they are few in number, and I am not certain that they have an evolutionary significance.

3. The density of 10^5 H atoms per cm^3 seems altogether too large. A value of the order of 10^3 atoms would be more consistent with my own data. J. W. Chamberlain gives values ranging between 171 and 46,000 for different modes of excitation. But he prefers values of the order of 500. Unless the distance to the nebula is very much greater than 1000 parsecs, the value used by Fessenkov, this would allow only a mass of $0.01 \odot$ within the available volume of a filament—too little for the formation of a main-sequence star of the mass considered. Cederblad gives a distance of 400 pc; Chamberlain mentions as a possibility 1600 pc; and Oort uses 500 pc.

4. The spectra of the filaments are of the emission type—indicative of $T \approx 10,000^\circ$, or more. Cold grains are probably very rare. Hence the difficulty of the gravitational instability criterion would be well-nigh insuperable.

1. *Russ. A. J.* **28**, 492, 1951.

2. *Ibid.* **29**, 397, 1952.

*Berkeley Astronomical Department,
University of California,
Berkeley, Calif.*

Stuart, F. E. and J. H. Rush. Further evidence of 15,000 km cellular structure in the solar photosphere.

In 1950 Richardson and Schwarzschild obtained a high quality spectrogram exhibiting small Doppler velocities in solar granules.¹ They noted only a slight correlation between velocity and brightness for the small granules. Later, Frenkiel and Schwarzschild found in the turbulence spectrum calculated from these velocity data evidence of cells spaced approximately 15,000 km apart.²

From Richardson and Schwarzschild's published data we confirmed the existence of a weak positive correlation between ascending velocities and brightness ($r = 0.3$). We then applied a running-mean procedure to reduce the effects of large scale fluctuations, and obtained an improvement in the correlation ($r = 0.5$) that can only be interpreted as evidence that the bright small granules are, in general, ascending.

We also analyzed several excellent white-light photographs of the solar disk taken by W. A. Miller at R.C.A. Laboratories, Rocky Point, Long Island. Microdensitometer traces of these plates revealed a brightness structure with a mean spacing of 15,000 km. The r.m.s. deviation from the mean brightness averaged about 1 per

cent of the mean brightness. It is tempting to identify these brightness fluctuations with Frenkiel and Schwarzschild's velocity fluctuations.

This research was supported in part by the Radio Corporation of America.

1. *Ap. J.* **111**, 351, 1950.

2. *Ap. J.* **116**, 422, 1952.

*Department of Physics,
University of Colorado,
and High Altitude Observatory,
Boulder, Colo.*

Tombaugh, Clyde W. Some research suggestions for the coming opposition of Mars.

Some principles of telescope optics and atmospheric seeing as related to observation of planetary detail are discussed. The definition of fine dark detail on a bright background is not governed in the same way as is fine bright detail on a dark background because of the phenomenon of irradiation. It is a serious mistake to attempt observation for fine Martian and lunar detail with a magnifying power of less than 30 per inch of aperture and without a yellow-to-amber color filter.

The advantages of eccentrically-placed circular diaphragms on large reflecting telescopes are described in the hope that observers will use this efficient device in direct visual and photographic observations during the coming oppositions of Mars. The use of the amber filter has special advantages in observing Mars for surface detail.

Spectrographic, radiometric, and polarimetric observations should be made with special emphasis on certain Martian regions at particular Martian seasonal dates to test various questions of planetological importance. This will require the teamwork of several investigators. The work may be coordinated by the newly-formed Mars Committee.

In tests for water vapor, particularly, the slit should be guided on those regions of the Martian disk at a seasonal date when water vapor is expected to lie over them.

Since direct terminator irregularities have serious limitations for Mars, an attempt should be made to compile a rough topographic map by measuring differences in intensity of the weak carbon dioxide bands over different Martian regions with the new and powerful infrared spectrographs attached to large reflectors. A radiometric observing program should parallel the spectrographic one. There are a dozen selected areas which are of special interest to test certain meteorological and geological concepts.