event were made simultaneously. Analysis of the 3.15- and 9.4-cm records indicate that the times at which abrupt changes in the slope of the flux curves occur, coincide with the times of intersection of the moon's limb with the H-alpha plage regions. The times of slope changes at 3.15 cm preceded the times of slope changes at 9.4 cm, showing the well-known height wavelength relationship. Assuming the radio sources extend radially above the H-alpha plages, the average minimum heights above these regions for six radio sources were found to be 27 000 and 40 000 km for 3.15 and 9.4 cm, respectively. The size and brightness temperature of these radio sources may be determined from the observed motion of the moon across each region and the measured flux increases during transit. Preliminary calculations indicate that the radio source size is of the order of 0.8 minute of arc; and that the average brightness temperatures for 3.15 and 9.4 cm are 1.8×10^6 ° and 6.8×10^6 °K, respectively.

Line Blending in Stellar Spectra. J. H. EVANS, L. HALLGREN, V. L. PETERSON, D. C. SCHMALBERGER, and MARSHAL H. WRUBEL, *Astronomy Department, Indiana University*.—Earlier theoretical studies of line blending have been restricted to simple cases because of computational limitations. The availability of high-speed digital computers now makes it possible to include the dependence on depth of all the physical quantities, such as the number of absorbers and the continuous opacity, which contribute to the profile of the blend. Preliminary studies are being made with the IBM 650 of the Indiana University Research Computing Center. The application of these computations to the interpretation of blends produced in the solar atmosphere will be discussed.

The Effect of Nonsphericity on the Interstellar Extinction Curve. J. M. GREENBERG, A. MELTZER, AND J. C. PEDERSEN, *Rensselaer Polytechnic Institute*.—An approximate method of calculation has been applied to determine the effects of nonsphericity on the difference between the wavelength dependence of the extinction as a function of the kind of orientation of the particles. Using a reasonable distribution of particle sizes such as that of Oort and van de Hulst, one finds different deviations from the λ^{-1} law in the short wavelength region depending on whether one views along or perpendicular to magnetic field directions. The orientation mechanism which is assumed is that of Davis and Greenstein. An analysis of existing observational data is being made for the purpose of comparing with the qualitative features of the calculations.

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Measurements on the Extinction and Polarization of Light by Nonspherical Particles. J. M. GREENBERG AND N. E. PEDERSEN, *Rensselaer Polytechnic Institute*.—A microwave analog method has been developed to give the total cross sections, angular distributions, and polarization of light scattered by nonspherical particles. Some data pertaining to the interstellar absorption and polarization are presented, and the effects on the interpretation are discussed. It is shown that the polarization and wavelength dependence of the extinction can probably be used somewhat independently to determine the nonsphericity of the particles. Some interesting variations of scattering cross sections with orientation are discussed.

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Photometry of the Brighter Stars in the Scorpius Region. R. H. HARDIE, *Dyer Observatory, Vanderbilt University*.—Three-color photometry of stars earlier than AO (HD type) located north of -30° declination in the Scorpius-Centaurus Association is presented. These include stars near β Sco, δ Sco, π Sco, ρ Sco, σ Sco, τ Sco, 13 Sco, and τ Lib, which form the northern end of the long extended region covered by the association. The color-magnitude diagram is discussed in relation to the absolute magnitudes of the stars.

The Redshift. GERALD S. HAWKINS, *Boston University and Harvard College Observatory*.—The spherically symmetric metric of general relativity has the polar form,

$$ds^2 = -e^{\lambda} dt^2 - r^2 d\theta^2 - r^2 \sin^2 \theta d\phi^2 + e^{\nu} dr^2. \quad (1)$$

In a static fluid of density ρ , pressure p , the components of the energy-momentum tensor become

$$8\pi p = e^{-\lambda}[(\nu'/r) + (1/r^2)] - 1/r^2, \quad (2)$$

$$8\pi\rho = e^{-\lambda}[(\lambda'/r) - (1/r^2)] + 1/r^2, \quad (3)$$

where $\nu' = d\nu/dr$. For a homogeneous fluid we may take $p + \rho = 0$. By solving for λ and ν the metric becomes, in cgs units:

$$ds^2 = \frac{-dr^2}{1 - (8\pi/3c^2)G\rho r^2} - r^2 d\theta^2 - r^2 \sin^2 \theta d\phi^2 + [1 - (8\pi/3c^2)G\rho r^2] dt^2. \quad (4)$$

This is the general relativity line element for a static universe and it includes the effect of the material in the universe of mean density ρ . Since this is a static solution,

$$\delta t/\delta s = [1 - (8\pi/3c^2)G\rho r^2]^{-1/2}. \quad (5)$$

This relates the observed period δt to the interval δs at rest, and the wavelength λ observed from a source at a distance r is increased in the ratio

$$\lambda/\lambda_0 = 1 + (4\pi/3c^2)G\rho r^2. \quad (6)$$

Thus, the following redshift law is predicted:

$$(\delta\lambda/\lambda) = (4\pi/3c^2)G\rho r^2. \quad (7)$$

A redshift is therefore a necessary property of a static universe and is related to the difference gravitational potential between galaxies. As a corollary, if the observed redshifts agree with this prediction we may conclude that the universe is indeed static and the concept of a large scale expansion becomes unnecessary. The gravitational redshift is proportional to the mean density ρ and to the square of the distance, in contrast to the linear relation of Hubble. A good fit is obtained with the observational data out to a distance of 10 megaparsecs taking the mean density as 3×10^{-26} g cm $^{-3}$ and the Hubble constant as 180 km sec $^{-1}$ /megaparsec. The deviation from an r^2 law beyond 10 megaparsecs is of interest. The deviation occurs at the boundary of the super cluster where the concentration of galaxies begins to decrease. The linear redshift law would be approximated if we assumed that the density ρ decreases by a factor of 10 beyond the edge of the super cluster. Since these densities are possible we might take a stationary universe as a working hypothesis. It is of interest to note at this stage that there is an approximate radiation balance in the universe; a galaxy such as M31 receives almost as much radiation from the universe as it emits. The hypothesis of a stationary universe leads to other conclusions. The lifetime of the universe may be increased by several orders of magnitude beyond the current estimates. The mean density of clusters of galaxies must be less than 7.12×10^{-22} divided by the square of the diameter in megaparsecs. The shift is progressively red, at no distance would we expect it to become systematically blue. The redshift from members of a cluster of galaxies should be greater than that from field galaxies because of the gravitational potential of the cluster.

The Older Meteor Streams. G. S. HAWKINS AND R. B. SOUTHWORTH, *Harvard College Observatory*.—A criterion, distinguishing members of a meteor stream from nonmembers, has been established as follows. A function $D(A, B)$ of the orbits of any pair of meteors A and B has been chosen to represent the difference between the orbits. The function $D(A, B)$ is approximately the velocity increment that perturbs one orbit into the other, where velocity is measured in units of the speed in a circular orbit. Within known streams, the difference $D(M, N)$