An Isophotal Map of the Zodiacal Light. FRANKLIN E. ROACH, *National Bureau of Standards, Boulder*.—An isophotal map of the zodiacal light has been made covering most of the observable sky between astronomical twilight and astronomical dawn. The region covered extends from elongation 30° to 180° (gegenschein) along the ecliptic and from ecliptic latitude 0° to 90° . A single analytical expression has been developed giving the brightness as a function of ecliptic coordinates. Of particular interest is the fact that the brightness at the pole of the ecliptic is about $100S_{10}$ (vis) units. A full report is in preparation in collaboration with L. L. Smith and R. Owen.

Stellar Magnitudes and Atmospheric Extinction. EDWIN A. ROTH AND RICHARD A. BERG, *U. S. Air Force, Aeronautical Chart and Information Center, St. Louis*.—Both visual and photographic stellar magnitudes have been established by arbitrary empirical methods. Although a somewhat systematic division or categorization has developed, most studies in the past have dealt with observations near sea level. This study explores methods for determining the total magnitude change from stellar extinction by the atmosphere. Assuming a plane, parallel, and homogeneous atmosphere, the quantitative effect of extinction is determined by considering the separate effects of molecular absorption, molecular scattering, and particle scattering. The Kovalevski or lens effect of the atmosphere is considered in the discussion of the qualitative effect of extinction.

Extinction is also determined by taking the difference between the radiometric and bolometric magnitudes. The paradox which develops is discussed in light of the definitions of bolometric and radiometric magnitude and resolved. This quantitative measure of differences is compared to previously published values of extinction. The magnitude correction ranges from -0.30 to -0.55 with an average of -0.4 .

From the analysis, it is concluded that small, subtle changes of the order of one magnitude can be detected in the appearance of celestial objects and measured. Thus, atmospheric-extinction effects may be important considerations in the design of automated stellar-identification devices associated with space-navigation systems. However, effects on other space-navigation problems and stellar charting should be minimal.

It remains for the Orbiting Astronomical Observatory to furnish us with more definitive field observations.

Nitrogen Oxides on Mars. CARL SAGAN, *Harvard College Observatory and Smithsonian Astrophysical Observatory*, PHILIP L. HANST, *AVCO Corporation*, AND ANDREW T. YOUNG, *Harvard College Observatory*.—In a series of recent papers, Kiess and collaborators have announced the identification of nitrogen peroxide on Mars, and have attempted to interpret a wide range of Martian phenomena in terms of nitrogen oxides. Analyses of observations at a variety of wavelengths in the present paper, and previously by Sinton, Spinrad, and Moroz, place a firm upper limit on the Martian NO_2 abundance of 1 mm-atm. Nitrogen dioxide is a highly photolabile gas, and will be photodissociated by visible and ultraviolet radiation on Mars. The photochemical equilibria of nitrogen oxides on Mars have been computed from the observational upper limits on the NO and O_2 abundances. The same procedure gives consistent results for the earth, at locales free from urban pollution. The corresponding theoretical upper limit to the abundance of NO_2 on Mars is 1 mm-atm, when reactions with water are neglected. When reactions with water are considered, the NO_2 abundance is further diminished. These low abundances are inadequate to account for the Martian observables discussed by Kiess *et al.* The one Martian phenomenon in which nitrogen peroxide may play a role is the blue haze, where 1 mm-atm may help to explain not only the general blue and violet opacity, but also the dependence of the opacity on time and position. The required abundance of NO must then be >50 cm-atm. Kiess *et al.* have expressed the opinion that the quantity of nitrogen peroxide on Mars is so large as to exclude indigenous life. It is of interest to note that a typical value for the abundance of NO_2 over the city of Los Angeles is 5 mm-atm.

Early Evolution of a White Dwarf. M. P. SAVEDOFF AND S. C. VILA, *University of Rochester*.—Arguments are presented to support the proposition that faint white dwarfs are much cooler than when formed. In particular, it is shown that Sirius B probably has existed as a white dwarf for a period exceeding 5×10^8 yr.

However, Sirius A is probably less than 2×10^8 yr old. This inconsistency can best be resolved by finding additional energy losses to cool Sirius B of which the speculative neutrino processes look most interesting. Alternative explanations are explored.

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