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Abstract of recently accepted papers

ISO Observations of the Unidentified 30 Micron Feature in Proto–Planetary Nebulae

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The intrinsic emission profile of the unidentified broad 30 μm emission feature is derived from *ISO* spectra of proto-planetary nebulae (PPNs). The feature is resolved into two components: a narrower feature at 26 μm and a broader feature at 33 μm. This improves upon the initial study of these two components by Hrivnak et al. (2000). The intrinsic profiles of these two features and their varying strengths in PPNs are determined. The chemical origin of these features and the processes responsible for their changing strengths from AGB stars to PPNs to planetary nebulae are discussed.

Accepted by Astrophysical Journal

Preprints can be obtained by contacting kwok@iras.ucalgary.ca

Globular Clusters and the Mira Period-Luminosity Relation

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A globular cluster distance scale based on Hipparcos parallaxes of subdwarfs has been used to derive estimates of M_K for cluster Miras, including one in the SMC globular cluster NGC121. These lead to a zero-point of the infrared period-luminosity relation, PL(K), in good agreement with that derived from Hipparcos parallaxes of nearby field Miras. The mean of these two estimates together with data on LMC Miras yields an LMC distance modulus of 18.60 ± 0.10 in evident agreement with a metallicity corrected Cepheid modulus ($18.59\pm \sim 0.10$).

The use of luminous AGB stars as extragalactic population indicators is also discussed.

Accepted by: Monthly Notices of the Royal Astronomical Society

For preprints, contact mwf@artemisia.ast.uct.ac.za
Also available from the URL http://arXiv.org/abs/astro-ph/0111108

The origin of primary nitrogen in galaxies

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We investigate the role of stellar axial rotation on the nitrogen nucleosynthesis at low metallicities Z. For this purpose, we have calculated models with initial masses between 2 and 60 $M_\odot$ at Z=0.00001 from the zero age sequence to the phase of thermal pulses for models below or equal to 7 $M_\odot$, and up to the end of central C–burning for the more massive stars. The models include all the main physical effects of rotation. We show that intermediate mass stars with rotation naturally reproduce the occurrence and amount of primary nitrogen in the early star generations in the Universe. We identify two reasons why rotating models at low Z produce primary ^{14}N: 1) Since the stars lose less angular momentum, they rotate faster. Simultaneously, they are more compact, thus differential rotation and shear mixing are stronger. 2) The H–burning shell has a much higher temperature and is thus closer to the core, which favours mixing between the two.

Accepted for publication in Astron. and Astrophys. Letters

preprint available from georges.meynet@obs.unige.ch *or at* astro-ph/0111187

Water-maser emission from a planetary nebula with a magnetized torus

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A star like the Sun becomes a planetary nebula towards the end of its life, when the envelope ejected during the earlier giant phase becomes photoionized as the surface of the remnant star reaches a temperature of $\sim$ 30,000 K. The spherical symmetry of the giant phase is lost in the transition to a planetary nebula, when non-spherical shells and powerful jets develop. Molecules that were present in the giant envelope are progressively destroyed by the radiation. The water-vapour masers that are typical of the giant envelopes therefore are not expected to persist in planetary nebulae. Here we report the detection of water-maser emission from the planetary nebula K 3-35. The masers are in a magnetized torus with a radius of about 85 astronomical units and are also found at the surprisingly large distance of about 5,000 astronomical units from the star, at the tips of bipolar lobes of gas. The precessing jets from K 3-35 are probably involved in the excitation of the distant masers, although their existence is nevertheless puzzling. We infer that K 3-35 is being observed at the very moment of its transformation from a giant star to a planetary nebula.

