via their rotation-vibration bands and rotation lines. It is to be hoped that this mechanism will make the isothermal assumption used in the theory of diffusion and viscous momentum transport a good postulate. Otherwise, still smaller meteoric densities are in prospect.

For the present then it seems best to tentatively adopt the model of isothermal diffusion whence the density of the meteoroids comes out to be for spherical meteoroids,

$$\rho_m = 0.05 \pm 0.02 \text{ gm cm}^{-3}.$$

Too much emphasis should not be put on this numerical value until it is confirmed by data from other trains. The value of the luminous efficiency factor found is such as to multiply the masses on the system of Jacchia by a factor 220 ± 150 . Thus, Jacchia's masses appear to be about two orders of magnitude too small.

A recent investigation by the author on the role of heat conduction in ballistic pellets leads to a heat transfer coefficient 0.05 for velocities of 3 to 5 km/sec. This value may be taken as a lower limit. An upper limit can be established by taking the heats of formation for Fe_2O_3 , MgO and SiO_2 using the abundances of Fe , Mg , Si and O for stony meteorites. The additional heat of formation of silicates is negligible by comparison. The result is an upper limit upon the heat of ablation, S' . The observed constants entering the equations for meteoric intensity and velocity may be combined with the limit on S' to find an upper limit of 0.21 on the heat transfer coefficient. Conversely, the lower limit 0.05 can be used to find a lower limit on S' by employing the same observed constants. The results are

$$\Lambda = 0.13 \pm 0.08,$$

$$S' = 1.3 \times 10^{11} \pm 0.8 \times 10^{11} \text{ ergs gm}^{-1}.$$

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Cuffey, James. Tests of an improved iris photometer.

The correction of iris photometer readings for varying background density due to brightness of sky was investigated. Photographs of a series of artificial stars covering a 4 magnitude range in brightness were fogged by post-exposure to densities 0.3, 0.4, 0.5, and 0.6. Plots of magnitude against iris reading show, as might be expected, that the faintest images are more sensitive to fog than the brightest ones. A table formulated on the basis of the curves shows the corrections, as a function of background density and apparent

magnitude, necessary to reduce iris readings to a standard background density of 0.3. The results permit some interesting conclusions to be drawn concerning the errors introduced if one does not correct for background fog, whether caused by sky brightness, or by superposed nebulosity. Thus, a faint star, $m = 15$, will give iris readings 1.5 mag. too bright when measured against a background nebulosity of density 0.6. For bright stars, the errors are much smaller; a tenth magnitude star will appear 0.3 mag. too bright if measured on a nebula of surface density 0.5.

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Dennison, Edwin W. The Upper Air Research Observatory contour densitometer.

The present Upper Air Research Observatory contour densitometer is a further development of the instrument recently built at the High Altitude Observatory (Fowler, Johnson and Billings, 1953) which was based on a suggestion by H. W. Babcock (1950).

The linear resolution is approximately 1/500th of the linear dimension of the scanned area. This area is seven by seven centimeters on the cathode ray tube and is reduced by a factor of ten to the film or plate being analyzed. This resolution is limited by the smallest illuminated spot which can be produced on the face of the tube.

The density resolution is such that two isophotes which differ from each other by 0.03 of a density unit can be just distinguished at a photographic density of two. At a density of one, two isophotes may be drawn which differ by 0.01 of a density unit. This limitation is almost entirely the result of the shot noise resulting from the electronic current at the photocathode of the photomultiplier. Consequently the density resolution can be improved by increasing the brilliance of the cathode ray tube or by increasing the speed of the optical system. Each of these steps has an associated disadvantage, e.g., shortened tube life, critical focusing, etc.

Ten seconds are required to make a complete trace, regardless of the complexity of the object. In the design and construction of this instrument the accuracy and resolution have been somewhat compromised in order to achieve the rapid operation.

Babcock, H. W. 1950, *Pub. A.S.P.* **62**, 18.
Fowler, F. E., D. S. Johnson and D. E. Billings 1953, *J. Opt. Soc. Amer.* **43**, 63.

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