THE AGB NEWSLETTER

An electronic publication dedicated to Asymptotic Giant Branch stars and related phenomena

Official publication of the IAU Working Group on Abundances in Red Giants

No. 142 — 2 May 2009

http://www.astro.keele.ac.uk/AGBnews

Editors: Jacco van Loon and Albert Zijlstra

Editorial

Dear Colleagues,

It is our pleasure to present you the 142$^{\rm nd}$ issue of the AGB Newsletter. It has been a little quieter this month, but probably this is just a moment of calm before the storm. The submissions are no less exciting.

We would like to congratulate Walter Alfredo Weidmann with his Ph.D. If he or others are looking for a postdoctoral position, then please see the advertisement for two such positions in South Africa, where the largest single optical telescope of the world is just about to enter the operational phase.

There is also an announcement, asking for input in a review paper. If you want your work advertised, don't forget to react in time.

An anonymous reader has sent in some reactions to previous Food for Thought's — please follow his example, and get some lively discussion going:

AGB Newsletter 138: Our Sun becomes a red giant - do we have a contingency plan? "I guess no. Long-term planning is not a strength of the human race, though it would be a clear asset in this complex and ever-changing world (see the climate change and protection debate). On the shorter scale, we have to first ask the question "Do we have a contingency plan against hazardous asteroids?". I would suggest to wait and see if humankind survives the current century, then we can think about the sun becoming a red giant (if there isn't something more coming up)."

AGB Newsletter 139: Do planets form in discs surrounding evolved stars or stellar remnants? "It seems probable to me that planet formation is just a natural consequence in every disk that is cool enough and metal-rich enough. Is there any other requirement?"

AGB Newsletter 140: Why do low-mass stars become red giants? "I once read a popular article by Rudolf Kippenhahn, where he reported on numerical experiments that some stellar evolution theorists (I do not remember who, maybe he was involved himself) performed. One of the things they did in the stellar evolution code was to twiddle around with nuclear reaction rates. As far as I remember, this did not much change the evolution of the numerical star. Another experiment the scientists made was that they put a massive, compact core in the otherwise normal (main sequence?) star. What happened was that the star expanded, and turned into a red giant! Also real low-mass stars produce a compact core (first helium and later on carbon-oxygen), thus becoming red giants. Such kind of experiments can be very enlightening."

The next issue will be distributed on the 7$^{\rm th}$ of June 2009; the deadline for contributions is the 6$^{\rm th}$ of June.

Editorially Yours,

Jacco van Loon and Albert Zijlstra

Food for Thought

This month's thought-provoking statement is:

How different is the dust condensation sequence in the absence of hydrogen?

Reactions to this statement or suggestions for next month's statement can be e-mailed to agbnews@astro.keele.ac.uk (please state whether you wish to remain anonymous)

Refereed Journal Papers

Orbital Periods For Three Recurrent Novae

Bradley E. Schaefer[1]

[1]Louisiana State University, USA

I report on the discovery of the orbital periods of three recurrent novae in our galaxy. V745 Sco has an orbital period of 510 ± 20 days with ellipsoidal modulations, based on SMARTS photometry from 2004–2008. V3890 Sgr has an orbital period of 519.7 ± 0.3 days with ellipsoidal modulations and a shallow eclipse, based primarily on SMARTS and AAVSO photometry from 1995–2008, but also extending back to 1899 with archival plates. In addition, a sinusoidal modulation of amplitude 0.2 mag and period 103.8 ± 0.4 days is seen mainly in the red, with this attributed to ordinary pulsations in the giant companion star. V394 CrA has an orbital period equal to twice its primary photometric period ($P_{\rm orb} = 1.515682 \pm 0.000008$ days), as based on photometry extending from 1989–2008. I use all available information (including the UBVRIJHK spectral energy distributions) to get distances to the four RNe with red giant companions as 800 ± 140 pc for T CrB, 4300 ± 700 pc for RS Oph, 7300 ± 1200 pc for V745 Sco, and 6000 ± 1000 pc for V3890 Sgr. Further, the red giant in the RS Oph system has a mass-loss rate of close to 3.7×10^{-8} $M_\odot$ yr^{-1} as based on many confident measures, and this is too weak (by a factor of 100,000) to supply the white dwarf with mass at the known rate of 3.9×10^{-6} $M_\odot$ yr^{-1}. Thus, the only way to get matter onto the white dwarf fast enough is through Roche lobe overflow, and this confidently demonstrates that the distance to RS Oph is $\gtrsim$3000 pc.

