19.08
HST WF/PC OBSERVATIONS OF M42
J. J. Hester (IPAC/CIT), R. Gilmozzi (STScI), C. R. O'Dell (Rice U.), S. M. Faber (Lick Obs.) and members of the WF/PC Investigation Definition Team

We present HST Wide Field Camera images of a field in the Orion Nebula obtained in emission from [S II], Hβ, and [O II]. The morphology of the [S II] emission is markedly different from the other lines. While Hβ and [O II] are distributed fairly smoothly, [S II] is dominated by filamentary features with widths between 0'0.1 and 1'0 which sharply delineate ionization fronts moving into dense neutral material. These photoinization fronts act as probes of the structure of the cavity walls of this blazar H II region. Their morphology indicates that while the surfaces into which they are moving are textured, subarcsecond clumps with high density contrast are uncommon. An exception is a bow shock ionized formation front seen along the face of a solar system sized (0'0.5 = 270 AU) clump which is itself seen in extinction.

The field contains a number of HH objects and related structures, many of which were previously recognized as such, but whose complex structure is revealed here by the resolution of HST. These include M42 HH-1, which is seen to be an intricate structure of knots and filaments with a head-tail morphology. M42 HH-2 shows structure from both the shocked cavity walls and the shocked atomic outflow. M42 HH-5 through 7 break into numerous condensations with an appearance reminiscent of HH 7-11. All objects with a bow-shock shaped structure (i.e., M42 HH-1, 5, 7, and 10) show enhanced Hβ emission at the apex of the structure where the shock should be strongest. M42 HH-8 and 9 may be condensations photoinization by a nearby A or B star rather than HH objects. Emission from [S II] traces shocks at the walls of an ionized jet flowing from a star in a dark cloud. This cloud seen in extinction is coincident with Hβ Peak 1, which we propose is on the near side of the nebula.

19.09
High Dispersion Spectral Observations with the GHRS/HST of Interstellar Line Toward Xi Persei
A.M. Smith (NASA/GSFC), B. Savage (Wisc.), M. Jura (UCLA), D. Ebbets (BASG), F. Bruhweiler (CUA/CSC), J. Cardelli (Wisc.). D. Lambert (Texas)

The first interstellar spectrum obtained with the Goddard High Resolution Spectrograph (GHRS) at high dispersion through both the large and small science apertures are discussed. The data for the star, xi Per (07 III: Per OB2), were obtained at a resolution of R = 80-90 x 10^5 at signal-to-noise ratios near 125 and 20 for the large and small apertures, respectively. Comparisons with Copernicus and high quality IUE data are made. Measurements of the interstellar features of the low ionization species indicate that velocities of these features can be reliably determined to better than ± 1.3 km s^-1 over the wavelength range 3350 - 2382 Å in both the Echelle-A and B modes. The use of wavelength calibrations (WAVECALs) should improve these already accurate velocities. Preliminary analysis indicates that the C IV and Si IV features are split into two separate velocity components, while the low ionization species (Fe II, O I, Si II, and Cl I) indicate at least two additional components. Interstellar S I, which should reflect the distribution of neutral and molecular species formed in dense regions shielded from the ambient UV radiation field, shows a -4 km s^-1 shift relative to the stronger identified component for the low ionization species. These results are consistent with the description of the interstellar medium where the observed gas is associated with expanding high ionization and neutral shocks around the Per OB2 association, of which xi Per is a member.

19.10
Differential Astrometry with the HST Planetary Camera
T. M. Girard and W. F. van Altena (Yale Univ. Obs.)

The astrometric capabilities of the Planetary Camera (PC) are explored using both simulated PC frames as well as actual in-orbit exposures. In particular, this study emphasizes the possibility of using the PC to determine relative proper motions within globular clusters. A primary concern is the effect of the extended point spread function on star image centering accuracy in both crowded and uncrowded fields, and as a function of position within the PC frames. Several different image centering techniques are tested. The extended PSF also limits the effective magnitude range over which star images can be centered in any single exposure. The feasibility of measuring relative proper motions within globular clusters relies on the assumption of second-epoch exposures, (with a vastly improved PSF), using WF/PC II.

This research was supported in part by the Space Telescope Science Institute and a Space Telescope Astronomy Team contract with NASA.

19.11
The First GHRS Spectra of a Cool Star: The Chromosphere of Alpha Tau
K. Carpenter (NASA/GSFC), R. Robinson (CSC), D. Ebbets (BASG), J. Linsky (JILA), F. Walter (SUNY), G. Wahlgren, and T. Akes (CSC)

The K5 III star Alpha Tau is scheduled to be observed on 18-October-1990 as part of the Science Assessment Program for the Goddard High Resolution Spectrograph (GHIRS) for Hubble Space Telescope. These spectra will be the first GHRS spectra of a cool star and should provide us an opportunity to evaluate the relative capabilities of the medium and high-resolution (echelle) modes, using both the Large and Small Science Apertures (LSA and SAA), for the study of chromospheric emission features. The planned observations include an interactive acquisition with GHRS maps, spectra in both the LSA and SAA in modes G270M at 2345 A and Echelle-B at 2325 A, as well as an echelle spectrum with the SAA at 2799 A. The first four exposures will contain the C II (UV 0.01) intercombination lines (plus several Si II (UV 0.01) and Fe II lines), while the last will contain the Mg II b and lines. The former will be used to estimate the chromospheric turbulent and flow velocities and the electron density. The Mg II profiles will be examined for the presence of discrete absorption features superposed on the emission lines, including the Mn I and Fe I lines, unresolved with IUE, which are thought to be the agents responsible for the reduction of the observed flux in the visible wings of the Mg II b line. LSA and SAA observations using both echelle B and G270M will allow experiments with deconvolution of LSA and medium resolution data. The effective resolution of each mode will be discussed.

19.12
Spectroscopic Properties of Melnick 42 (O3Fm Star in the LMC)
S. R. Heap (NASA/GSFC), D. Ebbets (BASG), J. Hutchings (DAO), A. Altner (CSC)

We have begun a program to determine the properties of the hottest and most massive stars in the Large Magellanic Cloud. Here we report on our studies of Melnick 42, an O3Fm star in the 30 Doradus region, about 8° north of R136a. Ground-based photometry combined with a crude estimate of temperature (50,000 K, based on its ultraviolet and visual spectral type) yield log Lbol=9.9, which makes the star one of the brightest known. (Recent pictures of the 30 Dor region taken by the Wide Field and Planetary Camera indicate that Melnick 42 is a single star.) Comparison of T_K and L with evolutionary models (Maeder and Mayne 1987) suggests that the star could be a very mas-