	190.5	Note 12
5072	07 58	−67 11.1	12.2	13.3	Eclipsing			5 minima
5073	09 46	−67 29.9	13.3	14.2	Short			Red star
5074	12 51	−67 03.2	11.1	15.8	Long	1700	538	Note 13
5075	13 12	−71 11.1	14.5	15.3	Long?	5410	163	Note 14
5076	13 14	−66 13.9	13.0	[16.5	Long	5460	423.5	35 epochs
5077	13 55	−65 54.9	10.7	12.0	Semiregular			Note 15

H.V.	R.A. (1900)			Dec. (1900)		Max.	Min.	Type	Epoch J.D. 2420000	Period	Remarks
	h	m	s	°	′	m	m			d	
5078	14	14	33	−69	29.8	11.0	[16.5	Long	5370	417	14 epochs, Note 3
5079		14	53	−72	49.6	10.6	15.2	Eclipsing	5360.4	34.074	440 epochs, 310 obs.
5080		15	50	−69	30.5	11.7	13.0	Eclipsing			3 minima
5081		16	04	−65	38.3	12.6	14.1	Short			
5082		17	02	−64	36.1	15.3	[16.5	Long	5380	430	34 epochs
5083		17	07	−68	41.2	13.4	[16.5	Long	5320	266	56 epochs
5084		17	39	−63	32.4	12.0	13.5	Semiregular	3890	159	14 epochs, Note 16
5085		18	41	−64	32.8	13.5	[16.5	Long	6150	337.3	44 epochs
5086		19	51	−69	04.8	13.3	[16.5	Long	3970	252	59 epochs
5087		21	04	−68	11.0	14.0	15.5	Cluster	3991.50	0.41905	
5088		21	28	−63	54.4	13.3	[16.5	Long	6170	286.6	52 epochs
5089		22	36	−70	20.1	13.8	[16.5	Long	5355	117.3	112 epochs
5090		22	50	−70	20.5	10.5	16.0	Long	5450	474	23 epochs
5091		22	53	−66	12.2	12.1	13.0	Eclipsing			3 minima
5092		23	50	−71	29.7	10.0	[16.0	Long	5660	383	35 epochs
5093		23	57	−71	30.2	13.5	[16.5	Long	5330	222.7	59 epochs
5094		25	01	−72	29.1	12.6	14.0	Eclipsing			5 minima
5095		25	08	−71	44.1	13.0	[16.5	Long	5390	256.3	58 epochs
5096		27	39	−69	24.2	14.2	[16.5	Long	3880	325	45 epochs
5097		28	12	−66	09.1	14.0	16.6	Long	6045	220	68 epochs
5098		28	22	−67	11.4	14.2	[16.5	Long	3990	320	49 epochs
5099		29	11	−70	16.3	14.7	15.4	Short			
5100		29	17	−70	52.6	14.0	14.6	Cluster			
5101		29	17	−72	05.1	10.0	16.0	Long	5410	303	48 epochs
5102		29	38	−71	12.5	13.5	14.5	Short			
5103		29	48	−72	23.5	12.2	13.6	Cluster?			
5104		29	51	−71	12.3	14.0	16.3	Eclipsing	5330.55	3.520	
5105		30	06	−66	03.9	13.5	14.2	Eclipsing?			
5106		30	11	−71	07.9	12.8	14.0	Cluster?			
5107		31	13	−70	18.9	11.0	12.2	Short			
5108		31	23	−67	30.4	14.2	[16.5	Long	5650	281	53 epochs
5109		31	39	−66	36.5	13.8	[16.5	Long	5380	273	55 epochs
5110		32	06	−70	05.7	14.3	15.2	Cluster?			
5111		32	51	−67	57.7	10.9	12.4	Semiregular?			
5112		35	58	−68	58.0	12.2	16.0:	R Coronae		4350:	Note 17
5113		36	26	−70	51.9	13.7	14.7	Eclipsing?			
5114		36	48	−71	38.7	14.6	15.7	Cluster			
5115		38	21	−72	22.3	13.0	[16.5	Long	5655	240	62 epochs, Note 18
5116		38	31	−69	28.4	13.7	14.5	Short			Faint companion
5117		38	45	−67	30.2	12.5	13.5	Short			
5118		39	25	−70	54.4	9.8	11.5	Cluster	5384.34	0.501692	29804 epochs, 266 obs.
5119		40	01	−70	33.3	13.5	[16.5	Long	5740	315.1	41 epochs