Accepted for publication in Astrophysical Journal
Available from arXiv:0903.1349

On the Mass and Metallicity Distributions of the Parent AGB Stars of O-rich Presolar Stardust Grains

Larry R. Nittler[1]

[1]Carnegie Institution of Washington, USA

Presolar grains in meteorites formed in a sample of AGB stars that ended their lives within $\sim$ 1 Gyr of the origin of the Solar System 4.6 Gyr ago. The O-isotopic compositions of presolar O-rich stardust reflect the masses and metallicities of their parent stars. We present simple Monte Carlo simulations of the parent AGB stars of presolar grains. Comparison of model predictions with the grain data allow some broad conclusions to be drawn: 1) Presolar O-rich grains formed in AGB stars of mass $\sim$ 1.15–2.2 $M_\odot$. The upper-mass cutoff reflects dredge-up of C in more massive AGB stars, leading to C-rich dust rather than O-rich, but the lack of grains from intermediate-mass AGB stars ($>$ 4 $M_\odot$) is a major puzzle. 2) The grain O-isotopic data are reproduced well if the Galaxy in presolar times

was assumed to have a moderate age–metallicity relationship, but with significant metallicity scatter for stars born at the same time. 3) The Sun appears to have a moderately low metallicity for its age and/or unusual $^{17}O/^{16}O$ and $^{18}O/^{16}O$ ratios for its metallicity. 4) The Solar $^{17}O/^{18}O$ ratio, while unusual relative to present-day molecular clouds and protostars, was not atypical for the presolar disk and does not require self-pollution of the protosolar molecular cloud by supernova ejecta.

Accepted for publication in Publications of the Astronomical Society of Australia
Available from arXiv:0904.1388

Discovery, Photometry, and Kinematics of Planetary Nebulae in M 82

L.C. Johnson[1]*, R.H. Méndez*[2] *and A.M. Teodorescu*[2]

[1]Department of Astronomy, University of Washington, Box 351580, Seattle, WA 98195, USA
[2]Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA

Using an [O III] λ5007 on-band/off-band filter technique, we identify 109 planetary nebulae (PNe) candidates in the edge-on spiral galaxy M 82, using the FOCAS instrument at the 8.2m Subaru Telescope. The use of ancillary high-resolution Hubble Space Telescope ACS Hα imaging aided in confirming these candidates, helping to discriminate PNe from contaminants such as supernova remnants and compact H II regions. Once identified, these PNe reveal a great deal about the host galaxy; our analysis covers kinematics, stellar distribution, and distance determination. Radial velocities were determined for 94 of these PNe using a method of slitless spectroscopy, from which we obtain a clear picture of the galaxy's rotation. Overall, our results agree with those derived by CO(2–1) and H I measurements (Sofue 1998) that show a falling, near-Keplerian rotation curve. However, we find a subset of our PNe that appear to lie far ($\sim$ 1 kpc) above the plane, yet these objects appear to be rotating as fast as objects close to the plane. These objects will require further study to determine if they are members of a halo population, or if they can be interpreted as a manifestation of a thickened disk as a consequence of a past interaction with M 81. In addition, [O III] λ5007 emission line photometry of the PNe allows the construction of a planetary nebula luminosity function (PNLF) for the galaxy. Our distance determination for M 82, deduced from the observed PNLF, yields a larger distance than those derived using the tip of the red giant branch technique (TRGB; Dalcanton et al. 2009), using Cepheid variable stars in nearby group member M 81 (Freedman et al. 1994), or using the PNLF of M 81 (Jacoby et al. 1989). We show that this inconsistency most likely stems from our inability to completely correct for internal extinction imparted by this dusty, starburst galaxy. Additional observations that yield object-by-object foreground and internal extinction corrections are required to make an accurate distance measurement to this galaxy.

