Lorentz fields. An analogue of the Dollar-Teller formula involving the Lorentz field rather than the ion field is \( \log N_\text{L} = 2.24 - 0.2 \log E_\text{L} \). \( N_\text{L} \) is the number of the lower countable Balmer member. This relation holds at \( 10^7 \, \text{K} \). Approximate Stark profiles for the higher Balmer members have been calculated, which would allow one to estimate the effects of ion and Lorentz fields. In an actual solar atmosphere, the Lorentz fields will dominate the ion microfields only for the highest magnetic fields. It is therefore unlikely that gross overestimates of the electron density may be attributed to the Lorentz fields, but accurate work must consider their influence.

16.03.05 Tests of the Minsmaert Formula for Spectral Analysis. J. G. Collins and J. F. Mutschlechner, Indiana University. - The Minsmaert semi-empirical formula for absorption line profiles has been used frequently for the analysis of stellar spectra. The use of this formula with a S-S (Schuster-Schwarzschild) approximation yields relative abundances and, as by-products, a representative temperature, electron pressure, and turbulent velocity for the line-forming region in the S-S approximation. We have employed two tests in an effort to evaluate the accuracy of the Minsmaert procedure as compared with the results from a detailed synthetic spectrum calculation using a model atmosphere. In the first test, two observed regions of the solar spectrum were analyzed using synthetic spectra calculated by a detailed model procedure. Next, the spectral regions were analyzed by the Minsmaert procedure. The resulting abundances were in excellent agreement with those obtained using model synthetic spectra. Further, the S-S parameters showed good agreement with conditions expected in the solar line forming region. As judged statistically, the quality of fit to the observations in the Minsmaert calculation was nearly as good as that from the model procedure. In the second test a synthetic spectrum was generated using a model atmosphere corresponding approximately to a G5 giant. Analysis of this spectrum by the Minsmaert procedure gave abundances in good agreement with those used to produce the test spectrum and again the S-S parameters represented those expected for the line-forming region. The fit of the Minsmaert spectrum to the model synthetic spectrum was of reasonably good quality except for some line cores. We conclude that the Minsmaert formula provides an efficient and reasonably accurate procedure for the determination of abundances and S-S parameters at least for the general range of spectra investigated.

16.04.05 The CaII-FeII \( \lambda 8542 \) Resonance in T-auri Stars. L. A. Wilson, University of Michigan. - The lines \( \lambda 8542, \lambda 32 \) of FeII are observed to be slightly enhanced in the spectra of T-auri stars (see e.g., A. S. Joy, Ap. J. 102, 183, 1945). These lines originate from a common upper level in FeII, \( \lambda 8543 \). The transition \( \lambda 8542 \rightarrow \lambda 32 \) has wavelength 8545.26 \( \AA \), CaII \( \lambda 3968.47 \) and is a broad emission line. It has been suggested therefore that FeII \( \lambda 8543 \) is overpopulated due to the enhanced emission around \( \lambda 3968.47 \) (see G. R. Hebbig, PASP 77, 166, 1955). A statistical equilibrium analysis, using a 5-level atom and assuming an optically thin medium, yields results consistent with this suggestion. In addition, certain conclusions may be drawn from the calculations regarding [Ne, Te] in the medium. An approximate method for determining for what conditions the mechanism is possible is compared with the detailed calculations and found to be consistent. A few trial runs with a 13-level model atom indicate that the essential physics is contained in the 5-level atom model.

16.05.05 A Model for the Chromosphere of Procyon. J. L. Linsky and T. R. Ayres, Joint Institute for Laboratory Astrophysics. - We propose a one-component model for the chromosphere of Procyon (P5 IV) consistent with observations of the Mg II resonance lines, our absolute flux line profile of the Ca II K line, and the profile of the Ca II 8542A line. The model assumes a one-component plane-parallel chromosphere in hydrostatic equilibrium. Theoretical non-LTE profiles for the Ca II and Mg II lines are computed based on a three-level representation for Mg II and a five-level representation for Ca II. The model is compared with various scaled solar chromosphere models. We find in particular that the temperature minimum of Procyon is the solar value multiplied by the ratio of effective temperatures of the two stars. This scaling law may be applicable to all F and early G dwarfs and giants.

16.06.05 Detection of Gravity Darkening and Axial Inclination of Rapidly Rotating Stars from Photographic Line Profiles. T. R. Stockmanley, Michigan State University. - Absorption lines of neutral and ionized helium, ionized magnesium, and ionized calcium have been measured from direct-intensity microphotometer tracings of excellent high-dispersion spectrograms of 67 southern OBA main sequence stars, both slowly and rapidly rotating, obtained by William Buscombe at Mt. Stromlo Observatory. These stars were treated earlier by Buscombe (1969), IA 144, 1). Similar types of individual profiles were combined together when possible to obtain improved profiles, and all profiles were computer-fit to Voigt profiles by least squares. The intrinsic profiles (for no rotation) were obtained experimentally from the data, and results were compared with calculations by Norris and Baschek.