

yields $(m-M)_B = 24.65 \pm 0.15$ for M31. With a foreground absorption $A_B = 0.31$ mag this gives $(m-M)_0 = 24.34 \pm 0.15$ corresponding to a distance of 740 ± 50 kpc. The RR Lyrae star frequency per unit luminosity in the halo of M31 is seen to be similar to that in RR Lyrae-rich Galactic globulars. Since Mould and Kristian find the Population II giants in the M31 halo to be of intermediate metallicity ($[Fe/H] = -0.6$) this result suggests that the halo population of M31 has a better developed horizontal branch than Galactic globular clusters of similar metallicity. Spectroscopic observations by Burstein *et al.* indicate that intermediate and metal-rich M31 globular clusters exhibit stronger Balmer lines than their Galactic counterparts suggesting that they have well-developed horizontal branches i.e. the M31 halo and globular clusters in the Andromeda Nebula appear to exhibit similar "family traits." Twenty-eight RR Lyrae variables for which periods could be determined have $\langle P \rangle = 0.548$, which suggests that these objects in the halo of M31 belong to a population resembling Oosterhoff's Type I. This conclusion is strengthened by the observation that the variables with $0.45 < P(\text{days}) < 0.50$ have the largest light amplitudes. However, the phase coverage and photometric accuracy of the data are such that many of the derived periods are not unique. The intrinsic dispersion in the luminosity of RR Lyrae stars in our field in the halo of M31 is 0.3 mag. An eclipsing variable with $B(\text{max}) = 25.0$ is probably a Galactic foreground object.

09.03

High Resolution CO and HI Line Observations of Molecular and Atomic Clouds toward the Star Formation Site A22/D118 in M31

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Spectral line observations of the two lowest rotational transitions of CO and the 21 cm spin-flip transition of HI have been obtained of an active star formation region in M31. The observations were made with similar spatial and spectral resolutions by using the VLA and the NRD 45 meter millimeter-wave telescope for the HI and CO observations respectively. At a spatial resolution of roughly 50 pc, HI and CO emission appear coincident on the sky. However, along the same lines-of-sight, the CO emission is found to be significantly redshifted with respect to the HI emission by an average of 21 km/s over the region observed, suggesting that the atomic and molecular clouds do not occupy the same volume of space. Indeed, along most lines-of-sight, there is little overlap in velocity of HI and CO emission profiles, suggesting that the HI emission arises from clouds which are entirely atomic and the CO emission from clouds which are entirely molecular. A model is proposed in which the molecular clouds formed from the atomic clouds 30 million years ago in an abrupt phase transition which was coherent over a size scale of at least 500 pc. The CO observations, radiative transfer models, and observations of a galactic molecular cloud are compared and this comparison shows that the size and physical properties of molecular clouds in M31 are not very different from those of molecular clouds in the solar neighborhood.

09.04

VLA Observations of the HI and OH Absorption in the Leo Triplet Spiral Galaxy NGC 3628

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Hydrogen and hydroxyl absorption are observed against the nuclear region of NGC 3628, an edge-on spiral galaxy in the Leo Triplet. VLA observations against the extended continuum reveal individual HI and OH features which are distinguished both spatially and in velocity space. Features in both sets of data show a velocity gradient that is consistent with a circular, rotating disk which

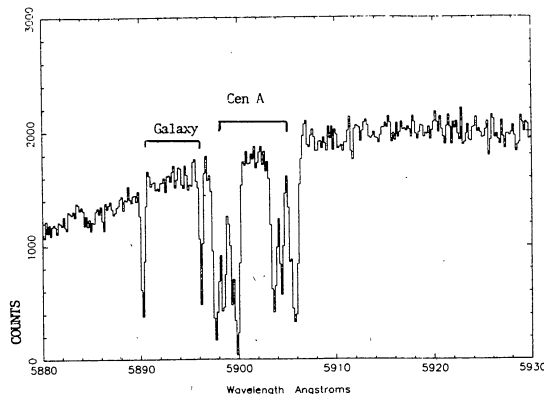
may be the inner portion of the rotation curve. A second structure is also identified; this is expanding with respect to the disk and may be similar to the 3 kpc arm in our own Galaxy. The HI features are, in general, optically thick with $\tau \approx 1$ in many cases and $N_{HI}/T_s \approx 10^{20} \text{ cm}^{-2} \text{ K}^{-1}$. The OH features are optically thin with $\tau \approx 0.18$ and $N_{OH}/T_{ex} \approx 3 \times 10^{15} \text{ cm}^{-2} \text{ K}^{-1}$. The hydrogen and hydroxyl results provide a consistent picture of the inner ~200 pc of NGC 3628, a disturbed and complex galaxy.

09.05

Echelle Spectroscopy of SN 1986G in Cen A: Complex Na D Absorption and Interstellar Diffuse Bands

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Spectroscopy of SN1986G at 0.3Å resolution using the CTIO 4 m telescope and echelle spectrograph has resolved 5 systems of Na doublets, 4 of which are likely due to absorbing material associated with Cen A. Velocities of the systems associated with Cen A are 369, 409, 453, and $480 \pm 5 \text{ km s}^{-1}$. These velocities may be compared with the velocity of H α at the position of the supernova, $490 \pm 10 \text{ km s}^{-1}$, measured by Marcellin *et al.* (1982 *Nature*, 297, 38) and the stellar systemic velocity of $532 \pm 25 \text{ km sec}^{-1}$ measured by Wilkinson *et al.* (1986 *M.N.R.A.S.*, 218, 297). A doublet most likely due to Na in the disk of the Milky Way was found at -12 km sec^{-1} . All of the Na D doublets are saturated and were found to have column densities $\approx 10^{13} \text{ cm}^{-2}$. Interstellar diffuse bands with rest wavelengths of 5780, 5797, and 6284Å (Herbig 1975 *Ap.J.*, 196, 127) were found redshifted to $\approx 420 \text{ km s}^{-1}$, coincident with the Na absorbing clouds. The well known band at 4430Å was too blue to be observed. This is the first detection of diffuse bands in an extragalactic object other than the Magellanic clouds.



09.06

Detection of More H II Regions in the Sombrero Galaxy

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The Sa galaxy NGC 4594 (Sombrero) has many knots of blue stars in its disk. A claim was made some time ago that none of these knots were H II regions, and thus proportionally few massive stars have been made in this galaxy. Schweizer has shown that two of the knots are indeed H II regions. I present data taken in H α with an Imaging Fabry-Perot on the Cerro Tololo 4m telescope that show that all of the blue knots observed are H II regions, with additional H II regions being found that are not associated with blue knots. The luminosity function of the regions in the Sombrero is the weakest of any galaxy yet measured. The faintest H II regions measured have H α luminosities of 6×10^{36} ergs per sec.

09.07

The Ringed Spiral Galaxy NGC 7531

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The southern galaxy NGC 7531 is a nearby non-barred "grand-design" spiral possessing a very bright inner ring. CCD surface photometry, photographic surface photometry, and emission-line spectroscopy have been obtained as a means of