The device may have several interesting applications: (1) to measure the magnitudes of faint stars in a bright moonlit sky, (2) to monitor the transparency of stars day or night, (3) to monitor the transparency of the sky by observing Polaris continuously. An arrangement for doing this is now being designed at the Amherst College Observatory. This latter project is being supported by the Research Corporation of New York.

*Amherst College Observatory,
Amherst, Mass.*

Hins, C. H. and A. Blaauw.* Star streaming among faint low-latitude stars.

The velocity distribution of the distant stars at low latitudes has been studied according to the dispersion method.¹ The method was applied to the improved proper motions in the northern Selected Areas, obtained by combining² the Radcliffe³ and the Pulkovo⁴ measurements ($m_{pg} = 11.5 - 14.4$), and to the McCormick proper motions ($m_{pv} = 10 - 13$).⁵

From the distribution of the proper motion components in a given direction in a certain area we derive the dispersion of the tangential velocity components in the corresponding direction by eliminating the influence of the solar motion and of the accidental errors of the proper motions. By combining the results from different areas we find the dispersion of the linear velocity components for various directions in space. A least-squares solution shows that the galactic longitude of the direction of greatest dispersion is 323.5 ± 1.8 (m.e.), the galactic latitude being assumed to be zero. This coincides with the direction of the galactic centre, but it is in contrast to the results of earlier investigations in which K. Schwarzschild's methods were applied, and from which the well-known vertex deviation toward greater longitude was found. Schwarzschild's methods are based on the distribution of the directions of the absolute proper motions. The discrepancy probably is due to the ambiguity in the determination of the position angle of the direction to the vertex in each area, which is inherent in Schwarzschild's methods, and to the influence of the accidental errors of the proper motions in these methods. Both give rise to an error in the vertex longitude. The vertex deviation therefore does not seem to exist for these distant stars in the galactic plane.

* Most of the work was done by C. H. Hins. The paper was presented by A. Blaauw.

The ratio of the axes of the velocity ellipsoid is found to be $.49 \pm .04$ (m.e.).

1. A. Blaauw, *B.A.N.* No. 315, 1939.
2. See *B.A.N.* No. 362, 1943.
3. *Radcliffe Catalogue of Proper Motions*, 1934.
4. *Pub. Obs. Central Pulkovo*, Series 2, **54**, 1940.
5. *Pub. Leander McCormick Obs.* 7, 1937.

*Leiden Observatory,
Leiden, Netherlands, and
Yerkes Observatory,
Williams Bay, Wis.*

Joy, Alfred H. The spectra of the brighter variables in the globular clusters.

The short period variables in the clusters number more than a thousand, but less than 50 with periods greater than a day have been found. Since the frequency of variables in the different classes is of great importance in connection with studies of the population of the clusters, a spectroscopic survey of the brighter variables within reach of the 100-inch reflector on Mount Wilson was carried out for the purpose of establishing, by means of radial velocity measures, membership in the clusters and of confirming the classification of the variables by the use of their spectra.

In this investigation spectrograms of 28 variables in 12 globular clusters were obtained. The radial velocity of one Mira-type variable, No. 14 in M22, was found to differ more than 200 km/sec from that of the cluster, indicating that it is a field star.

For each of four groups separated according to period, the number of stars observed, the probable type of variation, the range in spectral type, the difference in luminosity as compared with that of the cluster-type variables, and the occurrence of hydrogen emission lines are shown in the table. The photometric data are from the publi-

TABLE. BRIGHT VARIABLES IN GLOBULAR CLUSTERS

Period Days	No. Stars	Class	Mean Spectral Type	Ex- cess Mag.	No. with <i>H</i> Emission
1.1-2.8	7	1-2 day	A4-F3	0.8	None
5.1	1	Ceph.	cFo-cG2	1.8	None
13.6-33.6	13	W Vir and Ceph.	cF6-cG4	2.3	6
50-106	6	RV Tau and Irreg.	cGo-cG8	1.7	3

cations of Miss Helen Sawyer. The first group with short periods, early spectral types, and relatively low luminosities, may well be related to the cluster-type variables. The lack of δ Cephei variables with periods from 3 to 13 days where the galactic Cepheids are most frequent is extremely significant. Without a much larger amount of observational material it is impossible

to separate the W Virginis stars from the Cepheids with periods from 13 to 30 days. If we assume that hydrogen emission at the time of increasing light is a characteristic of W Virginis stars, as seems quite probable from knowledge at present available, then at least six (probably with further observation emission may be found in other stars) of the group of 13 stars belong to the W Virginis group—a much larger proportion than is found in the galaxy. The absence of Mira- and irregular M-type variables is striking.