H.V.	R.A. (1900) h	m	s	Dec. (1900) °	′	Max. m	Min. m	Type	Epoch J.D. 2420000	Period d	Remarks
5120	14	40	31	−69	14.4	14.8	16.2	Cluster			
5121		40	40	−68	26.4	11.0	[16.5	Nova			Note 19
5122		40	51	−72	18.4	14.5	16.0	Eclipsing			2 minima
5123		41	07	−68	27.4	13.4	[16.5	Long	5660	287.5	51 epochs
5124		41	13	−70	02.1	13.2	14.0	Short			
5125		41	27	−70	42.1	15.1	15.9	Cluster	5433.24	0.4194:	Companion at $15^m.6$
5126		42	54	−70	56.5	14.4	16.0	Cluster?			Close companion
5127		42	58	−70	28.6	14.7	15.8	Cluster	5327.52	0.40075	
5128		44	48	−68	50.3	14.2	[16.5	Long	5410	281.7	52 epochs
5129		49	52	−71	23.8	12.0	13.7	Cluster	5326.54	0.48252	
5130		51	56	−71	35.3	12.1	13.9	Long	5690	88.3	153 epochs
5131		52	57	−71	24.4	12.4	[16.5	Long	5300	234	63 epochs
5132		53	10	−70	33.8	13.5	14.7	Cluster?			At edge of field

NOTES

1. H.V. 5003. Elements: J.D. 2424173.06 + $0^d.60562$ E + $0^d.35$ sin 0°.12 E. This formula fits for the observed interval, though probably a small parabolic term should be added.
2. H.V. 5006. The period of 193 days fits the majority of the 218 observations. The variable is irregular particularly at minimum during the following intervals of time: J.D. 2414800 to J.D. 2415200, eleven observations; J.D. 2415900 to J.D. 2417900, twenty two observations; J.D. 2425620 to J.D. 2425810, twenty three observations.
3. The five variable stars given in the list below have changes of period, though the character of the change cannot be observed as the data are too scattered.

H.V.	Early Elements	Number of Epochs	Change in Period occurred between	Remarks
5007	J.D. 2412590 + 113^d E	70	J.D. 2419200 and J.D. 2423900	$11^m.2$ to $14^m.0$
5011	2415130 + 269^d E	45	J.D. 2418600 and J.D. 2423900	
U Cir	2412560 + 151^d E	52	around J.D. 241700	H.C. 231, Sp. S
5066	2415880 + 242^d E	31	J.D. 2418500 and J.D. 2420000	
5078	2414360 + 427^d E	16	J.D. 2418000 and J.D. 2420200	

4. H.V. 5015. The period remains constant but there is a large fluctuation in the range. From J.D. 2411190 to J.D. 2415960 the range is from $12^m.0$ to $12^m.8$. After J.D. 2416000 the range is from $12^m.0$ to $14^m.4$ with an extreme scatter at minimum of $\pm 0^m.7$. At maximum the scatter is less than $\pm 0^m.2$ for all points. There are 192 observations.
5. H.V. 5018 may possibly have half the period given, though it is unlikely.
6. H.V. 5025 has an anomalous light curve. It has a constant maximum for 60 days, a "stillstand" on the descending branch for 30 days at $15^m.7$, and a constant minimum for 40 days. There is no variation in the series of plates taken during one night. This variable needs further observations.
7. H.V. 5036. The period of 99 days fits fairly well for all observations, though the following change of period is indicated: from J.D. 2412550 through J.D. 2419200 the period is 99^d, 67 epochs; from J.D. 2423900 through J.D. 2426100 the period is $97^d.3$, 22 epochs.
8. H.V. 5037. The observed minima occur as follows:

[13.3	J.D. 2415071	one observation
15.0	2415413	one observation
14.5	2425300	well observed
14.0	2425700	well observed
13.5	2426100	well observed

The observations from J.D. 2423900 through J.D. 2426200 fit a period of 405 days. The light curve resembles that of an eclipsing binary. The early observations from J.D. 2411200 to J.D. 2423000 will fit a period of 366 days. There are 235 observations covering 38 years. But whether this variable is a long period, semiregular, or eclipsing is very uncertain.