Accepted for publication in ApJ
Available from arXiv:0904.0266

Interferometric properties of pulsating C-rich AGB stars I. Intensity profiles and uniform disc diameters of dynamic model atmospheres

C. Paladini[1]*, B. Aringer*[1,2]*, J. Hron*[1]*, W. Nowotny*[1]*, S. Sacuto*[1] *and S. Höfner*[3]

[1]Department of Astronomy, Vienna, Austria
[2]INAF-OAPD, Padova, Italy
[3]Department of Physics and Astronomy, Uppsala, Sweden

We present the first theoretical study on center-to-limb variation (CLV) properties and relative radius interpretation for narrow and broad-band filters, on the basis of a set of dynamic model atmospheres of C-rich AGB stars. We computed visibility profiles and the equivalent uniform disc radii (UD-radii) in order to investigate the dependence of these quantities upon the wavelength and pulsation phase. After an accurate morphological analysis of the visibility and intensity profiles determined in narrow and broad-band filter, we fitted our visibility profiles with a UD function

simulating the observational approach. UD-radii have been computed using three different fitting-methods to investigate the influence of the sampling of the visibility profile: single point, two points and least square method. The intensity and visibility profiles of models characterized by mass loss show a behaviour very different from a UD. We found that UD-radii are wavelength dependent and this dependence is stronger if mass loss is present. Strong opacity contributions from C_2H_2 affect all radius measurements at 3 μm and in the N-band, resulting in higher values for the UD-radii. The predicted behaviour of UD-radii versus phase is complicated in the case of models with mass loss, while the radial changes are almost sinusoidal for the models without mass loss. Compared to the M-type stars, for the C-stars no windows for measuring the pure continuum are available.

Accepted for publication in A&A
Available from arXiv:0904.2166

The shapes of AGB envelopes as probes of binary companions

P.J. Huggins[1], *N. Mauron*[2] *and E.A. Wirth*[1]

[1]New York University, USA
[2]Université de Montpellier, France

We describe how the large scale geometry of the circumstellar envelopes of asymptotic giant branch stars can be used to probe the presence of unseen stellar companions. A nearby companion modifies the mass loss by gravitationally focusing the wind towards the orbital plane, and thereby determines the shape of the envelope at large distances from the star. Using available simulations, we develop a prescription for the observed shapes of envelopes in terms of the binary parameters, envelope orientation, and type of observation. The prescription provides a tool for the analysis of envelope images at optical, infrared, and millimetre wavelengths, which can be used to constrain the presence of companions in well observed cases. We illustrate this approach by examining the possible role of binary companions in triggering the onset of axi-symmetry in planetary nebula formation. If interaction with the primary leads to axi-symmetry, the spherical halos widely seen around newly formed nebulae set limits on the companion mass. Only low mass objects may orbit close to the primary without observable shaping effects: they remain invisible until the interaction causes a sudden change in the mass loss geometry.

Accepted for publication in MNRAS
Available from arXiv:0904.1884

The depletion of carbon by extra mixing in metal-poor giants

Richard J. Stancliffe[1], *Ross P. Church*[1], *George C. Angelou*[1] *and John C. Lattanzio*[1]

[1]Centre for Stellar and Planetary Astrophysics, Monash University, Australia

There is an apparent dichotomy between the metal-poor ([Fe/H] ≤ -2) yet carbon-normal giants and their carbon-rich counterparts. The former undergo significant depletion of carbon on the red giant branch after they have undergone first dredge-up, whereas the latter do not appear to experience significant depletion. We investigate this in the context that the extra mixing occurs via the thermohaline instability that arises due to the burning of ^{3}He. We present the evolution of [C/Fe], [N/Fe] and ^{12}C/^{13}C for three models: a carbon-normal metal-poor star, and two stars that have accreted material from a 1.5 $M_\odot$ AGB companion, one having received 0.01 $M_\odot$ of material and the other having received 0.1 $M_\odot$. We find the behaviour of the carbon-normal metal-poor stars is well reproduced by this mechanism. In addition, our models also show that the efficiency of carbon-depletion is significantly reduced in carbon-rich stars. This extra-mixing mechanism is able to reproduce the observed properties of both carbon-normal and carbon-rich stars.

