6 orders of magnitude in luminosity. RS CVn's, Algols, FK Com stars, and WTTs tend to be "microwave-rich". This relation points to an intimate connection between the nonthermal, energetic electrons causing the radio emission and the coronal bulk plasma responsible for thermal X-rays. We have tested the hypothesis that particles accelerated in quasi-continuous flares-like processes emit synchrotron radiation during their lifetime and finally lose energy in collisions, thereby heating the coronal plasma. This scenario requires commonly assumed values for the magnetic field strength (100 G) and produces acceptable electron lifetimes.

51.10
A Search for Phase-Dependent Asymmetries in the Mg II h and k Lines of V711 Tau
T.F. Meade (Bucknell), J.E. Neff (Penn State)

V711 Tauri (HR 1099; G5 IV + K1 IV) is a bright, non-eclipsing RS CVn-type system. This summer, we analyzed a set of LWP high-dispersion spectra of V711 Tau that was obtained with the International Ultraviolet Explorer satellite in December 1984. These spectra form a unique data set, because this was the only time that V711 Tau was observed continuously throughout its 2.8 day period.

Variations in chromospheric surface brightness on a star will produce an asymmetric Mg II emission line profile. Such variations could be short-lived (flares) or stable for many rotations (plages). In order to measure the asymmetries, we impose a partially-constrained, multi-gaussian fit on the Mg II h and k emission lines from the stellar chromosphere. We will describe this procedure in more detail and justify the constraints that we applied.

V711 Tau undergoes occasional flaring episodes in all wavelength bands, and it is the proto-typical Doppler imaging candidate. Unfortunately, the chromospheres of V711 Tau showed no detectable non-uniformity and no appreciable variability during the December 1984 observing run. A multi-wavelength observing campaign of V711 Tau, including IUE spectra, radio interferometry, ground-based spectroscopy, and optical photometry, will be carried out in December 1992.

This work was completed while the first author was an REU summer student at Penn State University.

51.11
Plasma Flows in the Outer Atmosphere of α Ori
K. Carpenter (NASA/GSFC), R. Robison, G. Wahlgren (CSC), J. Brandt, J. Linsky (UCO), D. Ebbets (BASG), R. Weymann (MWLCO)

We present the results of a Goddard High Resolution Spectrograph (GHRSS) study of flow velocities in the outer atmosphere of the M2 II supergiant α Ori. Data from individual, GHRSS Teem, and consortium projects are combined to allow the inclusion of emission and absorption features from multiple ions with a variety of intrinsic strengths, in order to sample a wide range of atmospheric heights. Ions with observed chromospheric features include C I, C II, Si I, Si II, O I, Co II, Al II, Mg II, Cr II, Fe I and Fe II, while the photospheric absorption spectrum is dominated by Fe I. We have carefully optimized the wavelength calibrations to obtain high-precision radial velocities and present measurements of both absolute radial velocities and relative velocities (ion to ion, and chromosphere to photosphere). The rich Fe II spectrum is of particular interest since it exhibits in this UV spectral region many lines, with a wide range of intrinsic strengths, and thus provides a good height resolution of the radial velocity field. The overall wind velocity variation with height, and any evidence for isolated downflows and/or outflows will be discussed.

51.12
Spectral Classification of Peculiar G Stars
R.F. Garrison, Brian Beattie, and J. Thompson (DDO, U. Toronto)

During a uvby photometric survey of ten thousand Solar-type stars, Erik Olsen (Denmark) has isolated a small number of stars with uniquely peculiar photometric indices. These are being observed at MK resolution (2 A) with the 60cm Helen Sawyer Hogg Telescope of the University of Toronto Southern Observatory at Las Campanas Observatory in Chile and with the 84cm telescope of the San Pedro Martir Observatory in Mexico. Preliminary classifications are presented for stars observed up to now.

One of the most interesting stars is HD 204848, which is a weak-lined carbon star with a preliminary classification of K0 III+Fe 2.5-CN-3 CH+-1, indicating that it is carbon-strong and nitrogen-weak. It also has been observed at high resolution with the David Dunlap Observatory 1.8m telescope. There are a few stars with similar characteristics and several with quite different peculiarities.

In addition, the twenty weakest-lined stars and the twenty strongest-lined stars from Olsen's homogenous sample are being observed in order to set up parallel sequences of weak-lined and strong-lined G stars.

51.13
Detection of O I and Si II Far-Infrared Fine-Structure Emission from Alpha Orionis
M. R. Haas (NASA-Ames), A. E. Glassgold (NYU)

We have detected [O I] 63 μm and [Si II] 35 μm emission from α Orionis (Betelgeuse), an oxygen rich, M2 lab supergiant. This is the first reported detection of far-infrared fine-structure emission from the expanding atmosphere of a star. The [O I] line flux is 2.2 ± 0.2 × 10−18 W cm−2 and the [Si II] line flux is 0.9 ± 0.4 × 10−18 W cm−2. The associated narrow-band continuum flux is 140 ± 40 μJy at 63 μm and 720 ± 30 μJy at 35 μm.

For a late type star, α Ori's envelope is unusually devoid of dust and molecules. Glassgold and Huggins (1986, ApJ, 306, 605) summarized the observational data and developed a model for α Ori's ionization structure, concluding that its envelope is principally atomic. Rodgers and Glassgold (RG; 1991, ApJ, 382, 605) computed the thermal structure and found that [O I] 63 μm is the dominant coolant over a significant portion of the inner envelope (~ 10 − 40 Rₜ). Their predicted fluxes for the [O I] and [Si II] lines are in good agreement with our measurements when a realistic velocity field is employed. Our observations are consistent with RG's choice of distance (200 pc), hydrogen mass loss rate (4 × 10−6 Mₛ yr⁻¹), and chemical abundances (ξₒ = 6.3 × 10⁻⁸ and ξₑ = 3.8 × 10⁻⁸). The RG calculation predicts that the temperature drops sharply from ~ 1700 K at 10 Rₜ, to ~ 100 K at 40 Rₜ as a result of this fine-structure cooling, suggesting that these lines arise in a particularly interesting region of the envelope where molecules and dust are expected to form.

51.14
Starspot Reconstruction via Matrix Light Curve Inversion
R. Harmon, W. Wild, R. Rosner (U. Chicago), W. Drish

We use a new indirect imaging method, matrix lightcurve inversion (MLI), to reconstruct stellar surface features from lightcurve variations due to rotation of the star. Because the inversion is ill-posed, it is very sensitive to noise. We alleviate this problem by choosing the "smoothest" solution whose corresponding light curve differs from the data by the estimated noise level. The noise level is independently estimated by first performing a Chaline nonlinear inversion on the data; the residual produced by this method can be shown to produce a useful estimate of the noise. The MLI method has the important advantage that no a priori assumptions are made regarding the number and type of stellar surface features. In order to demonstrate the feasibility of the method, we present reconstructions of synthetic data calculated for various model star surfaces.