The presence of the high velocity variables of the RR Lyrae, W Virginis, and the RV Tauri classes in the globular clusters, and the lack of variables of other classes, strongly support the idea recently advanced by W. Baade in regard to the preponderance of population of type II in the globular clusters.

*Mount Wilson Observatory,
Pasadena, Calif.*

McLaughlin, Dean B. The absorption spectra of Nova Geminorum 1912.

Velocities of the chief absorption systems of Nova Geminorum from 65 slit spectrograms are given in the table. Absorption I is the "pre-maximum" system; II is the "principal"; and III is the "diffuse enhanced."

The interpretations differ from those of Stratton and Wright in the following particulars:

- a. Absorption I continued as weak sharp lines at -230 km/sec.
- b. Absorption IIa was present before maximum light as a close companion of I. Its displacement increased until March 20 and only slightly thereafter.
- c. Component IIb did not branch from IIa March 29, but was present as a weak close companion March 22 to 26, and as a more distant companion March 15 to 19.
- d. The line at 1300 km/sec March 16 is interpreted as IIIa, while Stratton and Wright considered it the beginning of II.
- e. Absorption III had two components through most of its history, and not merely after March 29.
- f. Discordant hydrogen and metallic velocities March 22 and 23 are attributed to emergence of IIc, which was strong March 24 to 27.

The use of spectrograms taken at Allegheny, Lick, Lowell, Mount Wilson and Yerkes Observatories is gratefully acknowledged.

TABLE. NOVA GEMINORUM 1912

Velocities of absorption systems. (Negative, in km/sec.)

Mar.	I	CaII and IIc	IIa	IIb	IIIa	IIIb	Orion
13.7	364	660c	528				
15.7	452	709c	596	1011			
16.6	409	658c	717:	1064:	1300:		
17.7	360	612c	790	1134	1382		
18.8	380:	531c	772	1080	1350:		
19.7			750a	1082:	1540	1840:	1673
20.8			837b		1430	1678	1620
21.7			834	968		1610	1619
22.7	243	781m	820h	948	1364	1492	1305
23.7		770m	826h	980	1396	1490	1242
24.7	228:	758	852	986	1287	1395	1327
25.6		685	796	990	1409	1538	1457
26.6		670	776	970:	1400	1530	1512
27.6		708	850:		1580:	1760:	1852
28.7			802	990:	1490	1650	1440
29.6			803	1004	1506	1740	2114
30.6	236	696m	840	1006	1449	1711x	1663
31.6	232		848	1015	1508	1646x	1776
Apr.							
1.6		700:	824d	1018h	1598b	1598bx	1569
2.7	254	790mb	857h	1020h	1560	1734x	1830
3.6	218:	802mb	859h	1014	1577	x	1840
4.6		715h	862:		1660:		1659
5.6		790m	960b	1038:m	1604	1807:	2055

a—another component: hydrogen, -913 ; metals, -858 .

b—probably the velocity of a blend of two components.

c—CaII only.

d—hydrogen, -798 , metals, -851 .

h—hydrogen lines only.

m—metallic lines only.

x—component III c, -1860 approximately.

*Observatory, University of Michigan,
Ann Arbor, Mich.*

McMath, Robert R. and Orren Mohler. The use of a high dispersion spectrograph in the wave-length region 1.0 to 2.0 microns.

The recent development of photoconductive cells, sensitive in the near infra-red, has made possible the observation of the solar spectrum with a dispersion not previously possible. The McGregor tower telescope of the McMath-Hulbert Observatory and the McGregor Littrow-type spectrograph have been provided with a lead-sulfide, photoconductive cell, and means for recording the cell output. With this equipment we have produced a complete map of the infra-red solar spectrum on a scale of 1.6 mm/A, ending at 20,600Å. The wave-length limit of the map is set by the strong absorption of the telescope objective and the spectrograph collimator-camera lens. The measured resolving power on tracings obtained with this equipment is 32,000 at 16,000Å. Observations at large and small zenith distances from the sun have been made to aid in separating solar lines from the general background of terrestrial lines in this region of the solar spectrum.