

creasing particle emission (injection). The poloidal magnetic field is generally expressible in terms of the undisturbed component (solutions of Laplace's equation) times a magnetohydrodynamic distortion factor given by the confluent hypergeometric functions. Expressions are given for the toroidal current and current density associated with the distorted field and for the particle flux required to maximize the total toroidal current. Coronal azimuthal (ring) current densities comparable to ionospheric current densities are predicted.

Coated Metallic Grains as the Source of Diffuse Interstellar Lines. CHARLES A. WHITNEY, *Harvard and Smithsonian Observatories*.—Unsöld has suggested (*Z. Astrophys.* 56, 221, 1963) that the unidentified, diffuse interstellar lines may result from resonant absorption by metallic grains. The known bulk properties of alkali metals have been utilized to predict the absorption spectra of grains about 200 Å in diameter. Among other interesting coincidences, it is found that a sodium grain thickly coated with ice will produce an absorption band centered at $\lambda 4430$ Å and having a profile very similar to the observed one.

Laboratory experiments with vacuum deposited sodium have verified the existence of an absorption band at $\lambda 3700$ Å, as predicted by theory for uncoated particles. Attempts to produce the $\lambda 4430$ Å band are in progress.

Metal-to-Hydrogen Ratios in the Galaxy as Indicated by Narrow-band Photometry. JOHN A. WILLIAMS, *University of California, Berkeley*.—Cepheids with periods longer than 13 days and in galactic longitudes between 0° and 180° (new system) were studied for indications of systematic variations of chemical composition using the seven-color photometric system of Crawford (*Astron. J.* 66, 281, 1961).

The amount of interstellar reddening is determined by comparing the continuum break across the G band with the $b-y$ color index. The method was calibrated by Cepheids in galactic clusters. The relative metal-to-hydrogen ratios are indicated by the Strömgren metal index. The results for giant stars indicate that the photometry is able to separate the effects of temperature, interstellar reddening, and metal abundance for stars with compositions differing from the sun by factors of $\frac{1}{2}$ to $1/10$ but fails to separate reddening and metal deficiency for stars with metal-to-hydrogen ratios of the order of $1/1000$ the solar value. Stars are not available at present to evaluate the accuracy of the procedure for metal deficiencies between $1/10$ and $1/1000$.

Population II Cepheids with periods greater than seven days may be distinguished by their excessively bright violet and ultraviolet intensities compared to Population I Cepheids of the same period. Since these Population II characteristics occur only at certain phases, a star will usually have to be observed around the complete light cycle before its population type is clear.

The long-period Population I Cepheids in the Sagittarius arm appear to have larger metal-to-hydrogen ratios on the average than those within 1.5 kpc of the sun, but the distant Cepheids in the Cygnus and Perseus arms appear to have smaller ratios. The effects of variable chemical composition that are observed are not much larger than the observational errors; so these results should be considered provisional and subject to confirmation by further work.

Balmer Line Strengths in Peculiar A Stars. H. JOHN WOOD, *Goethe Link Observatory, Indiana University, Bloomington, Indiana*.—Repeated spectrum scans and $H\beta$ -type photometry of $H\beta$, $H\gamma$, and $H\delta$ show the variability of these lines in several spectrum variables. The observations were taken with the spectrum scanner of the Perkins 69-in. reflector of Ohio Wesleyan University and the Ohio State University at Lowell Observatory and the two-channel simultaneous photometer of the 16-in. reflector at Kitt Peak National Observatory.

ϵ U Ma and 73 Dra show intensity variations in the extreme wings of $H\beta$ with the core relatively constant. Possible periods for $H\beta$ in 73 Dra are $2^h 25^m 73^s$, half the value, and twice the value. Superimposed on the $2^h 25^m 73^s$ period are oscillations with a quasi-periodicity of about 30 min. In the course of these oscillations $H\beta$ is out of phase with $H\gamma$ but in phase with $H\delta$. These oscillations are not present at all phases in the $20^d 27$ spectrum and UBV period of 73 Dra.

HD 224801 shows a "flickering" in $H\beta$ with a period of 35 min. However, as in 73 Dra, these oscillations are not present at all phases in the $3^d 74^m 22^s$ UBV period found by Provin.

It is suggested that variations in the extreme wings of the Balmer lines are caused by changes in the electron density low in the photospheres of these stars. The 35-min oscillations may be caused by acoustic waves at nonpropagating frequencies.

Identification Atlas of the Large Magellanic Cloud. F. W. WRIGHT, *Smithsonian Astrophysical Observatory*, AND P. W. HODGE, *University of California, Berkeley*.—A series of plates secured with the ADH Schmidt telescope provides a large-scale atlas of the Large Magellanic Cloud, arranged in