Lorentz fields. An analogue of the Englis-Teller formula involving the Lorentz field rather than the ion field is \( \log N_E = 2.24 - 0.2 \log B \). \( N_E \) is the number of the least countable Balmer member. This relation holds at \( 10^5 \, K \). Approximate Stark profiles for the higher Balmer members have been calculated which would allow one to combine the effects of ion and Lorentz fields. In Ap stars and in solar flares, 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 Minnaert Formula for Spectral Analysis. J. G. Collins and J. F. Kutschschmer, Indiana University. - The Minnaert 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, 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 determine the accuracy of the Minnaert procedure, as compared with the results from a detailed synthetic spectrum calculation using a model atmosphere. In the first test the two observed regions of the solar spectrum were analyzed using a synthetic spectrum calculated by a detailed model procedure. Next the spectral regions were analyzed by the Minnaert 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 Minnaert 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 Minnaert 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 Minnaert spectrum to the model synthetic spectrum was of reasonably good quality except for some line cores. We conclude that the Minnaert 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-FeI \( \lambda 3969 \) Resonance in T-Tauri Stars. J. A. Wilson, Univ. of Michigan. - The lines \( \lambda 3969 \), \( \lambda 132 \) of FeI are observed to be highly enhanced in the spectra of T-Tauri stars (see e.g. A. H. Joy, Ap. J. 102 188, 1945). These lines originate from a common upper level in FeI, \( \gamma 2 \). The transition \( \alpha 2 \rightarrow \gamma 2 \) has wavelength 3969.261, CaII \( \gamma 2 \) has \( \lambda 3968.47 \) and is a broad emission line. It has been suggested therefore that FeI \( \gamma 2 \) is overpopulated due to the enhanced emission around \( \lambda 3968.47 \) (see G. H. Herbig, PASP 77, 166, 1965). 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 \( \text{Ne}, \text{Te} \) 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 model atom.

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 (P.S IV) consistent with observations of the Mg II resonance lines, our absolute flux line profile of the Ca II K line, and profile of the Ca II \( \beta 42 \) 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 Procyon spectrum 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. Stoneley, 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), Mm. 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.