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CALIFORNIA INSTITUTE OF TECHNOLOGY  
PASADENA

ASTROPHYSICAL OBSERVATORY

October 31, 1932

Dr. Max Mason  
Rockefeller Foundation  
61 Broadway  
New York.

Dear Mason:

Thanks for your letter of October 15. I referred your question to Anderson, who has been making a general study of stellar scintillation, and has considered meteors as a possible cause of the residual effects observed telescopically under the best atmospheric conditions. I enclose his statement, which refers, you will notice, only to meteors easily seen with the naked eye.

It is very difficult, of course, to estimate the number of smaller particles in space, but in some regions they seem to be very numerous. Thus the extensive dark nebulae appear to be composed chiefly of fine dust. Seares, Hubble and others have found that the stars within or beyond them are almost invariably redder than average stars of the same spectral class. This might be due to gas, but fine dust particles would be much more effective. General interstellar space, however, away from such obscuring clouds, has thus far shown little or no evidence of general or selective absorption.

Since writing the above I have received your letter of October 25. Dr. Strong, who developed here the method of condensing quartz and metals on various surfaces, is a very able physicist, formerly a National Research Fellow. The thin layer of quartz does not seem to be such an effective means of protecting silver as we had expected, but if anyone can perfect a process for this purpose, Strong is certainly the man. As for the condensation of metals, he has had great success with small mirror discs, and probably the same method can be used for large mirrors. One of the advantages is the great reduction of scattered light, a troublesome defect of the ordinary silvering process, because of the countless fine scratches due to the unavoidable burnishing.

Very sincerely yours,

George E. Hale

GEH:G

A star viewed through a small telescope (2 in. or smaller) fluctuates in brightness sometimes as rapidly as 30 to 50 times per second. The cause of this is supposed to be optical striae in our atmosphere. The magnitude of the oscillations in brightness varies from very small up to two or three magnitudes.

The number of meteors striking the earth in 24 hours, which are bright enough to be seen comfortably with the naked eye, is estimated at about 20,000,000. Since the volume of the space traversed by the earth in 24 hours is around  $7.5 \times 10^{13}$  cubic miles, this gives for the density of meteors in the neighborhood of the earth's orbit, one meteor per 3,000,000 cubic miles.

J.A.A.