Published in Nature, 414, 284 (2001)

Preprints can be obtained by contacting lfm@iaa.es

Observations of SiO Maser Sources within a Few Parsecs from the Galactic Center

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Mapping and monitoring observations of the SiO maser sources near the Galactic center were made with the Nobeyama 45-m telescope at 43 GHz. Rectangular mapping an area of approximately $200'' \times 100''$ in a $30''$ grid, and triangular mapping in a $20''$ grid toward the Galactic center, resulted in 15 detections of SiO sources; positions of the sources were obtained with errors of 5–$10''$ except for a few weak sources. Three-year monitoring observations found that the component at $V_{lsr} = -27$ km s^{-1} of IRS 10 EE flared to about 1.5 Jy during 2000 March–May, which was a factor of more than 5 brighter than its normal intensity. Using the radial velocities and positions of the SiO sources, we identified 5 which are counterparts of the previously observed OH 1612 MHz sources. The other 10 SiO sources have no OH counterparts, but two were previously detected with VLA, and four are located close to the positions of large-amplitude variables observed at near-infrared wavelengths. A least-square fit to a plot of velocities versus Galactic longitudes gives a rather high speed for rotation of the star cluster around the Galactic center. The observed radial-velocity dispersion is roughly consistent with the value obtained before. It was found that all the SiO sources with OH 1612 MHz counterparts have periods of light variation longer than 450 days, while SiO sources without OH masers often have periods shorter than 450 days. This fact suggests that lower-mass AGB stars are more often detected in SiO masers than in the OH 1612 MHz line.

PASJ 54 no.1 (2002 February. issue) in press
Preprints can be obtained by contacting deguchi@nro.nao.ac.jp
or via WWW on http://www.nro.nao.ac.jp/library/report/list.html
or via anonymous ftp on ftp://www.nro.nao.ac.jp/nroreport/no548.pdf.gz

HD 331319: a post-AGB F–supergiant with He I lines

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Based on CCD spectra taken with an echelle spectrometer attached to the 6-m telescope, we have determined the fundamental parameters and detailed chemical composition of HD 331319, an optical counterpart of the infrared source IRAS 19475+3119, by the model-atmosphere method. Helium lines were detected in the spectrum of this luminous ($Mv < -8^m$) object with the effective temperature Te $\approx$ 7250 K. This detection can be interpreted as a significant helium overabundance in the observed atmospheric layers and may be considered as a manifestation of helium synthesis during the preceding evolution. Nitrogen and oxygen were found to be overabundant, $[N/Fe]_\odot = +1.30$ dex and $[O/Fe]_\odot = +0.64$ dex with the carbon overabundance being modest. The metallicity of the stellar atmosphere, $[Fe/H]_\odot = -0.25$, differs only slightly from its solar value. The s-process metals are not overabundant but most likely underabundant relative to iron: $[X/Fe]_\odot = -0.68$ for Y and Zr. Barium is also underabundant relative to iron: $[Ba/Fe]_\odot = -0.47$. The heavier elements La, Ce, Nd, and Eu are slightly enhanced relative to iron: the mean $[X/Fe]_\odot = +0.16$ for them. In general, the elemental abundances confirm that IRAS 19475+3119 is a post-AGB object. The metallicity in combination with the radial velocity $V_r = -3.4$ km s^{-1}and Galactic latitude $|b| = 2\overset{\circ}{.}7$ of the object suggest that it belongs to the Galactic disk population. The envelope expansion velocity, $V_{exp} \approx 21$ km s^{-1}was determined from the positions of the absorbtion bands that originate in the circumstellar envelope. A comparison of our results for the comparison star HD 161796 = IRAS 17436+5003, a typical post-AGB object, with previously published data revealed an evolutionary increase in the effective temperature of HD 161796 at a mean rate of 50^o per year.

Accepted by Astronomy Letters, 2001, January

Preprints can be obtained by contacting valenta@sao.ru

High Resolution Near-infrared Spectro-imaging of NGC 7027

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We present near-infrared spectro-imaging of the young planetary nebula NGC 7027 between 2.10 and 2.20 μm with high spatial ($0.5''$) and high spectral ($8.7\,\mathrm{km\,s^{-1}}$) resolution. The observations, made using *BEAR* at the CFHT, reveal the detailed morphology and kinematics of the ionized nebula (in the Brγ line and 16 other atomic lines) and the surrounding molecular envelope (in the 1–0 S(1) line of H_2).