Accepted for publication in MNRAS
Available from arXiv:0904.2393

CO and H I observations of an enigmatic interstellar cloud

Y. Libert[1], *E. Gérard*[2], *T. Le Bertre*[1], *L.D. Matthews*[3], *C. Thum*[4] *and J.M. Winters*[4]

[1]LERMA, UMR 8112, Observatoire de Paris, France
[2]GEPI, UMR 8111, Observatoire de Paris, France
[3]MIT Haystack Observatory, USA
[4]IRAM, France

An isolated H I cloud with peculiar properties has recently been discovered by Dedes, Dedes, & Kalberla (2008, A&A, 491, L45) with the 300-m Arecibo telescope, and subsequently imaged with the VLA. It has an angular size of $\sim 6'$, and the H I emission has a narrow line profile of width ~ 3 km s^{-1}. We explore the possibility that this cloud could be associated with a circumstellar envelope ejected by an evolved star. Observations were made in the rotational lines of CO with the IRAM-30m telescope, on three positions in the cloud, and a total-power mapping in the H I line was obtained with the Nançay Radio Telescope. CO was not detected and seems too underabundant in this cloud to be a classical late-type star circumstellar envelope. On the other hand, the H I emission is compatible with the detached-shell model that we developed for representing the external environments of AGB stars. We propose that this cloud could be a fossil circumstellar shell left over from a system that is now in a post-planetary-nebula phase. Nevertheless, we cannot rule out that it is a Galactic cloud or a member of the Local Group, although the narrow line profile would be atypical in both cases.

Accepted for publication in Astronomy and Astrophysics
Available from arXiv:0904.2299

V532 Oph is a New R Coronae Borealis Star

G.C. Clayton[1], *D. Kilkenny*[2], *P. Wils*[3] *and D.L. Welch*[4]

[1]LSU, USA
[2]University of the Western Cape, South Africa
[3]Vereniging Voor Sterrenkunde, Belgium
[4]McMaster University, Canada

V532 Oph has been found to be a member of the rare, hydrogen-deficient R Coronae Borealis (RCB) stars from new photometric and spectroscopic data reported in this paper. The lightcurve of V532 Oph shows the sudden, deep, irregularly spaced declines characteristic of RCB stars. Its optical spectrum is typical of a warm ($T_{\rm eff} \sim 7000$ K) RCB star, showing weak or absent hydrogen lines, the C_2 Swan bands, and no evidence for ^{13}C. In addition, the star shows small pulsations typical of an RCB star and an infrared excess due to circum- stellar dust. It also appears to be significantly reddened by foreground dust. The distance to V532 Oph is estimated to be 5.5–8.7 kpc. These new data show that this star was misclassified as an eclipsing binary in the General Catalog of Variable Stars. The new data presented here for V532 Oph reveal the power of high-quality, high-cadence all-sky photometric surveys, such as ASAS-3, to identify new RCB candidates on the basis of lightcurve data alone, now that they have been collecting data for durations sufficiently long to reveal multiple declines. Despite their small numbers, RCB stars may be of great importance in understanding the late stages of stellar evolution. In particular, their measured isotopic abundances imply that many, if not most, RCB stars are produced by WD mergers, which may be the low-mass counterparts of the more massive mergers thought to produce type Ia supernovae. Therefore, establishing the population of RCB stars in the Galaxy will help constrain the frequency of these WD mergers.

Accepted for publication in PASP
Available from arXiv:0904.0613

Do Hydrogen-deficient Carbon Stars have Winds?

T.R. Geballe[1]*, N. Kameswara Rao*[2] *and Geoffrey C. Clayton*[3]

[1]Gemini Observatory, USA

[2]Indian Institute for Astrophysics, India

[3]LSU, USA

We present high resolution spectra of the five known hydrogen-deficient carbon (HdC) stars in the vicinity of the 10830 Angström line of neutral helium. In R Coronae Borealis (RCB) stars the He I line is known to be strong and broad, often with a P Cygni profile, and must be formed in the powerful winds of those stars. RCB stars have similar chemical abundances as HdC stars and also share greatly enhanced ^{18}O abundances with them, indicating a common origin for these two classes of stars, which has been suggested to be white dwarf mergers. A narrow He I absorption line may be present in the hotter HdC stars, but no line is seen in the cooler stars, and no evidence for a wind is found in any of them. The presence of wind lines in the RCB stars is strongly correlated with dust formation episodes so the absence of wind lines in the HdC stars, which do not make dust, is perhaps to be expected.

