the contribution from the silicate dust in the circumstellar shell is strongest. The FWHM at 10 μm is 2.0 arcsec, while our point-source comparison has a FWHM of 1.6 arcsec. These results are very similar to those presented for a N/S slit by Gradyden, Sloan, and LeVan (1992, ApJ, 384, L25). IRC+10216 is also resolved in both slit orientations, having a FWHM of 1.9 arcsec at 11 μm, compared with 1.5 arcsec for a point source. No spectral structure is apparent in the spettrograms, indicating that there is little change in the spectral character of the emission across the source. AFGL 2688 (the Cygnus Egg) is clearly resolved in the N/S slit orientation, where its FWHM at 11 μm is 2.2 arcsec, but its spettrogram in the E/W slit orientation is barely distinguishable from that of a point source.

46.19

Mg II h and k Profiles in Luminous, Cool Stars
R.D. Robinson (CSC/GHRS), K.G. Carpenter (NASA/GSFC)

As part of an investigation of the velocity fields in the atmospheres of cool, luminous stars we used the Goddard High Resolution Spectrograph (GHRS) aboard the Hubble Space Telescope to obtain a high resolution spectrum of the Mg II h and k lines in the M supergiant α Ori. These strong, centrally reversed emission lines have been well studied by the IUE. While the h line in α Ori has nearly equal intensity in the red and blue peaks, the blue peak of the k line is always much weaker than the red peak. This asymmetry is normally explained as resulting from absorption by Fe I and Na I in the circumstellar shell. An examination of the GHRS spectrum, however, reveals that the asymmetry results from a velocity shift between the emission wings and the central absorption core of the line. Further, while the central absorption profiles for the h and k lines agree very well when plotted on a velocity scale, the centroid of the k line emission wings was observed to be redshifted by approximately 23 km/s with respect to that of the h line. Examination of other high resolution GHRS observations of Mg II showed a similar, though less pronounced, relative redshift of the k line centroid on the normal Mg II γ Crv and the hybrid K giant γ Dra. To date, no concrete model has been proposed to explain these shifts. Examining well exposed, high resolution IUE observations of α Ori shows a close agreement with the GHRS results. This gives us confidence that we can use IUE spectra to study the relative shapes and velocities of the Mg II h and k lines and we are currently involved in a program to use the IUE archive to quantify the behavior of the Mg II h and k profiles as a function of luminosity and spectral type for luminous, cool stars. The results of this program will be presented.

46.20

Modeling the Time Variability of Circumstellar Silicate Emission
I.R. Little-Marenin (CASA & Wellesley C.), W.Hagen Bauer, J.Klesow (Wellesley C.)

During the pulsational cycle of Miras, the total IR luminosity and the effective temperature of the star vary as shock waves pass out through the atmosphere and into the circumstellar shell. Since dust appears to form and evaporate near the inner edge of a circumstellar shell during the light cycle of Mira, we expect that the observed low resolution spectra (LRS) obtained by IRAS of the dust grain signatures should vary as a function of phase. Analysis of the individual spectral scans of M star Miras shows that the 12 μm PSC fluxes and the contrast of the 10 μm silicate feature vary in phase with the optical light curve. The contrast is defined as the ratio of observed flux at 10 μm to the black body flux at that wavelength.

We are currently modeling the dust emission using the Lunar computer code (CSDUST3) for modeling radiative transfer in dust shells. The effects of varying model parameters (such as dust optical depth, stellar temperature and the inner radius of the dust shell) on the contrast of the observed silicate feature are being investigated and show, for example, that the contrast of the emission feature decreases as the temperature of the central star decreases. As T varies from 3500 K to 2000 K the contrast decreases from 2.6 to 1.4 (for r(10 μm) = 0.1). A contrast of unity indicates no emission feature. The predictions of the models will be compared to the observed variations in PSC flux and contrast in order to model changes in the dust shell with phase.

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46.21

Sources of the 13 μm Emission Feature Associated with Silicate Dust
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We have carefully searched the Atlas of Low-resolution Spectra (IRAS Science Team 1986, A&A Suppl., 65, 607; Volk and Cohen 1989, AJ, 98, 931) for sources of the 13 μm emission feature associated with silicate emission at 10 μm first discussed by Little-Marenin and Little (1988, ApJ, 330, 305). We have identified 73 spectra for which the 13 μm feature is detected at 4σ or better. In several cases, we have confirmed the existence of the feature using GLADYS, the Air Force long-slit 10 μm spectrometer, at the Wyoming Infrared Observatory.

Our sample of 13 μm emission sources are nearly all late M giants, the majority of type M6 or M7. Variability types exist for 54; over half are SB1 variables, while the remainder are fairly evenly divided among Miras and classes SRA and Sb. Most of the sources have LRS characterizations of 14, 15, or 21-24, i.e. weak silicate emission at 10 μm. The shape of the silicate emission feature varies from a nearly classic 10 μm profile broadened at longer wavelengths to a hump-bump profile with a pronounced 10 μm bump. In the case of Little-Marenin and Little, these shapes would be characterized as S1+, S1+1, and 3-component. The root mean square radial velocity of our sample is 31 km/sec. The mean angle from the galactic plane is 29 degrees, and there are no obvious dependencies with galactic longitude. These properties indicate that our sample consists of old Population I AGB stars.

We have also investigated how the strength of the 13 μm emission varies with spectral type, class and period of variability, LRS characterizations, 10 μm feature width, and galactic position. We find no correlation with any of these properties, indicating that the 13 μm emission is not unique to any specific class of Population I AGB stars. There is no strong evidence for the contention that the 13 μm sources are precursors to S stars.

46.22

Mass Loss Rates and Circumstellar Envelope Chemistry of S Stars
J.H. Beiging (Steward Obs.), W.B. Latter (NRAO)

We report the results of a survey of 27 S stars within 1 kpc of the sun for emission from the J=1-0 and 2-1 lines of CO. For those stars detected strongly in CO we also searched for emission from the J=0-1 line of HCN and the J=2-1, v=0 and v=1 emission lines of SIO. We derive mass loss rates for the S stars detected in CO, and compare with other estimates. Our mass loss rates from the CO J=1-0 line (and using the model of Kastner, 1992 ApJ 401, 337) are well-correlated with the rates derived by Jura (1988 ApJ Suppl, 66, 33) from IR flux densities and a dust model, but our values are systematically higher than Jura's by a factor of 2.

Eight stars detected in CO were surveyed for emission from the HCN J=1-0 line. Four show definite detections of HCN in their circumstellar envelopes. Seven stars were searched for thermal (v=0, J=2-1) SIO emission, of which 5 were detected. Eight of 14 surveyed showed maser (v=1, J=2-1) SIO emission. We use our results to estimate HCN and SIO abundances.

We have computed thermodynamic equilibrium models for the chemical abundances of species expected to form in and near the photospheres of AGB stars. We compare our model abundances for HCN and SIO formed under conditions with C/O nearly equal to unity (appropriate for S stars), with the abundances estimated from our observations of HCN and SIO thermal emission from our survey stars. We discuss the implications of our results for the formation of molecules, and for the status of S stars in post-main sequence evolution.

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46.23

The "Baldwin Effect" in Wolf-Rayet Stars
Patrick Morris (JILA), Peter S. Conti (JILA), H.J.G.L.M. Lamers (SRON, Utrecht), Gloria Koenigsberger (UNAM, Mexico)

The equivalent widths of a number of emission lines in the spectra of WN-type Wolf-Rayet stars are found to inversely correlate with the luminosity of the underlying continuum. This is the well-known Baldwin Effect that has