then give an upper limit to the integral of longitudinal magnetic field times electron density along the ray path. It is shown that Hatanaka's measurements (Hatanaka *et al.* 1955) of solar bursts are not inconsistent with the assumption of dipole-type magnetic fields in the corona, with a field strength of one gauss at the pole. Possible measurements to determine the dispersion are discussed.

Hatanaka, T. 1955, "The Faraday Effect in the Earth's Ionosphere with Special Reference to Polarization Measurements of Solar Radio Emission," *Research Report EE 257*, School of Electrical Engineering, Cornell University, Ithaca, N. Y.
Hatanaka, T., Suzuki, S. and Tsuchiya, A. 1955, *Proc. Japan Acad.* 31, 81.

*School of Electrical Engineering,
Cornell University,
Ithaca, N. Y.*

Cook, Allen F. and Hawkins, Gerald S. Inadequacy of recombination as the source of radiation from meteoric trains.

The assumption is made that recombination of ions and free electrons produces the observed luminosity in meteoric trains. Available theoretical and observational results are used to establish an upper limit on the intensity of radiation from this source. Recombination is shown to fail by a factor of more than two hundred to account for the observed intensity.

*Harvard College Observatory,
Cambridge, Mass.*

Davis, Robert J. Ultraviolet stellar magnitudes.

Computations are performed from which it is possible to construct a tentative map of the sky at 1249 Å. For normal stars, it is assumed that the energy distribution can be represented by a Planck function at a temperature depending only on spectral type. Wolf-Rayet stars, nuclei of planetary nebulae, certain peculiar A stars, the sun, and the moon are considered separately. Interstellar reddening is taken into account on the assumption that absorption varies as $1/\lambda$. The limiting magnitude is taken as +2.0 in the ultraviolet; 218 objects prove to be brighter than this limiting magnitude. Of these 211 are normal, only the sun is of spectral type later than A1. The results of this survey may form the basis for a rocket experiment, or for an experiment from an artificial satellite.

*Harvard College Observatory,
Cambridge, Mass.*

Deutsch, Armin J. The dead stars of Population I.

It has been shown that the M5 II star α Herculis and its visual companion are enveloped in an expanding gas cloud with a diameter of at least 150,000 times that of the sun. This gas has been expelled from the M star and is being lost into the interstellar medium at a rate of at least a solar mass in 3×10^7 years. Since the shell-type absorption lines of this envelope are characteristic of all M stars more luminous than normal giants, it is probable that all these objects are losing mass at a comparable rate. By extrapolation of the observed rate of mass-loss and the observed space-density of M giants backwards for 5×10^9 years, it is found that the number of M giants that have "died" is nearly equal to Salpeter's estimate of the total number of "dead" stars of Population I. This is the number of stars that have populated the main sequence above $M_v = +3.5$. The remnants of these originally massive stars are probably the white dwarfs. Half or more of the present interstellar gas may once have been in an M giant. A large fraction of the He, C, N, O, Ne, and the stable elements heavier than Cu, which are now in interstellar gas and early-type stars, may have been synthesized in the hot cores of these past generations of M giants.

*Mt. Wilson and Palomar Observatories,
Pasadena, Calif.*

Duncombe, Raynor L. Relativity effects for the three inner planets.

Results of a recent discussion of the meridian observations of Venus 1750-1949 have been examined for the relativity effect in the observed motion of the perihelion. Corrections to Newcomb's theoretical secular variations of the perihelia of Mercury, Venus, and the Earth due to the introduction of a new system of planetary masses (Clemence and Brouwer 1955) were applied and the empirical terms were removed. The correction $+0''.79 \pm .13$ to Newcomb's value of the general precession ($+1''.50$ to the value used in his tables of Venus), given by Clemence and Brouwer, was used. The deduced theoretical secular variations followed by the observed values are given in the table. The probable errors of the theoretical values arise from the probable errors of the new system of planetary masses and of the revised precession.

