DIVISION VI: INTERSTELLAR MATTER
(MATIÈRE INTERSTELLAIRE)

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Commission 34: Interstellar Matter

1. INTRODUCTION

Division VI of the International Astronomical Union deals with Interstellar Matter, and
incorporates Commission 34. It gathers astronomers studying the diffuse matter in space
between the stars, ranging from primordial intergalactic clouds via dust and neutral and
ionised gas in galaxies to the densest molecular clouds and the processes by which stars are
formed. There are approximately 730 members. The working groups in Planetary Nebulae
and Cosmochemistry have served us well in organising periodic seminars in these subject
areas. However, the Organising Committee has recognised that other developing areas of
the ISM are not properly represented in the current organisation. In January 1997, the Di­
vision formed a new ISM working group on Star Forming Regions including cross-divisional
representation to monitor progress in their fields and to help develop proposals for future
IAU Symposia or Colloquia. In the future, especially in view of the rapid developments in
spaceborne X-ray and IR astronomy, Division VI also hopes to form other working groups
on the Hot ISM and the Extragalactic ISM.

2. SCIENTIFIC HIGHLIGHTS 1997 - 1999

2.1. Planetary Nebulae:

Since the last IAU symposium on planetary nebulae held in Groningen in 1996, significant
new results on planetary nebulae have emerged from observations made with the HST
and ISO satellites. High resolution imaging observations have revealed new morphological
features, and infrared spectroscopic observations have detected new molecular and solid-
state features. The imaging results and their implications on the morphological shaping of
planetary nebulae were reported in the conference on asymmetric planetary nebulae held
at MIT in August, 1999. The HST data reported at that conference on the young compact
PNe has revealed some remarkable stuctures, and in strongly bipolar PNe a number of clear
examples of jets have been found. These have no theoretical explanation at the current time.

The infrared spectroscopic observations of planetary nebulae were discussed in several
of the ISO conferences, as well as the IAU Symposium 191 on asymptotic giant branch stars
and IAU symposium 197 on astrochemistry. The Working Group held a meeting during
the IAU General Assembly in Kyoto, where a number of scientific papers were presented in
addition to the business meeting. The Working Group is proposing to hold its next IAU
symposium on planetary nebulae; subject to EC approval, in Canberra, Australia, in 2001.
2.2. Supernova Remnants:

Continuing investigations of the gamma ray emission from SN1006 and the non-thermal X-rays from SN1006 and other supernova remnants are providing reliable separation of the thermal and non-thermal X-ray components. Following the discovery of TeV gamma rays from SN1006 by the CANGAROO experiment (Tanimori et al. 1998, ApJ 497, L25), theoretical models of electron acceleration in shock waves have been much more strongly constrained. While ambiguities remain, for instance between the particle diffusion coefficients and the magnetic field strengths in the shocks, the theory of particle acceleration in very high Mach number shocks can be put on a more solid observational footing.

Recognition of the importance of non-thermal tails also improves the understanding of the thermal components of supernova remnants. The high quality X-ray spectra from ASCA and the sensitivity to harder X-rays of BeppoSAX have forced the reinterpretation of the X-ray spectra of a number of remnants, such as Cas A (Vink et al. 1999, A&A 344, 289). The elemental abundances and the temperature and density of the thermal plasma are affected.

Infrared observations of supernova remnants with the ISO satellite have provided exquisitely detailed spectra and images. It has become clear that much of the IR radiation observed by IRAS and interpreted as radiation from hot dust actually arises from fine structure transitions in neutral or singly ionized species (e.g. Oliva et al. 1999, A&A 341, L75). The ISO spectra greatly increase the number of ions available for determination of elemental abundances and shock speeds.

With the launch of the Chandra Observatory, and the imminent launch of the European XMM Mission, we look forward to seeing a rapid advance in our understanding of supernova remnants.

2.3. Astrochemistry

This field has continued to advance rapidly. Indeed, both of the Annual Reviews of Astronomy & Astrophysics articles reported below are in this area. As of August 1999, some 120 chemical species have been identified. The list is maintained at www.cv.nrao.edu/~awootten/allmols.html and can be reached via the Astrochemistry Working Group homepage referred to below. The detailed report of the Astrochemistry Working Group is given separately.