The observations show that the ionized gas forms an elongated ($\sim 6'' \times 12''$, PA $= 32°$), limb-brightened shell with an expansion velocity of 19.5 km s$-$1 along the line of sight. The shell is composed of numerous small condensations and has nearly parallel sides with flattened ends which are not well matched by a uniform ellipsoidal model. Low level Brγ emission is detected at high red- and blue-shifted velocities ($\pm$55 km s$-$1) along a bipolar axis at PA $= 60°$ that deviates significantly from that of the main nebula. The H_2 emission is distributed at the periphery of the ionized gas, in a limb-brightened, bi-conical shell ($\sim 10'' \times 13''$, PA $= 28°$) with enhanced emission at the equator and complex structure at the ends of the major axis. The H_2 emission traces the inner edge of the extended molecular envelope seen in CO, and its distribution and intensity are well matched by model predictions of a high-density ($n_H \sim 10^6 - 10^5\,\mathrm{cm^{-3}}$) photo-dissociation region.

The kinematic structure of the H_2 emission reveals a remarkable series of lobes and openings in the molecular shell. These features are point symmetric about the center, and the most prominent pair aligns with the high velocity, bipolar emission seen in Brγ. These observations demonstrate recent activity by collimated outflows in NGC 7027, with a multiple, bipolar geometry. The interaction of the outflows with the surrounding envelope has significantly affected the morphology of the developing nebula and its environment, and their presence in this well studied archetype underscore the general importance of outflows in the early shaping history of planetary nebulae.

Accepted by Astronomy & Astrophysics Main Journal

Preprints can be obtained by contacting pierre.cox@ias.u-psud.fr

Job opportunities

Schoenberg postdoctoral research fellowship in stellar astrophysics

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The Schoenberg post-doctoral research fellowship in stellar astrophysics is available at the Department of Astronomy and Space Physics, at Uppsala University, Sweden. The position is for 1+1 years with a starting date during 2002, contingent upon availability of funding.

The successful candidate should have obtained a PhD in astronomy or a related field no earlier than in 1997, and should additionally have a strong research record in stellar physics, good communication skills and ability to interact constructively with the other research staff.

Any field of observational and theoretical stellar physics will be considered for the position, although preference may be given to applicants with an overlap with current or planned research activities of the stellar astrophysics group of the department. The fields of astronomical research include stellar atmospheres, radiative transfer, atomic physics, astrophysical hydrodynamics, stellar surface structures, late-type stars, T-Tauri stars, AGB-stars, circumstellar envelopes, the solar system, galactic chemical evolution, galactic structure and dynamics, and galaxies. Within these fields observational, numerical, theoretical, and instrumentation work is carried out.

The research is characterized by many international collaborations and the department is nowadays located in a common building together with the other departments of the physical sciences. The scientific staff currently consists of 3 professors, 5 associate professors, 2 research associates, 3 postdoctoral fellows, 18 PhD students and several short and long-term visitors. More than half of the staff belongs to the stellar astrophysics group. Sweden has access to all ESO telescopes, VLT, the NOT and the Swedish Solar Vacuum Telescope on La Palma, and the various ESA projects, incl. HST. Computing facilities are very good both at the institutional and national levels.

Uppsala is located about 80 km north of the capital Stockholm, and has a population of about 200 000 with a strong academic presence.

Applications should consist of Curriculum Vitae, list of publications, three letters of recommendation and a description of current and planned research program. Women are particularly encouraged to apply. The application should be received not later than Jan. 18, 2002, at the above address. For further information, please contact

Director K. Eriksson (e-mail: Kjell.Eriksson@astro.uu.se),

Prof. N. Piskunov (e-mail: Nikolai.Piskunov@astro.uu.se) or

Prof. B. Gustafsson (e-mail: Bengt.Gustafsson@astro.uu.se).

Announcements

Post-AGB Objects as a Phase of Stellar Evolution.