Accepted for publication in ApJ

Available from arXiv:0904.0652

IRC +10 216's innermost envelope — the eSMA's view

Hiroko Shinnaga[1]*, Ken H. Young*[2]*, Remo P.J. Tilanus*[3,4]*, Richard Camberlin*[1]*, Mark A. Gurwell*[2]*, David Wilner*[2]*, A. Meredith Hughes*[2]*, Hiroshige Yoshida*[1]*, Ruisheng Peng*[1]*, Brian Force*[1]*, Per Friberg*[3]*, Sandrine Bottinelli*[5]*, Ewine F. van Dishoeck*[5] *and Thomas G. Phillips*[1]

[1]Caltech Submillimeter Observatory (CSO), USA

[2]Harvard-Smithsonian CfA, USA

[3]Joint Astronomy Centre, USA

[4]Netherlands Organization for Scientific Research, The Netherlands

[5]Leiden Observatory, The Netherlands

We used the Extended Submillimeter Array (eSMA) in its most extended configuration to investigate the innermost (within a radius of ~ 290 R$_\star$ from the star) circumstellar envelope (CSE) of IRC +10 216. We imaged the CSE using HCN and other molecular lines with a beam size of $0.''0022 \times 0.''0046$, deeply into the very inner edge (~ 15 R$_\star$) of the envelope where the expansion velocity is only ~ 3 km s^{-1}. The excitation mechanism of hot HCN and KCl maser lines is discussed. HCN maser components are spatially resolved for the first time on an astronomical object. We identified two discrete regions in the envelope: a region with a radius of $\lesssim$15 R$_\star$, where molecular species have just formed and the gas has begun to be accelerated (region I) and a shell region (region II) with a radius of 23 R$_\star$ and a thickness of 15 R$_\star$, whose expansion velocity has reached up to 13 km s^{-1}, nearly the terminal velocity of 15 km s^{-1}. The Si^{34}S line detected in region I shows a large expansion velocity of 16 km s^{-1} due to strong wing components, indicating that the emission may arise from a shock region in the innermost envelope. In region II, the P.A. of the most copious mass loss direction was found to be $\sim 120 \pm 10°$, which may correspond to the equatorial direction of the star. Region II contains a torus-like feature. These two regions may have emerged due to significant differences in the size distributions of the dust particles in the two regions.

Accepted for publication in Astrophysical Journal

Available from arXiv:0904.0280

The metallicity gradient as a tracer of history and structure: the Magellanic Clouds and M 33 galaxies

Maria-Rosa L. Cioni[1]

[1]University of Hertfordshire, STRI, Hatfield AL10 9AB, United Kingdom

The stellar metallicity and its gradients pose constraints to the formation and evolution of galaxies. This is a study of the metallicity gradient of the LMC, SMC and M 33 galaxies derived from their asymptotic giant branch (AGB) stars. The [Fe/H] abundance was derived from the ratio between C- and M-type AGB stars and its variation analysed as a function of galactocentric distance. Galaxy structure parameters were adopted from the literature. The metallicity of the LMC decreases linearly as -0.055 ± 0.004 dex kpc^{-1} out to ~ 8 kpc from the centre. In the SMC Fe/H]$\sim -1.12 \pm 0.03$ dex up to ~ 12 kpc. The gradient of the M 33 disc, until ~ 9 kpc, is -0.098 ± 0.004 dex kpc^{-1} while an outer disc/halo, out to ~ 25 kpc, has [Fe/H]$\sim -1.61 \pm 0.03$ dex. The metallicity of the LMC, as traced by different populations, bears the signature of two major star forming episodes: forming a thick disc/halo population and one a thin disc and bar due to a close encounter with the MW and SMC. The [Fe/H] of the recent episode supports an LMC origin for the Stream. The metallicity of the SMC supports star formation, ~ 3 Gyr ago, as triggered by LMC interaction and sustained by the bar in the outer region of the galaxy. The SMC [Fe/H] agrees with the present-day abundance in the Bridge and shows no significant gradient. The metallicity of M 33 supports an "inside-out" disc formation via accretion of metal poor gas from the interstellar medium. M 33 has not experienced significant chemical enrichment from the formation of the AGB progenitors to the present time.