9. H.V. 5054. Secondary maximum $12^m.2$, secondary minimum $14^m.4$. There are 117 observations covering 285 epochs.
10. H.V. 5060 cannot be a cluster type variable because the range is excessive and there is no variation in the night runs. There is an indication of a period in 1925 of $19^d.5$, range $10^m.0$ to $12^m.2$, twenty observations, but otherwise the variable appears irregular. It varies rapidly and the observations are too scattered to give any other indication of period. The star is probably similar to Z Camelopardalis and RX Andromedae.
11. H.V. 5065 has a companion at $16^m.0$ and probably there is another at $16^m.4$, although the latter may be the variable which then would have a nearly constant minimum for 275 days.
12. H.V. 5071. The period of $190^d.5$ fits approximately the observations since 1924. In 1929 the variable has irregular fluctuations during maximum. The early observations on B plates are too few and too scattered to determine a period.
13. H.V. 5074. Details are given in a separate contribution in this Bulletin.
14. H.V. 5075 has a small range, $0^m.7$, and shows no variation during the night runs, but whether it is really a long period is open to doubt.
15. H.V. 5077. Details are given in a separate contribution in this Bulletin.
16. H.V. 5084 is apparently a semiregular variable and the following table gives the elements. The variable may have a sinuous change but the observations are too scattered:

Elements	Number of Epochs	Number of Observations
J.D. 2412580 + 136^d E	29	25
2414740 + 159^d E	8	24
2415870 + 136^d E	16	18
2423890 + 159^d E	14	92

Between J.D. 2418100 and J.D. 2423880 there are no observations. The observations for 1930 again indicate a shorter period.

17. H.V. 5112 has 230 observations.

Observed Maxima		Observed Minima	
...	...	J. D. 2411100 to	J.D. 2411200
J.D. 2411900 to	J.D. 2414100	2414400	2415900
2415900	2418800	2420200	2420400
2420500	2422400	...	...
2423200	2423650	2423900	2424640
2424650	2426150	...	...

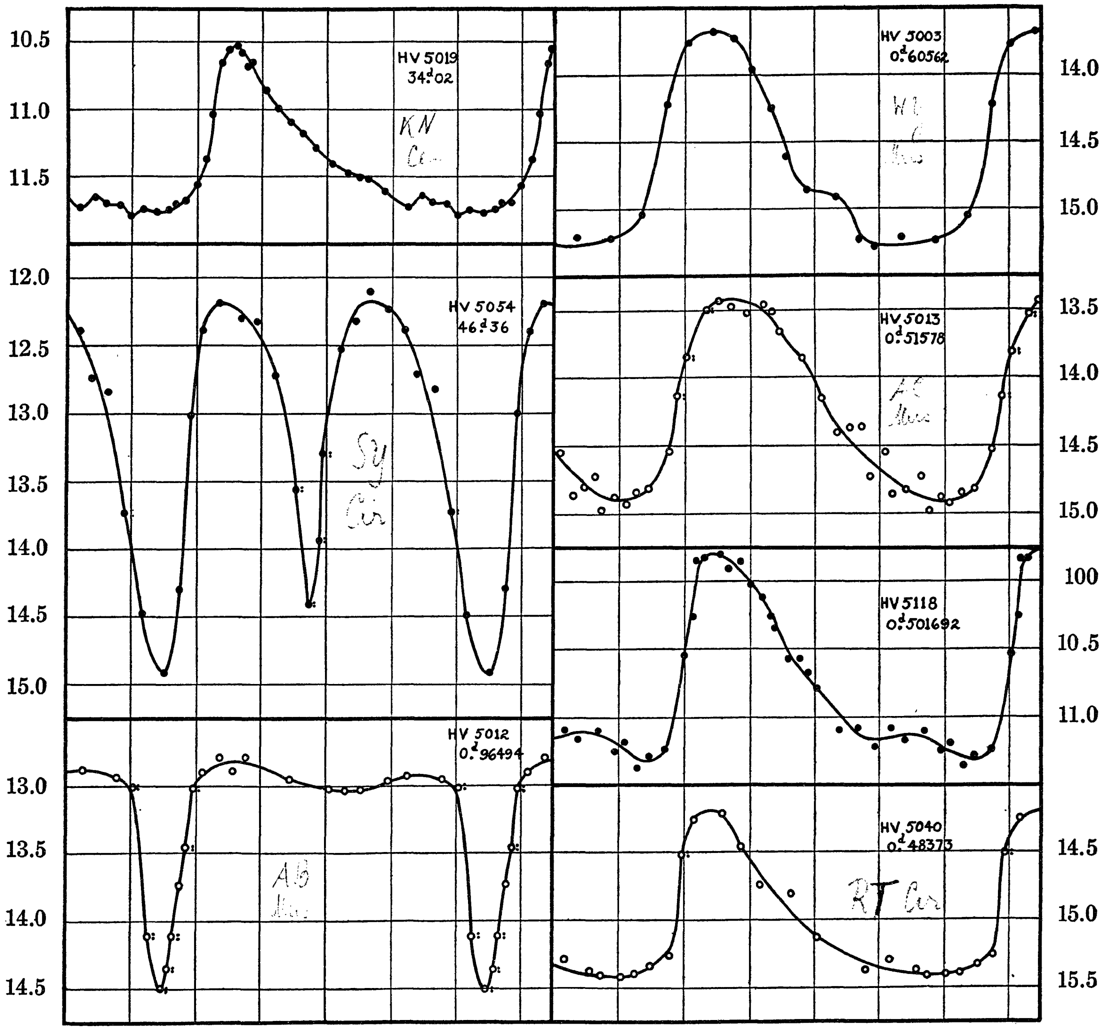
When the Julian days do not follow consecutively there are gaps in the observations.

