electron temperature and the excitation temperature. Accordingly, for photospheric models that neglect deviations from LTE one might expect large discrepancies in the abundance of an element when the calculations are based on lines that are formed in different layers of the photosphere, i.e., lines observed at different points on the solar disk and lines of different excitation potentials. The purpose of this investigation has been to determine whether or not such discrepancies exist for elements in the iron group, and if they do exist, to determine their magnitude. The elements of the iron group were chosen for investigation because (a) for these elements a number of faint and medium-strong lines of different excitation potential are observed in the solar spectrum, and (b) reliable experimental relative f values are available. The lines were observed at the three positions on the solar disk $\mu=1.0$, 0.5 , and 0.3 with the vacuum spectrograph at the McMath-Hulbert Observatory by Dr. Mohler and his associates. The equivalent widths of blended lines were determined by the Utrecht method. A homogeneous model of the photosphere, assuming LTE, was employed in which the recently observed temperature distributions are included. The theoretical calculations of the equivalent widths by the weighting function method were carried out with the aid of the IBM 704 computer of The University of Michigan. Individual curves of growth were calculated for each element for various sets of wavelengths and excitation potentials. The observed lines of each element were separated into groups according to their excitation potentials. For each element and for each position on the solar disk, the individual groups of lines were plotted separately on a curve of growth diagram and individual abundances derived. No systematic variation of the abundances from center to limb or from lower to higher excitation lines could be detected. This result indicates that the assumption of LTE in the photospheric model does not introduce great discrepancies in the solar abundances of the elements in the iron group.

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Shock-Wave Support of the Chromosphere of 31 Cygni. G. J. ODGERS, *Dominion Astrophysical Observatory*.—From observational data obtained at the 1961 eclipse of 31 Cygni an estimate can be made of energy losses from the inner and outer chromosphere of this star. Also some idea can be formed of the turbulent velocity field in these regions from knowledge of the multiple structure of the K line. An attempt is made to apply the theory of dissipating shock waves, arising from acoustic disturbances in the hydrogen convection zone, to determine whether

the energy balance could be maintained in this way. Much more detailed knowledge of the turbulent velocity field would be required to give any definite result but it appears that the chromosphere might be supported by such a process.

Photoelectric Spectrophotometry of RR Lyrae Variables. J. B. OKE, *California Institute of Technology, and Mount Wilson and Palomar Observatories*.—Photoelectric spectrum scans of SU Dra, RR Lyr, and X Ari have been obtained and used to determine the absolute energy distributions in the spectrum at different phases. Series of slit spectra with a dispersion of $18 \text{ \AA/mm}$ have also been obtained. The profiles of H_γ have been measured and used to determine the interstellar reddening of the three stars. Making corrections for reddening the absolute energy distributions have been compared with fluxes computed from model atmospheres to determine the effective temperature and gravity at all phases. It is found that for all three stars the effective temperature varies from 7600° to 6100°K . The photometric displacement curve R/R_{max} has also been determined. The radius varies by about 10% in each star.

Detailed radial-velocity measurements of SU Dra and RR Lyr show that differential motions exist in the atmospheres at all phases. Since the atmospheric layer which one observes changes during the cycle, due to changes in opacity, the velocity curve cannot be interpreted literally, and integration of the velocity curve does not yield the absolute displacement curve, $R_{\text{max}}-R$. Therefore the Wesselink-Baade method gives incorrect radii for RR Lyrae stars. During a limited portion of the light cycle, however, it is possible to interpret the velocity curve and an absolute radius can be determined. In the case of SU Dra the mean radius is 5.2 solar radii. The mean absolute visual magnitude is $+0.8 \pm 0.4$.

Neon in Tektite Bubbles. JOHN A. O'KEEFE, *Goddard Space Flight Center*, KENNETH L. DUNNING, *Naval Research Laboratory, Washington, D. C.*, AND PAUL D. LOWMAN, JR., *Goddard Space Flight Center*.—An electrodeless discharge was excited in a 1 cm^3 bubble in a tektite, bediasite #1876 of the U. S. National Museum collection, kindly loaned by E. P. Henderson. The spectrum showed 90 Ne I lines, 12 He I lines, 4 lines of O I , and 3 bands of O_2^+ .

Reynolds has shown experimentally that helium will diffuse through a 1-cm tektite in a period of the order of 10 years; for neon the time is about 10^6 years; for oxygen it is probably much longer. The