servations are still too few to regard this period as definitive. So far there is a curious scarcity of observations of No. 10 near maximum. For No. 6, the indications are that the rise from minimum to maximum takes at least 40 days. The recent observations of No. 2 so far show such a small range that the variation, if real, would not have been noticed. No. 3 behaves like a slow variable, but it may prove to have a short period. Prof. Joy is investigating these brighter variables spectroscopically.

There appear to be seven variables which are probably RR Lyrae type and cluster members. The median magnitude of these variables is 15.62. Measured with the same sequence, the magnitude of the 25 brightest stars in the cluster is 14.73, with the 6th star at 14.3 and the 30th, 14.9. The value last determined by Shapley in 1918 for the 25 brightest stars was 14.89. The two values are in remarkably close agreement, in view of independent sequences and selection of stars. Four variables regarded as field stars are very faint, and at considerable distance from the cluster center. Because of its low southern declination, the cluster is accessible at the Dunlap Observatory for only a limited time each night, but it will be followed over a period of years until definitive periods can be derived.

The modulus of the cluster, uncorrected for absorption, may be taken as the mean magnitude

of the RR Lyrae stars, 15.62, and is half a magnitude brighter than the modulus of 16.14 published by Shapley and Sawyer in 1929, without regard to variables. Since the color excess as measured by Stebbins and Whitford is very high, $+0.29$, the cluster is probably relatively near to us, possibly as close as 3500 parsecs.

Table I gives a summary of the information on the variables in this cluster. The first nine variables were found by Bailey, the last seven by Sawyer. The coordinates of the new variables were measured to correspond as nearly as possible to the system used by Bailey.

1 *Circ. Harv. Coll. Obs.* 33.

2. *Ann. Harv. Coll. Obs.* 38.

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Seeger, Charles L. The variation of the Cygnus "radio star" at 205 Mc.

Seventy-five two-hour observations were made of the 205 Mc radio frequency radiation originating in the direction of Cygnus. The observations were grouped half in November and December 1948, and half in April and May 1949. The early observations show only occasional variability, while those of the later group were seldom non-variable. For all times when substantial activity was observed (approximately 1700 minutes) the average peak to peak period was 0.8 minutes. During any given two-hour period the rate might be 0.1 to 10.0 times this average value. The peak to peak period seldom varied by more than two to one during a two-hour period. This variability has been observed at substantially all altitudes of the source. The amplitude of the variations on occasion has reached values one hundred times the minimum detectable value. At these times the energy of the variable component has been equivalent to the total steady radiation received from approximately two hundred square degrees of the sky, centered on 42 degrees and 20 hours.

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Shapley, Harlow and Virginia McKibben Nail. Further evidence of supergiant long-period variables.

In 1923 the three brightest variable stars in the southern globular cluster 47 Tucanae were shown to be long-period variables of extraordinarily high luminosity at maximum. Their crowding toward the center of the cluster argued against the possibility of their being superimposed galactic stars. Some long-period variables were later

TABLE I. VARIABLE STARS IN NGC 6626

No.	x	y	Max.	Min.	Mean	Notes
Known Variables						
1	+174.0	+188.5	15.1	16.4	15.75	1
2	-47.3	+63.1	14.3	14.8	14.55	2
3	-32.9	+111.0	14.6	15.4	15.00	2
4	-34.5	+33.6	13.6	14.8	14.20	3
5	-44.8	+16.4	14.9	15.8	15.35	1
6	+34.1	+50.4	14.3	15.2	14.75	4
7	+172.2	+102.7	15.9	17.0	16.45	5
8	+227.3	-222.3	14.9	16.3	15.60	1
9	-158.6	-252.4	14.9	15.9	15.40	1
New Variables						
10	+96	-79	13.5	14.6	14.05	6
11	-14	+35	15.0	16.3	15.65	1
12	+148	-49	14.9	16.5	15.70	1
13	-92	-24	15.2	16.7	15.95	1, 7
14	-131	-100	15.7	16.2	15.95	5, 8
15	-472	-186	15.8	17.0	16.40	5
16	+432	-372	15.9	17.0	16.45	5

NOTES

1. Probably RR Lyrae type and cluster member.
2. Possibly slow variable.
3. Period probably 14 days, W Vir. type.
4. Period probably many weeks.
5. Probably field star.
6. Slow variable, type not yet known.
7. Double, south preceding varies.
8. Double, probably south component varies.

detected in the nearby Small Magellanic Cloud, but the large size of that galaxy made more reasonable the assumption that the red variables are superimposed and are not Cloud members. But the assumption is wrong.