Submitted to Astronomy and Astrophysics
Available from arXiv:0904.3136

New young planetary nebulae in IPHAS

K. Viironen[1]*, A. Mampaso*[1]*, R.L.M. Corradi*[1,2]*, M. Rodríguez*[3]*, R. Greimel*[4]*, L. Sabin*[5]*, S.E. Sale*[6]*, Y. Unruh*[6]*, G. Delgado-Inglada,*[3]*, J.E. Drew*[7]*, C. Giammanco*[1]*, P. Groot*[8]*, Q.A. Parker*[9]*, J. Sokoloski*[10] *and A.A. Zijlstra*[5]

[1]Instituto de Astrofísica de Canarias (IAC), C/Via Láctea s/n, 38200 La Laguna, Tenerife, Spain

[2]Isaac Newton Group of Telescopes, Apartado de Correos 321, E-38700 Sta. Cruz de La Palma, Spain

[3]Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), Apdo Postal 51 y 216, 72000 Puebla, Pue., México

[4]Institut für Physik, Karl-Franzens Universität Graz, Universitätsplatz 5, 8010 Graz, Austria

[5]Jodrell Bank Centre for Astrophysics, Alan Turing Building, University of Manchester, Manchester, M13 9PL, UK

[6]Imperial College London, Blackett Laboratory, Prince Consort Road, London SW7 2AZ, UK

[7]Centre for Astrophysics Research, University of Hertfordshire, College Lane, Hatfield AL10 9AB, UK

[8]Department of Astrophysics/IMAPP, Radboud University Nijmegen, P.O. Box 9010, 6500 GL, Nijmegen, The Netherlands

[9]Department of Physics, Macquarie University, Sydney, Australia

[10]Columbia Astrophysics Lab., 550 W120th St., 1027 Pupin Hall, MC 5247, Columbia University, New York 10027, USA

We search for very small-diameter galactic planetary nebulae (PNe) representing the earliest phases of PN evolution. The IPHAS catalogue of Hα-emitting stars provides a useful basis for this study since all sources present in this catalogue must be of small angular diameter.
The PN candidates are selected based on their location in two colour–colour diagrams: IPHAS (r′–Hα) vs. (r′–i′), and 2MASS (J–H) vs. (H–K_s). Spectroscopic follow-up was carried out on a sample of candidates to confirm their nature. We present a total of 83 PN candidates. We were able to obtain spectra or find the classification from the literature for 35 candidates. Five of these objects are likely to be new PNe, including one large bipolar PN discovered serendipitously close to an emission-line star. PN distances deduced from extinction-distance relations based on IPHAS field-star photometry are presented for the first time. These yield distance estimates for our objects in the range 2 kpc and 6 kpc. From the data in hand, we conclude that four of the discovered objects are probably young PNe.

Accepted for publication in A&A
Available from arXiv:0904.1937

MASYS. The AKARI spectroscopic survey of Symbiotic Stars in the Magellanic Clouds

R. Angeloni[1,2], *S. Ciroi*[1], *P. Marigo*[1], *M. Contini*[2,1], *F. Di Mille*[1] *and P. Rafanelli*[1]

[1]Department of Astronomy, University of Padova, Italy

[2]School of Physics & Astronomy, Tel Aviv University, Israel

MASYS is the AKARI spectroscopic survey of Symbiotic Stars in the Magellanic Clouds, and one of the European Open Time Observing Programmes approved for the AKARI (Post-Helium) Phase-3. It is providing the first ever near-IR spectra of extragalactic symbiotic stars. The observations are scheduled to be completed in July 2009.

Poster contribution, published in "AKARI, a light to illuminate the misty Universe", Fukutake Hall, The University of Tokyo, Japan, 16–19 February 2009
Available from arXiv:0904.1094

Surface Brightness Fluctuations as Stellar Population Indicators

John Blakeslee[1]

[1]Herzberg Institute of Astrophysics, National Research Council of Canada, Canada

Surface Brightness Fluctuations (SBF) can provide useful information about the unresolved stellar content of early-type galaxies and spiral bulges. The absolute SBF magnitude Mbar in a given passband depends on the properties of the stellar population and can be predicted by population synthesis models. SBF measurements in different bandpasses are sensitive to different evolutionary stages within the galaxy stellar population. Near-IR SBF magnitudes are sensitive to the evolution of stars within the AGB phase, especially the thermally pulsing AGB, while SBF in the blue and UV are sensitive to the hot horizontal branch and post-AGB stages. Thus, multi-band SBF studies can constrain important evolutionary parameters. Empirically, SBF data at the red end of the optical spectrum (i, z, and potentially y) remain excellent distance indicators. I briefly review some recent work on stellar populations using SBF, primarily from an observational point of view.

