23.02.07 Physics of Dense Interstellar Dust Clouds, C. M. LEUNG, National Radio Astronomy Observatory - The physical conditions of dense interstellar dust clouds (DIDC) are studied by taking into account the reactions among the gas, grains and the radiation field. In particular, the effects of radiation transport on the gas and grain temperature distributions are investigated. Theoretical models are constructed by solving simultaneously the equations of radiation transport in spherical geometry (for both line and continuum radiation), statistical equilibrium equations and energy balance equations which determine the gas and grain temperatures. The grain temperatures (Tg) for graphite, silicate, silicon carbide and core-mantle grains are computed. Typically Tg varies by a factor of 4 to 5 from surface to center, while Tg ≈ 10K in the DIDC with a central heat source. The emergent continuum radiation field is found to exhibit a limb-brightening effect, as observed in the so-called 'bright dark nebulae'. The presence of dust grains as a source of continuum opacity and emission helps cooling line photons to escape, thereby setting a lower limit on the gas cooling rate and the gas temperature (Tg), as well as narrowing line-widths of saturated lines. Furthermore, collisions between gas and grains are found to be important in determining Tg. Tg depends sensitively on the effects of radiation trapping (which can reduce the cooling rate by several orders of magnitude) and density gradients. For a typical DIDC, Tg varies from 4 x 10^4 K to ~ 10^6 K. The emergent line profiles for CO are computed and self-reversal features are quite common. The effect of cloud geometry (sphere vs slab) is also studied. It is found that slab clouds have lower Tg and higher Tg. The radiation energy density in the two geometries differs by more than a factor of two. The radiation pressure gradient is found to exceed the self-gravitational force near the cloud surface. Other implications of the numerical results will be discussed.

23.06.06 Spectroscopic Observations of Beta Persei (Algo). C.T. BOLTON & S.W. SHORE, David Dunlap Observatory, University of Toronto - We have obtained 112/nm blue and 104/nm red spectrograms during the intense radio flare observed at NRAO on 15/16 January 1975. We have also obtained similar spectrograms during the ingress and egress of the Ha eclipse reported by Yuan and McCook (Bull. A.A.S., 4, 466, 1974). The emission is visible on our plates filling in the near wings of the stellar absorption line, and variations in the profile have been seen during the ingress of the Ha eclipse. The behavior we observe appears to be different from that reported by Andrews (ApJ., 147, 1183, 1967). There are no obvious spectrum variations associated with the radio flare, but interpretation is difficult because of the lack of information regarding "normal" behavior during radio quiescent periods.

Some evidence is presented for transient emission at the K-line and MgII 4481 line.

23.03.07 Polarization of the Egg Nebula, S. J. SWAGI, University of Kansas and N. TAMONISHI, Steward Observatory - Accurate linear polarimetric measurements of the Egg Nebula have been made using a rotating half-wave plate polarimeter. The polarization is found to vary linearly from 40% at 0.57 microns to 50% at about 1 microns. Polarization data on each component of the nebula are also presented. The results of model calculations to attempt to explain the observations in terms of Mie scattering from grains will be given.

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23.04.05 A Numerical Model for the Polarized Flux from Be Stars, M.W. JOHNS, Dartmouth Coll. - The Monte Carlo method has been applied to calculating the monochromatic polarization and intensity of the radiation from a partially ionized, homogenous disk of stellar matter illuminated by a star at its center. This work extends previous work by considering the effects of disk thickness, large optical depths, and the absorption and emission of radiation. The disk is described by the amount of polarization produced. The results are reported here with a discussion of their application to Be stars.

23.05.06 (04) AN EXTRAORDINARY RADIO OUTBURST IN ALGO; FLUX AND STRUCTURE OBSERVATIONS. D. Gibson, L.R. DRAAM, M. Viner, Queen's U., S. Peterson, Cornell & DRAAM, T. Clark, L. Button, C. Ma, & W. Webster, NASA/SPC & NASA/GSFC & MDM, A. Rogers, Shapiro, A. Whitney, & J. Wittels, M.T.A. & Haystack Obs., A. Niell & G. Reach, J.P.L. We have observed the largest outburst to date from the radio binary Algol. The flux density of the source was measured at frequencies of 1400, 2693, 6000, and 8085 MHz during the night of 1975 January 15-16 UT. Two events were observed, the first reaching a flux density of 0.59 Jy (at 8085 MHz) at 2320 UT, the second reaching 1.02 Jy at 0500 UT. The radio spectrum showed no curvature and maintained a relatively constant spectral index of +0.11. VLBI observations were carried out at a frequency of 7850 MHz on the Green Bank-Haystack-Goldstone baselines with a maximum resolution of 0.0005 arc sec, which corresponds to about 20% of the width of the stellar disk. Variations in fringe visibility were observed during the outburst which can be interpreted as variations in the source structure.

23.07.09 Theoretical Cooling Coefficients and Soft X-Ray Spectra, J. C. RAYMOND, W. B. SMITH and F. COX, U. Wis. - We have extended the radiative cooling coefficient calculations of Cox and Tucker (1969 Astrophys. J. 157, 1157) and Cox and Dallabu [1971 Astrophys. J. 167, 113] to include Calcium, Iron and Nickel. Recent determinations of atomic data have been used and the permitted line and recombination spectra are calculated in greater detail. We present cooling coefficients and soft X-ray spectra for a low density, optically thin plasma of cosmic abundances in the range 10^4-10^8 K.

23.08.05 A Sudden Increase in the X-ray Flux from Centaurus A, F.P. WINKLER, J.R. and A.B. WHITE, Middlebury College. - Cent A (NGC 5128) was observed continuously for the 14 day period 1973 March 29 - April 12 by the MPE X-ray detectors (1-60 keV) on the OAO-7 satellite. During this observation, the 3-10 keV X-ray flux increased by a factor 1.6 ± 0.1 in an interval of at most six days. A similar increase was observed at higher energies. Comparison of the above data with 1970-71 results (Tucker et al. 1973 Ap. J. 180, 715; Lampman et al. 1972 Ap. J. [Letters]) indicates that the X-ray flux increased by a factor of 6 at 2-10 keV, and a factor of 14 at 10-50 keV in just over two years. The peak observed flux leads to a 2-50 keV luminosity of 3.1 x 10^41 erg s^-1 for Cent A, assuming a distance of 5 Mpc. The X-ray spectra from all OAO-7 observations are consistent with a strongly absorbed power law, with an absorption index a = 0.4. Both the variability and the spectrum are in agreement with a model recently