Through a study that has extended over many years, it has now been demonstrated that at least a dozen bright variables of the Small Magellanic Cloud are actually members of that system and therefore supergiant long-period variables, at least three magnitudes brighter than the average magnitude of the long-period variable stars in the galactic system. Many of them have relatively small ranges, but both in amplitude and period there are numerous analogues in the galactic system.

To prove the membership of these variables in the Small Magellanic Cloud we have studied the variable star population, down to the 16th magnitude, in fourteen variable star fields with galactic latitudes between 30° and 80° and covering in total something over 1,000 square degrees. In these comparison regions we find on the average one long-period variable star with maximum fainter than the 12th magnitude to each 40 square degrees. But in an area of seven square degrees, centered on the Small Cloud, we find at least ten long-period variable stars with photographic maximum fainter than the 12th magnitude. That is, the long-period variables of the Cloud are some 50 times more numerous per unit area than elsewhere in high latitude.

Another result of the study is the almost complete absence of galactic long-period variable stars with maxima fainter than photographic magnitude 14 between $\beta = 30^\circ$ and $\beta = 90^\circ$. We have in this result a demonstration of the concentration of galactic long-period variables toward the galactic plane. Cluster-type Cepheids are much more widely distributed in high galactic latitudes; they are, as is well known, important component members of the corona of stars surrounding the discoidal Galaxy.

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Spitzer, Lyman, Jr. and Evry Schatzman. Polarization of light by interstellar grains.

Previous work has shown that the observed polarization of light from reddened stars can be understood if galactic magnetic fields, of about 10^{-5} to 10^{-4} gauss, exist, and if an appreciable fraction of the interstellar grains are ferromagnetic needles, which the magnetic fields then

orient. The existence of such magnetic fields follows from Fermi's theory of the origin of cosmic rays. Detailed processes have now been considered by which evaporation of the lighter molecules— NH_3 , CH_4 , and H_2O —can produce ferromagnetic grains.

One process considered is a direct collision between two grains. On the basis of the Oort-van de Hulst theory, a relative velocity of 2.9 km/sec is required to evaporate the lighter constituents, while a velocity of 5.6 km/sec is required for a temperature high enough to melt *Fe* or its oxides. Not all collisions within this velocity range will produce *Fe* grains. The dynamics of the collision process are complicated, but the following factors seem important: (a) the virtual explosion of the grain, if the thermal energy much exceeds that required to evaporate the dominant constituents; (b) the high rate at which a liquid water drop cools by evaporation, resulting in a temperature fall of 100° in about 10^{-6} sec for a drop 10^{-5} cm in radius; (c) the possible release of chemical energy by reactions within the grain, following even a mild collision.

Collision of a cosmic-ray particle with an interstellar grain may also produce heating. An *Fe* nucleus, with an energy of about 10^9 electron volts per nucleon, would heat up a grain 10^{-6} cm in radius by about 100° . The observed numbers of heavy nuclei in cosmic radiation give a mean time of about 3×10^7 years between such collisions. This heating might provide sufficient activation energy to produce chemical reactions that might evaporate the lighter constituents. In addition, slower cosmic-ray nuclei would produce more intense heating, and may be relatively abundant.

One ferromagnetic grain to every ten normal grains would certainly not be inconsistent with present information. Most such grains would contain a ferromagnetic core, surrounded by a shell of lighter atoms, formed by continuing accretion.

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Stahr, Martha E. The variation of solar radiation at 205 megacycles.

Observations of solar radiation on a frequency of 205 megacycles have been in progress at Cornell University from July, 1948 to June, 1949. The radiation has been recorded daily over a two-hour interval centered about local apparent