In the case that the magnetic lines of force are perpendicular to the line of sight, we find the relation between polarization and distance

$$p/r = 0^m.000045 \text{ pc}^{-1},$$

and with Hiltner's maximum value of $p/A_v = 0.065$, the amount of interstellar extinction A_v within 25 pc around the sun is estimated to be

$$A_v/r = 0^m.0008 \text{ pc}^{-1}.$$

Observations at distances between 25 and 250 pc generally show an increase of the density of the polarizing matter, the influence of the Taurus and Ophiuchus clouds being evident. Though the scattering of the planes of vibration as well as the scattering in the amount of polarization are high, a preferential alignment of the planes of vibration parallel to the local spiral arm can be observed. The most probable value for the galactic longitude of the vertex of the spiral arm is

$$l = 30^\circ \pm 5^\circ.$$

A polarizing cloud in high galactic latitude has been found in Boötes. The density of polarizing matter is at least five times as high as in the neighborhood of the sun within 25 pc. This cloud also can be found in the results of the measurements of the 21-cm line emission of neutral hydrogen by Erickson, Helfer, and Tatel.

Mass and Mass Distribution in the Andromeda Nebula and the Galaxy. JOHN C. BRANDT, *Yerkes Observatory*.—The theory for the analysis of galactic rotation curves to determine the mass distribution has been developed for the special case of a highly flattened system. This is done by compressing a sequence of spheroidal homoeoids into a surface distribution of matter. The resulting integral equation is then essentially Abel's equation, and the mass distribution can be obtained as an explicit integral of the rotation curve. A family of analytic rotation curves is introduced, and the necessary constants relating to the mass distribution have been tabulated for two members. Aside from observational consistency, the existing determinations of the total mass must, in general, be adjusted so that the mass refers to the entire galaxy, and not just to the mass in homoeoids out to a certain point (often the point of the observation farthest from the center of the galaxy). The determinations of the mass of M31 by Babcock, Wyse and Mayall, Schwarzschild, Lohman, Schmidt, and this investigation can be shown to be mutually consistent with all of the adjusted values lying between 3.5 and $4.0 \times 10^{11} M_\odot$ for a distance of 600 kpc. The theory may also be applied to the problem of the mass of the Galaxy. From the radio observations, a simple expression for the mass of the Galaxy in homoeoids interior to the sun $M(R_0)$, can be obtained with H_0 and R_0 left as undetermined parameters throughout. This expression can be written entirely in terms of R_0 and goes essentially as R_0^3 . With the uncertainty in R_0 , the value of $M(R_0)$ is very uncertain. Further, the existing rotation curve leaves the value of the mass in homoeoids exterior to the sun ill determined. The combination of these two effects means that the total mass of the Galaxy is known only as to order of magnitude.

The Double-Lined Binary Alpha Octantis. W. BUSCOMBE AND P. M. MORRIS, *Mount Stromlo Observatory*.—Radial velocities have been measured from 24 new spectrograms of HD 199532, which together with eight measures previously published from Lick Observatory, make possible a solution of the orbit. The dispersion of both sets of plates is about 36 Å/mm at $H\gamma$. On six of the Mount Stromlo spectrograms, double absorption lines are resolved. The measures indicate velocity curves of the same amplitude (47 km/sec) corresponding to stars of equal mass. The period is 9.073 days, and the system velocity +45 km/sec. The MK classes are F4 III–F5 III. The eccentricity is 0.39 and primary periastron in longitude $276^\circ 13'$ at JD 2435302.404. The mass-function 0.304 combined with masses each twice the sun's, corresponding to the luminosities,

would indicate an inclination 23° between the normal to the plane of the orbit and our line of sight. As the projected semi-major axis is 5.4×10^6 km, and the stellar radii are 3×10^6 km, only very shallow grazing eclipses may be possible.

Curve of Growth of C_2 Absorption Bands Applied to the Problem of the C^{12}/C^{13} Abundance Ratio. JOHN L. CLIMENHAGA, *Victoria College*.—The curve of growth for a section of the 1,0 C_2 Swan band has been determined to try to obtain an improved value of the C^{12}/C^{13} abundance ratio in the atmospheres of the cool carbon stars. The Minnaert semiempirical equation $1/R_\lambda = 1/R_c + 1/\tau_\lambda$ was used to compute profiles for the head-forming regions of the $\lambda 4737$ $C^{12}C^{12}$ and $\lambda 4745$ $C^{12}C^{13}$ Swan bands for different numbers of absorbing molecules, first assuming no C^{13} is present, and secondly assuming for the abundance ratio C^{12}/C^{13} the three values 100, 20, and 4. There is good general agreement between computed and observed band profiles. Curves of growth were constructed for the head-forming region of the $C^{12}C^{12}$ band. Equivalent widths of the bands in stellar spectra all fall beyond the linear part of the curve of growth. Data from single-prism Victoria spectrograms of eight R-type stars showing $C^{12}C^{13}$ bands was used in conjunction with the curve of growth and a mean value of 5.8 was found for C^{12}/C^{13} . By using tracings of five high-dispersion spectra (kindly made available from Mt. Wilson and Palomar, and Victoria observatories) of two of these R-type stars and the curve of growth, a mean value of 4.7 was found for C^{12}/C^{13} . It was for the above stars that McKellar in 1948, neglecting curve-of-growth effects, obtained a ratio of about 3.5. The present values are in better agreement with the value of 4.6 determined from nuclear theory to represent the equilibrium ratio of C^{12}/C^{13} when the CN cycle is in operation. From additional high-dispersion spectrograms, abundance ratios of 8 and 16 were found for the N-type stars 19 Piscium and DS Pegasi. These values compare with the minimum ratio of about 10 reported for 19 Piscium by Wyller in 1958.

On the Reversal of the Sense of Rotation in Solar Microwave Bursts. M. H. COHEN, *Cornell University*.—The high-frequency theory of magneto-ionic mode coupling predicts a frequency, f_c , for critical coupling in a quasi-transverse (QT) region. If $f^4 \ll f_c^4$ there is weak coupling. One mode cannot excite the other, so that a wave composed of only one mode has its polarization change as the medium changes. If this wave passes through a QT region such that the longitudinal component of magnetic field is oppositely directed on the two sides of the region, its sense of rotation will be reversed. If $f^4 \gg f_c^4$ there is strong coupling, and the polarization is constant across the QT region. The critical frequency is given by $f_c^4 = 10^{17} N S B^3$, where N = electron density (cm^{-3}), S = scale of magnetic field (cm), and B = strength of magnetic field (gauss). It has been observed (Tanaka and Kahinuma, 1959) that about $\frac{2}{3}$ of the wide-band polarized microwave solar bursts have a sense of rotation which reverses at about 4000 Mc. It is suggested that this may be explained by the passage of the ray through a QT region in the lower corona, above an active region.

Winds in the Upper Atmosphere. A. F. COOK, II, *Harvard College Observatory*.—Various types of running waves including those discussed by C. O. Hines are considered as possible explanations of the observed distortions of meteoric trains. The Coriolis force is included so that the results apply to all frequencies. However, at periods much shorter than twelve hours and at meteoric heights the Coriolis force introduces only a minor perturbation. In addition to the gravity waves discussed by Hines, highly modified sound waves may also occur. Hines' results for the gravity waves are recovered, viz., nearly horizontal velocities of motion of the air for nearly vertical propagation of the waves. The modified sound waves corresponding to the observed wavelengths of distortions of meteoric trains require periods so short that the corresponding variations with time in the distortion of meteoric trains should have been observed. Since they are not