18.05.05 Radiative Transfer in Circumstellar Dust
C. A. HARVEY, Univ. of Fla. - An iterative numerical procedure is developed to calculate the radiation field within a spherically symmetric circumstellar dust shell. The dust shell is assumed to consist of grey isotropically scattering dust particles in thermal equilibrium with the radiation field and to be characterized by seven parameters -- (1) the radius of the central star, (2) the inner radius of the shell, (3) the outer radius of the shell, (4) the optical depth of the shell, (5) an index which specifies the density distribution, (6) the albedo of the dust particles, and (7) the temperature of the central star. Using this procedure, the temperature distributions and radiation fields within several model dust shells are determined, and used to calculate for each shell the spectral-energy distributions of the radiation emitted. (Calculations being made at 12 wavelengths from 0.4 to 20 microns). For shells of moderate optical depth (say 5) it is found that the radiation field is quite anisotropic especially at the shorter wavelengths, and that the shape of the spectral-energy distribution can be strongly dependent on the index in the assumed power law density distribution. The Eddington factor as a function of wavelength and optical depth is calculated for each model.

18.06.05 Abundance Analyses of some δ Delphini Stars
D. W. Kurtz, U. Tex. - Differential fine analyses of the δ Del stars HR706, HR2555, HR2557, HR3265, and HR7928 have been performed to two main sequence standards, HR114 and HR4825, and two giant standards, HR502 and HR8272. HR2557 is found to be normal. The Fe abundance is normal in HR706, HR2555, and HR7928 and is enhanced by 0.3 dex in HR3265. The average abundances, [Fe/H], derived for the above four stars are:

C I .04 Al I -.01 Si II .31 S I .03 Ca I -.10 Sc II -.10 Ti II -.07 V II .15 Cr I -.08 Cr II .03 Mn I .04 Co I -.01 Na I .09 Ni II .14 Zn I .20 Sr II .57 Y II .63 Zr II .47 Ba II .61 Ce II .16 Nd II .33 Sm II .09 Eu II .75 Gd II .33

At classification dispersions the δ Del stars have a rich metallic line spectrum similar to that of a late metallic line star (Cowley et al., ApJ, 74, 375). The δ Del stars are subgiants and the above abundances are similar to what one might expect for a subgiant and Am star. Ca and Sc are normal but the Ca deficiency is moderated in Am stars such that evolved Am stars show nearly normal Ca abundances (Smith, Astron. Astrophys., 12, 325). The SI overabundance is probably not real as only one or two partially blended high excitation lines were measured in each star. The enhanced (Zr/Fe) in these δ Del's is where they differ most from the late Am's which show normal (Zr/Fe). The δ Del abundance anomalies cannot be interpreted within the framework of the diffusion hypothesis as HR706, HR3265, and HR7928 are all known δ Scuti pulsators.

18.07.05 Radio Observations of Emission-Line Stars
C. W. Purton & K. A. Marsh, York U., Toronto, P.A. Feldman, Dominion Radio Astrophys., Penticton. - Radio observations have been made of a number of emission-line stars (and related objects) which exhibit an excess of infrared radiation. Several of these have been detected at 10 GHz. The angular size of the radio-emitting region has been determined for some, and is commonly ~ 1 arc second. It is presumed that free-free transitions in ionised hydrogen produce the radio emission; the observed continuum spectra show a variety of types from optically thin to optically thick. Emission measures are in excess of 10^8 cm^-6 pc. The type of star which produces detectable radio emission, and the gross characteristics of the radio-emitting circumstellar envelope, are discussed.

18.08.05 The Nature of Radio-Emitting Early-Type Emission-Line Stars
K.A. Marsh, York U., Toronto. - A number of objects classified as emission-line stars produce detectable radio emission, presumed to arise from free-free transitions in circumstellar gas. Of particular interest is the number of these objects which display a 41 spectrum (i.e. Sw+), which is suggestive of radial mass outflow (Seagast and Gregory, 1973 Nature Phys. Sc., 245, 85). It is likely that the detected objects represent various stages in the early evolution of a planetary nebula. Theoretical models have been constructed in order to explain their spectral characteristics, and the consequences of a rather striking correlation between their radio, optical and infrared properties are discussed.

18.09.05 An Upper Photosphere Model for Arcturus
R2 III Based on Partial Redistribution and the Ca II K-Lines
T. A. PHILIP, J. L. LINSKER, and R. A. SHINE, Joint Institute for Laboratory Astrophysics. - Significant progress has been made recently towards understanding the effects of partial frequency redistribution (PRD) on the source functions of strong resonance lines (e.g. R. W. Milkey and D. Mihalas 1973 Astrophys. J. 185, 709). We show in a specific example that departures from "complete redistribution" (CDR) in the inner wings of the Ca II K-line can be substantial, especially for low gravity stars. Based on