Oral contribution, published in "Probing Stellar Populations out to the Distant Universe," American Institute of Physics (AIP)
Available from arXiv:0904.0247

AKARI/IRC observations of heavily obscured oxygen-rich AGB and post-AGB stars

F. Bunzel[1], *D.A. García-Hernández*[2], *D. Engels*[1], *J.V. Perea-Calderón*[3] *and P. García-Lario*[3]

[1]Hamburger Sternwarte, Universität Hamburg, Germany

[2]Instituto de Astrofísica de Canarias, Tenerife, Spain

[3]European Space Astronomy Centre, ESAC, ESA, Madrid, Spain

We present AKARI/IRC observations of a sample of six extremely red IRAS sources, of which three are variable OH/IR stars and the rest are early post-AGB stars. The OH/IR stars show a red continuum with the expected strong 10 μm silicate absorption feature, while the post-AGB stars show an even redder continuum accompanied with a comparably weak silicate absorption. We modelled the spectral energy distributions with DUSTY. While for the

OH/IR stars a reasonable fit can be obtained with almost pure silicate dust, the post-AGB stars require a mixture of silicate and carbon-rich dust. We assume that in the latter objects the inner dust shell is carbon-rich, while the outer shells are still oxygen-rich.

Poster contribution, published in "AKARI, a light to illuminate the misty universe"
Available from arXiv:0904.4134

AKARI and Spitzer observations of heavily obscured C-rich AGB/post-AGB stars

D.A. García-Hernández[1], F. Bunzel[2], D. Engels[2], J.V. Perea-Calderón[3] and P. García-Lario[3]

[1]Instituto de Astrofísica de Canarias. La Laguna, Tenerife, Spain

[2]Hamburger Sternwarte. Hamburg, Germany

[3]European Space Astronomy Centre, ESAC, ESA. Madrid, Spain

We present AKARI/IRC and Spitzer/IRS observations of a selected sample of galactic IRAS sources considered to be heavily obscured AGB/post-AGB stars based on their characteristic IRAS colours. All of them are completely invisible in the optical range but extremely bright in the infrared. Based on AKARI and Spitzer spectroscopy and using DUSTY we are able to determine the dominant chemistry of their circumstellar shells as well as the properties of the dust grains contained in these shells. Most of the sources are found to be C-rich (being the reddest C-rich stars observed so far). We find only molecular absorptions (and no PAH features) such as acetylene (C_2H_2) at 13.7 μm, indicative of an early post-AGB stage. We shortly discuss our findings in the context of stellar evolution during the hidden "transition phase" from AGB stars to Planetary Nebulae.

Poster contribution, published in "AKARI, a light to illuminate the misty universe"
Available from arXiv:0904.4158

The transition from AGB to post-AGB evolution as observed by AKARI and Spitzer

D. Engels[1], P. García-Lario[2], F. Bunzel[1], D.A. García-Hernández[3] and J.V. Perea-Calderón[2]

[1]Hamburger Sternwarte, Universität Hamburg, Germany

[2]European Space Astronomy Centre, ESAC, ESA, Madrid, Spain

[3]Instituto de Astrofísica de Canarias, Tenerife, Spain

The AKARI and Spitzer satellites provided an unique opportunity to observe a variety of stars, which are considered as departing from the Asymptotic Giant Branch (AGB) and have started their post-AGB evolution recently. Most of these stars are absent optically and are bright in the mid-IR wavelength range. Spectra of close to 200 objects have been obtained. For all of them the 1–60 μm spectral energy distribution has been constructed using photometric data from various surveys. We report here on the results of Spitzer observations of 88 IRAS selected post-AGB candidates and discuss them in comparison to the results of the AKARI observations of post-AGB candidates reported elsewhere in these proceedings. The dust compositions can be divided broadly in oxygen- and carbon-rich types, but a variety of intermediate types have been found. Among the oxygen-rich stars amorphous dust prevails, but a few sources show emission features from crystalline dust. The spectra from carbon-rich shells may be completely featureless, may show emission features from PAHs or a molecular absorption line from C_2H_2. We found also sources with a neon emission line at 12.8 μm. More than a third of all sources show a near-infrared excess at < 5 μm and almost all of them show evidence of C-rich dust in their shells. We postulate that the emerging post-AGB wind after the end of AGB evolution contains always carbon-rich dust irrespective of the chemistry of the former AGB star.