3. WORKING GROUPS

Planetary Nebula Working Group: Chair: Sun Kwok (USA)

Members: Agnes Acker (France), Michael J. Barlow (UK), George Jacoby (USA), Jim Kaler (USA), Walter Maciel (Brasil), Dipankar C.V. Malick (India), Mario Perinotto (Italy), Stuart Pottasch (Netherlands), Luis Rodriguez (Mexico), Detlef Schönberner (Germany), Yervant Terzian (USA), Roumald Tylenda (Poland) & Peter Wood (Australia)

Astrochemistry Working Group: Chair: D.A. Williams (U.K.)

Secretary: E.F. van Dishoeck (The Netherlands), L.W. Avery (Canada), J.H. Black (Sweden), V. Buch (Israel), A. Daigarno (U.S.A), J.M. Greenberg (The Netherlands), C. Henkel (Germany), W.M. Irvine (U.S.A), J.P. Maier (Switzerland), K.M. Menten (U.S.A.), Y.C. Minh (Korea), M. Ohishi (Japan), B. Rowe (France), P.D. Singh (Brazil), L.E. Snyder (U.S.A), & Qin Zeng (China P.R.).

Working Group on Star Forming Regions: Chair: R. Bachiller (Spain),

Members: M. Burton (Australia), Y. Fukui (Japan), G. Garay (Chile), T. Henning (Germany), S. Lizano (Mexico), F. Palla (Italy), B. Reipurth (USA), A. Sargent (USA), & S. Strom (USA).

Liasing Members: Division IV: L. Cram (Australia), Div VII: J. Palous (Czech Republic)
4. MAJOR SCIENTIFIC CONFERENCES 1997 - 1999


5. MAJOR PUBLICATIONS 1997 - 1999


6. SOURCES OF FURTHER INFORMATION

The Star Formation Newsletter at: www.eso.org/gen-fac/pubs/starform/ is a monthly electronic publication which provides abstracts of recently accepted papers in the field of star formation, molecular clouds and the interstellar medium. Other useful newsletters relating to the ISM are the Hot Star Newsletter maintained by Phillippe Eenens at: www.astro.ugto. mx/~eenens/hot/, the AGB Newsletter produced by Claudaine Kahane & Thierry FORVEILLE at www-laog.obs.ujf-grenoble.fr/heberges/agbnews/agbnews.html, the Magellanic Clouds Newsletter put out by Eva Grebel and You-Hua Chu at: www.astro.uiuc.edu/projects/mcnews/MCNews.html (for US readers) or: www.astro.uni-bonn.de/~mcnews for the European region. Finally, the Active Galaxies Newsletter edited by Matthew Redman and which can be found at www.ast.man.ac.uk/~mpr/agn/ often contains items of interest to the ISM community.

An general search area for astrochemistry is maintained by the Astrochemistry Working Group of the Division at: www.strw.leidenuniv.nl/~iau34/. This contains links to a list of molecules detected in space, molecular gas-phase spectroscopy data-bases, chemical kinetics and reaction rates databases, solid-state databases (ices, silicates), observational facilities and astrochemistry groups world-wide. In Atomic physics we refer the reader to the database for radiative transition rates & energy levels for atomic spectral lines at: physics.nist.gov/PhysRefData/ASD1/, or to search for lines in a specific wavelength region see: physics.nist.gov/cgi-bin/AtData/lines_form.

A number of useful catalogs are maintained on the web. Dave Green’s catalogue of “Galactic Supernova Remnants” is at: www.mrao.cam.ac.uk/surveys/snrs/, “A General Catalogue of Herbig-Haro Objects” is maintained at: casa.colorado.edu/hhcat. This is a complete list of all known Herbig-Haro objects, with coordinates, extensive notes and a full list of references to the literature for each object. The catalogue, which is now in its second edition, will be updated approximately once a year. Finally the “The Herbig-Bell Catalogue” at: www-astro.phast.umass.edu/cataloga/HBC/HBC.html lists coordinates, information and references to the literature on 735 pre-main sequence stars. Finally, a complete database on upcoming international astronomy meetings is to be found at: cadcwww.dao.nrc.ca/meetings/meetings.html.

Michael A. Dopita
President of the Division