significant amounts of helium, with abundances sometimes as high as $N(He)/N(H) \sim 20$. This result is interpreted as the result of convective mixing between the thin superficial hydrogen layer with the more massive underlying helium envelope. The lack of hydrogen-rich objects in our sample in the range $7500\ K < T_e < 11,500\ K$ indicates that most DA white dwarfs mix near $T_e \sim 11,500\ K$, a result which is consistent with the location of the red edge of the ZZ Ceti instability strip. A definite trend for cooler objects to have lower helium abundances is also observed. These results are briefly discussed in terms of current models of convective mixing.

88.08

Population III Brown Dwarfs

L.A. Nelson (Bishop's University)

The evolution of Population III brown dwarfs in the mass range of 0.005 $M_\odot$ to 0.11 $M_\odot$ is examined. The evolutionary tracks of these objects are similar to those of Population I brown dwarfs of the same mass. However, during the initial stages of Hayashi contraction, the effective temperatures of Population III brown dwarfs are considerably higher than their Population I counterparts and they subsequently become degenerate on a shorter time scale.
If Population III brown dwarfs constitute a significant fraction of the baryonic dark matter in the universe, then they might contribute to a detectable, isotropic background of electromagnetic radiation. An upper limit ($\Omega_B=1$) to the intensity of this radiation has been calculated for several representative mass functions and formation epochs. The possible detection of this background at infra-red wavelengths by instruments such as DIRBE is also discussed.

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89.01

Echelle Observations of V410 Tau

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During September 1988 we obtained seven FOE spectra of the Naked T Tauri star V410 Tau on the 2.1m telescope at KPNO. The spectra were analyzed by subtracting the appropriate standard (K2V) photospheric spectrum and studying the resultant spectra. The subtracted spectra reveal variable excess emission in H alpha, H beta, CaII IRT, and CaII H. The variations were about 45% in H beta, 35% in CaII H and H alpha, and 10% in the IRT. The E(H alpha)/E(H beta) ratio was 4.7 +/- 1.0. Unfortunately the limited phase coverage prevents determination of the amount of correlation between these variations and the photometric phase.

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89.02

New Discovery of Pre-main Sequence Binaries in Taurus

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We have found three pre-main sequence binaries, DI Tau, FS Tau (Haro 6-5) A, and FW Tau by lunar occultations in the infrared K band. DI Tau system has a flux ratio of 7.8 and projected separation of 0\".07 in the direction of 257° east of north. FS Tau A has a companion 12 times fainter; the separation for the system is 0\".26 in 75°. FW Tau was resolved into a pair of stars of comparable brightness with separation 0\".12 projected in 206°.

To date we have found a total of 7 binaries in a sample of 21 stellar systems surveyed by lunar occultations in the Taurus star-forming region.

89.03

A Model for the Extended Dust Shell around the Supergiant R Coronae Borealis

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IRAS observations at 60 and 100 μm (Gillett et al., *Ap. J.*, **310**, 842, 1986) have revealed an extended emission region which is nearly symmetrical and centered on the hydrogen–deficient supergiant R Coronae Borealis (R CrB). This far infrared emission has been attributed to dust in a fossil envelope (a remnant of mass loss) of hydrogen–rich material surrounding the star. The observed uniformity of the 60 to 100 μm intensity ratio across the emission region suggests that the dust shell is nearly isothermal. These observations, supplemented with earlier ground–based observations, have been modeled by Gillett et al. Their semi–analytic model assumes optically thin emission from two independent dust shells: a hot inner shell which contributes to the emission in the near infrared and an isothermal extended shell responsible for the emission in the far infrared. To produce the uniform dust temperature in the extended shell, two scenarios have been proposed: a) *equilibrium* heating of large grains by the central star and an external radiation field which is 10 times that of the interstellar radiation field (ISRF) in the solar neighborhood, b) *transient* heating of very small grains by the central star and an external ISRF which is not enhanced. While the first scenario has been examined in some detail by these authors, the problem of transient heating of small grains was not considered. To distinguish between the two scenarios, we have constructed radiation transport models of dust shells with both large and small grains. Both the equilibrium heating of large grains and the transient heating of small grains are included and treated self–consistently. We examine the observational consequences of these models and apply the results to the available observations of R CrB.

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89.04

Diffuse Band Profiles in the Rho Oph Cloud

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High resolution, high S/N observations of the 5780 and 6613A sharp diffuse bands are presented for stars in the rho Oph cloud. Data was obtained with the Reticon detector on the CFHT at Coude focus. This system gives a 2-pixel resolution of 0.14A and S/N ranging from 100 to several hundred. Little variation is seen in the diffuse band profiles for stars in this cloud, despite a wide range in grain sizes as indicated by the maximum wavelength of polarization. It is concluded that the diffuse band carrier cannot be identified with the large grains responsible for optical polarization.