Session 43: Instrumentation & Techniques

High Resolution Infrared Imaging with a New Array Camera
I.S. McLean (U.K. Telescopes, Hawaii)

A wide range of observational results from the commissioning of the first near infrared camera on the 3.6m United Kingdom Infrared Telescope are presented. The new camera, called IRCAM, employs the 62 x 50 Indium Antimonide detector array, which has recently become available from SRRC, in an otherwise general purpose, common-user, system which is briefly described. IRCAM is an exceptionally sensitive IR imaging system and represents a major technological innovation for IR astronomy. Several imaging modes are possible including stepping, chopping and a high-speed snapshot mode. Optical configurations include a high resolution option of 0.6 arcsec per pixel and a low resolution image scale of 2.4 arcsec per pixel. Image mosaics are easily formed. Infrared imaging polarimetry and imaging spectroscopy are also possible, and the instrument is supported by an extensive suite of user-friendly software.

Numerous results from the new camera have already been obtained, and many of these were quite impossible using classical single-detector mapping techniques. Results to be presented include high resolution IR images of planets, star forming regions (GMC-1, GMC-2, GL47), interacting galaxies and the Galactic Centre.

Session 44: Solar System

The Identification of Polyoxymethylene from Observations of Ion Clusters in Comet Halley
D.C. Boice and W.F. Huebner (SWRI/San Antonio and LANL/Los Alamos)

Laboratory experiments have shown that is is possible to create formaldehyde polymer called polyoxymethylene (POM) by irradiating CH₃O with 5 MeV electrons. It is reasonable to assume that similar conditions caused by cosmic radiation existed in the solar or presolar nebula and that comet nuclei formed from particles containing POM or POM formed on comet nuclei while in the dust cloud. The PICCA instrument aboard the GIOTTO spacecraft measured heavy ion mass abundance peaks starting at about 45 amu and decreasing in intensity to 105 amu with regular spacings of approximately 13 amu. This periodicity is similar to that found in POM with alternating CH₃ (14 amu) and O (16 amu) bonds.

We investigate the effects of including POM kinetics (photodissociation, photomultiplication, and dissociative recombination) in our detailed physico-chemical model of comet Halley assuming a small amount of POM in the initial nuclear composition. A comparison is made to the PICCA mass spectrometer data at approximately 10⁷ km and the mass abundance data as a function of cometocentric distance. We discuss the interpretation of the heavy ion data in light of our model calculations which include POM and suggest that some of the ion clusters detected by the PICCA instrument contain POM.

Session 45: Variable & Other Stars

Flare Electric Fields Measured by Stark Effect in Paschen and Balmer Lines
P. Foukal, R. Little (CRI, Inc.), L. Gilliam (SPD)

The widths of high Paschen and Balmer lines emitted by a bright limb flare are measured on spectra obtained with the 40 cm coronograph at Sacramento Peak. Despite considerable Doppler broadening, both the Paschen and Balmer lines exhibit a clearly increasing broadening with upper quantum number that requires electric fields of at least 350 volts cm⁻¹. The local electron density as measured simultaneously and co-spatially with the MgI/SrII line intensity ratio is significantly lower than the value of 656 nm yield a map required to produce such a field by pressure broadening. We infer that an additional, macroscopic electric field of intensity several hundred volts cm⁻¹, due to plasma waves or reconnection is required in the flare plasma to explain this large Stark effect.

Session 50: Late Papers: SN 1987a

Optical Speckle Interferometric Observations of Supernova 1987a
W.P.S. Melotte, S.J. Mather, B.L. Morgan (Imperial College, London)

We have carried out observations of Supernova 1987A using the Imperial College Speckle Interferometer at the Anglo-Australian Telescope. Observations were made on April 2 (central wavelengths 386.9 nm, 486.1 nm), April 11 (486.1 nm, 492.1 nm) and April 14 (587.6 nm, 656.5 nm), 1987. The filter bandwidths were all between 1.0 and 1.6 nm. Preliminary reduction of the data indicates that the supernova was unresolved at 386.9 nm, 486.1 nm (IAU 4369) and 492.1 nm. However, at 656.5 nm a source was detected at angular distance 5.3±0.22 milliarcseconds from the supernova at p.a. 195°22 degrees (IAU 4391, 4394). The source is about 3 or 4 magnitudes fainter than the supernova at this wavelength and epoch. There is also marginal evidence that the source is present at 587.6 nm but at a fainter magnitude. To within the errors, the position of the source is the same as that reported by Karovska et al. (IAU 4382). The linear distance of the source from the supernova has led us to consider a scenario in which a gas cloud in the LMC is ionized and heated by the EUV pulse emitted during the first few hours after the shock reached the surface.

This work is supported by the U.K. Science and Engineering Research Council.

Detection of a Very Bright Close Companion Source to SN 1987A
P. Nisenson, M. Karovska, R. Noyes, C. Papalloilos (Harvard-Smithsonian Center for Astrophysics)

High angular resolution speckle imaging of the Large Magellanic Cloud supernova SN1987A has shown that the source consists of two bright components separated by approximately 60 milliarcseconds (mas), a separation which corresponds to a distance of 3000 au at 50 Kpc (the distance to the LMC) (IAU circular 4382). This point angle of the second source is approximately 195° relative to the SN. Speckle observations were performed on March 25 and April 2, 1987 at the Cerro Tololo Inter-American Observatory using the 4-meter telescope and the CFA two-dimensional photon-counting (PAPA) detector. Reconstructions from data recorded in H (10 nm bandpass centered at 656 nm) yield a magnitude difference of 2.7 ± 0.2 for the observations on both nights. Reconstructions in the 548 nm continuum (10 nm bandpass) have a somewhat larger magnitude difference, and the fainter source was not detected in a 450 nm (10 nm bandpass) observation. Since this fainter source is approximately 5 magnitudes brighter than the Sanduleak star was prior to the SN, we infer that this second source is not the Sanduleak. (The existence of this second source has been confirmed by Marcher et al. in IAU circular 4391.)