The observed secular motion of the perihelion

	Mercury	Venus	Earth
$eD_{\text{rel}} (T)$	$1142''.730 \pm .040$	$34''.472 \pm .006$	$103''.520 \pm .004$
$eD_{\text{rel}} (O)$	$1151.593 \pm .084$	$34.529 \pm .032$	$103.604 \pm .020$
$eD_{\text{rel}} (O-T)$	$8''.863 \pm .093$	$''057 \pm .033$	$''084 \pm .020$
Rel. Eff.	8.847	.059	.064
$D_{\text{rel}} (O-T)$	$43''.11 \pm .45$	$8''.4 \pm 4''.8$	$5''.0 \pm 1''.2$
Rel. Eff.	43.03	8.6	3.8

of Mercury is that derived by Clemence (1943), while the value for the Earth is a weighted mean of the determinations by Morgan (1945), Clemence (1943), and Duncombe (not yet published). The probable errors of the observed variations of Mercury and Venus are those given by their respective solutions, while for the Earth it is that derived from the probable errors of the three determinations mentioned.

The observed relativity effects followed by the theoretical values (Clemence 1947) are shown in the table, first containing the eccentricity as a factor, and then with the eccentricity removed. The size of the probable error of this effect for Venus is due to the small eccentricity of its orbit. The agreement of the observed excess motions of the perihelia with that predicted by the theory of relativity is within the probable error of the determinations. For the first time we have observational results accurate enough to detect the relativity effect in the motion of the perihelion of Venus.

Clemence, G. M. 1943, *Astr. Papers Amer. Ephemer.* 11, Part I.

Morgan, H. R. 1945, *A. J.* 51, 127.

Clemence, G. M. 1947, *Rev. Mod. Physics* 19, 361.

Clemence, G. M. and Brouwer, D. 1955, *A. J.* 60, 118.

U. S. Naval Observatory,
Washington, D. C.

Edmondson, Frank K. The local standard of rest.

Nearly 21 years ago E. A. Milne (1935) published an important paper entitled "Stellar Kinematics and the K -Effect." The purpose of the present paper is to draw renewed attention to some of Milne's conclusions, and to justify the use of the "basic solar motion" derived by Vysotsky and Janssen (1951) as the correct reduction to the local standard of rest instead of the "standard" solar motion ($18^h, +30^\circ, 20 \text{ km/sec}$).

Milne made two important points in his paper, only one of which seems to have been widely remembered. This is his conclusion that "whatever the velocity-distribution, there will be in general a non-zero K -effect, a non-zero systematic trend in transverse motions and 'double waves'

in longitude in the radial velocities and transverse velocities in any arbitrary plane; all the terms being proportional to the distance." Less widely remembered is the equally important conclusion that "a by-product of the investigation is that it is shown that when applying corrections for 'solar motion,' in order that the results may have simple physical interpretations, it is necessary to use the solar motion as given by the stars immediately surrounding the sun, and not that derived from a reduction of the motions of the stars under consideration." Milne calls this velocity the "local solar motion."

The solar motion as ordinarily defined is obtained from radial velocities and proper motions by means of a least-squares solution, the equations of condition being:

$$\begin{aligned}\bar{\rho} &= -X_0 \cos \lambda \cos \beta \\ &\quad - Y_0 \sin \lambda \cos \beta - Z_0 \sin \beta, \\ 4.74 \mu_\lambda'' &= \frac{X_0}{r} \sin \lambda - \frac{Y_0}{r} \cos \lambda, \\ 4.74 \mu_\beta'' &= \frac{X_0}{r} \cos \lambda \sin \beta \\ &\quad + \frac{Y_0}{r} \sin \lambda \sin \beta - \frac{Z_0}{r} \cos \beta,\end{aligned}$$

An extension of Milne's kinematic analysis to second-order terms (Edmondson 1937) gives the solar motion terms in the following form:

$$\begin{aligned}\bar{\rho} &= -S_1^0 \cos \lambda \cos \beta \\ &\quad - (S_2^0 - r^2 Q_1 \cos^2 \beta) \sin \lambda \cos \beta \\ &\quad \quad - S_3^0 \sin \beta \\ 4.74 \mu_\lambda'' &= \frac{S_1^0}{r} \sin \lambda - \left(\frac{S_2^0}{r} - 3r Q_1 \cos^2 \beta \right) \cos \lambda \\ 4.74 \mu_\beta'' &= \frac{S_1^0}{r} \cos \lambda \sin \beta \\ &\quad + \left(\frac{S_2^0}{r} - r Q_1 \cos^2 \beta \right) \sin \lambda \sin \beta \\ &\quad \quad - \frac{S_3^0}{r} \cos \beta.\end{aligned}$$

It is clear that if the coefficient Q_1 is larger than $1 \text{ km sec}^{-1} \text{ kpc}^{-2}$ the solar motion with respect to