18. H.V. 5115. The period given in the table fits all the observations except for one epoch at J.D. 2418500. This may indicate a small change in period. Before J.D. 2418400 the elements are J.D. 2414375 + 241^d E, 30 epochs; after that date the elements are J.D. 2423990 + 238^d E, 32 epochs. The change occurs between J.D. 2417800 and J.D. 2418400.
19. H.V. 5121 was discovered on plates taken in June 1914 when the nova had probably passed its maximum brightness. The observations on Harvard plates before and after it appeared are as follows:

Magnitude	Julian Date	Magnitude	Julian Date
[16.4	2418483	11.8	2420307
[11.9	20019	10.9	20314
[10.9	20278	10.9	20324
10.9	20282	10.9	20325
[10.9	20287	11.8	20346
10.9	20297	[14.5	21023

The nova has not been seen on any other plate examined for long period variables.

years that are covered by the observations. The last column also refers to notes which are listed at the end of the table, otherwise the remarks are self explanatory.



Light Curves for Seven Variable Stars in MWF 169

Dots are means of ten observations; circles are means of five observations; colons are used when there are less than the specified number.

The figure gives the light curves of seven of the best observed variables. No long periods are included as they have not enough positively seen observations to give a good mean light curve; most of the minima fall below the magnitude limits of the plates.

Of all the 137 variables in the field, including the two with periods already known, forty eight per cent are of long period, eighteen per cent are of cluster type, two per cent are Cepheids, sixteen per cent are eclipsing stars, eleven per cent are probably of short period, but of undetermined type, and the last five per cent includes irregular and unknown types, and one nova.

In previous fields the long periods have been noticeably regular. This present field is remarkable for the large number of semiregular variables and of long period variables with changing periods. It has been impossible to determine whether the change is sudden, secular, or sinuous, as the observations are too scattered and especially as there are no plates taken on this region between 1914 and 1924 suitable for measuring faint stars. Therefore in the notes an abrupt change of period has generally been assumed, rather than a continuous change, with one period for the early observations and another for the late. The period for the early observations may not always be exactly correct because of the scarcity of observations, but that there has been a change of period is certain.

The greatest frequency for the maximum magnitudes in this field occurs at $14^m.0$, and for the median magnitude of cluster type variables at $14^m.5$. These values are about half a magnitude brighter than for MWF 167 (H.B. 874, 1930) and more than a magnitude brighter, for the cluster type variables, than in MWF 185 (H.B. 852, 1928). It seems more probable that this difference represents a real effect of the distribution of the stars than that it arises from an oversight of the faint variables, since the method used has been the same as before and the number of plates superposed compares favorably with previous fields. It will be interesting to see whether the result is the same for MWF 168, which Miss Wright is examining, at latitude 0° between MWF 167 and this field, and partly overlapping both.

Henrietta H. Swope

Note on Stellar Variability in Galactic Clusters. — Twelve of the brighter galactic clusters: Messier 34, 35, 36, N.G.C. 457, 752, 1039, 3114, 3532, 6067, I.C. 2488, h–χ Persei, and Praesepe, have been examined to obtain evidence regarding the presence or absence of variable stars. The method of superposing a