Proceedings of the Toruń Workshop held July 5-7, 2000,
Astrophysics and Space Science Library Vol. 265, ISBN 07923-71453.
Publisher: Kluwer Academic Publishers, Boston/Dordrecht/London, 2001.
Publication Date: 08/2001

Edited by: R. Szczerba, S.K. Górny
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The main aim of the workshop was an attempt to formulate a consistent picture of the proto–planetary evolution by means of extensive comparison between observations and theoretical modeling. The meeting devoted to proto–planetary nebulae, which until the 1970's represented the missing link between Asymptotic Giant Branch (AGB) and planetary nebule (PNe), was organized in the 800 year–old Toruń (the home town of Nicolaus Copernicus) after the IAU Symposium 191 (Asymptotic Giant Branch Stars, held in Montpellier) and before the IAU Symposium 209 (Planetary Nebulae, held in Canberra).
These conference proceedings contain review, contributed and poster papers discussing results related to the proto-planetary nebulae, a short lasting phase between AGB and PNe. Results from the Hubble Space Telescope, the Infrared Space Observatory and other instruments are discussed and compared with theoretical predictions with the aim to formulate a consistent picture of the proto-planetary evolution. The main topics emphasized in the book include discussion of stellar evolution and winds, the onset of asymmetrical structures, chemical composition of the central stars as well as the constituents of their enelopes (atomic gas, molecular gas and dust).
Kluwer Academic Publisher, ASSL 256

EuroConference on Symbiotic stars probing stellar evolution

27-31 May 2002, La Palma, Canary Islands, Spain

Announcement of availability of grants from the European Union

We are pleased to announce that the conference will be financially supported by the *European Commission, High-Level Scientific Conferences*. A number of EU grants will be available, and will cover:

A) most (up to 85%) of the expenses (travel+accomodation+registration fee) of about 40 **young researchers** ($\leq$ 35 years old at the time of the conference) who are nationals of a Member State of the European Union or of an Associated State, and working in an institution inside a Member State or an Associated State;

B) up to 50% of the expenses of some 12-15 **researchers** (of any age), who are nationals of an EU Member State or an Associated State, and active outside member States and Associated States at the time of the conference.

For more information on the eligibility criteria of the grants above and how to apply for them, see the conference Web site

http://www.ing.iac.es/conferences/symbiotics/

With best regards,
Romano Corradi & Joanna Mikolajewska (Co-chairs, SOC)
... on behalf of the Scientific Organizing Committee:
M. Bode, R. Corradi, A. Jorissen, M. Livio, J. Mikolajewska, U. Munari, H. Nussbaumer, H.M. Schmid, E. Sion, and P. Whitelock
Contact email: *symbio@ing.iac.es*

New IAU Working Group:
The Working Group on Abundances in Red Giants

The IAU has recently approved the formation of a new Working Group, dedicated to advancing our understanding of abundances in red giant stars. This has become increasingly important in the last decade. For example, the continuing question of the abundance anomalies in globular cluster red giants now seems to require both primordial abundances as well as interior mixing beyond the standard theory. Solutions to these problems may be within reach soon, as a result of both theoretical breakthroughs as well as access to larger telescopes and finer instruments.

Concurrent with this has been the continued growth in our understanding of the importance and variety of nucleosynthesis occurring in AGB stars. These have implications well beyond the structure and evolution of the stars themselves. The related subject of the chemical evolution of the galaxy, for example, is intimately tied to AGB star nucleosynthesis. This is another area which is extremely rich for research at the moment, with incredible insights, constraints and data coming from meteorite analysis of pre-solar grains.

As a result of these recent and complementary developments, there has been a renewed synergy between cross-disciplinary areas related to red giants of all kinds. Hence we have formed the new Working Group, whose initial functions will be:

- to enhance communication among interested researchers by drawing up an email address list and sending messages about planned activities;
- to set up a new web site for posting relevant announcements, data sets, etc.
- to organize a symposium as part of the next IAU General Assembly in Sydney in 2003.

We are sponsored by Division IV (Stars) as well as Commissions 29, 35, 36 and 45.

Please see the following web-site for information http://www.maths.monash.edu.au/ johnl/wgarg/

John Lattanzio (Chair, WG-ARG)

*** come to IAU2003 in Sydney : 13-26 July 2003 ***

http://www.astronomy2003.com/