Oral contribution, published in "AKARI, a light to illuminate the misty universe"
Available from arXiv:0904.3958

Thesis

Comparative physical characteristics of planetary nebula with central stars rich and poor in hydrogen

Walter Alfredo Weidmann[1,2]

[1]Observatorio Astronómico de Córdoba, Argentina

[2]CONICET, Argentina

The phenomenon of planetary nebula (PN) is considered to be a phase of transition in the evolution of low- and intermediate- mass stars. The PN's constitute one of the most important subsystems of the Milky Way. In spite of the fact that more than two centuries have elapsed since the PN are studied, and that their number has increased year after year, these objects still possess important questions. One of these and perhaps the most important one, is related to aspects of the central star of the nebula. Though the number of PN's known in our Galaxy is high (about 3000), the number of central stars of PN's studied is relatively low, below about 10% of the number of galactic nebulae. At the beginning of the decade of 1990 it was discovered that the great majority of these stars can be classified in two well differentiated categories: those stars that possess an atmosphere rich in hydrogen, and the ones that not. With the purpose of enlarging the number of central stars of planetary nebulae with spectral type determined, and seeking possible statistical differences among the observed nebular parameters that will allow us to characterize the two groups of PN's, is that we proposed an observacional study of these objects. To this aim we studied a homogeneous sample of more than seventy PN's of the Southern Hemisphere with central stars of unknown spectral type. It is worth remarking that this branch of astrophysics has been scarcely developed in our country. Most of the data used in this work were obtained with the 2.15 m telescope and instrumental of the Complejo Astronómico El Leoncito (CASLEO, San Juan, Argentina), during 50 observing nights. Our study consisted essentially of long-slit spectroscopy in low and medium dispersion. The main results of this work are the following: 1) Fifty-nine spectra of central stars of planetary nebulae were classified, increasing a 19% the previous number of classified objects. 2) The stars studied were divided into two groups, those rich and those deficient in hydrogen, and the physical properties of the mitting gas of each group were analyzed. The H-deficient stars have nebulae of greater density, greater excitation, and greater abundance of oxygen than the H-rich stars, and are of relatively small angular size. These indicators suggest that these stars would be something more massive than the stars of the other group, and that the mass of their envelopes are lower. We find that these results are reasonably consistent with the evolutionary model of "born-again" stars presented initially by Iben et al. (1983) to explain the deficiency of hydrogen. 3) Several of the objects analyzed in this work had very few previous studies, for which our results contribute to enlarge the general knowledge of the planetary nebulae. 4) We want to emphasize, finally, that in several PN's of our sample we have discovered nuclei of unusual spectral type, such as [WO] and PG 1159.

Defended on 27$^{\text{th}}$ March 2009 at the University of Córdoba, Argentina

Job Advert

Postdoctoral Research Fellows

Applications are invited for two postdoctoral research fellowships at the South African Astronomical Observatory (SAAO). The appointments will be for two years, with consideration for tenure after that period.

Preference will be given to candidates whose research interests are relevant to South Africa's exploitation of SALT, and/or the 1.4m Infrared Survey Facility, and who have some experience in astronomical instrumentation and/or programming.

The SAAO is the National Facility for optical/infrared astronomy in South Africa. Its headquarters are in Cape Town where the successful applicant will be based. Observing facilities, situated 360 km away at Sutherland, comprise six telescopes with apertures ranging from 0.5 to 1.9m. The primary facility is the 10-m class Southern African Large Telescope (SALT), currently in the final stages of commissioning. SALT is operated by SAAO on behalf of an international consortium and about one third of its observing time is available to the South African research community.

While the successful applicant will spend most of her/his time on research, he/she will also be encouraged to contribute to instrumentation and/or software development programmers and/or postgraduate teaching and supervision.

More details of SAAO and SALT are available through www.saao.ac.za.

Applicants must have a PhD in astrophysics or a related subject. They should submit a curriculum vitae, with a statement of research and instrumentation interests to: The Personnel Officer, Ms. Linda Tobin, SAAO, P.O. Box 9, Observatory, 7935, South Africa, phone: +27 21 4470025; fax: +27 21 4473639; email: linda@saao.ac.za. Applicants should arrange for three professional referees to supply letters of recommendation by due date 31May 2009.

SAAO is committed to equity.

See also http://www.saao.ac.za/about/vacancies/postdoctoral-research-fellow

Announcement

Radio observations of planetary and proto-planetary nebulae

The above is the title of a review to be given at the workshop "The eVLA vision: stars on and off the main sequence", Socorro 26–28 May. If you have published or unpublished papers/data relevant to this, which you would like to see advertised at this meeting, I would be very hapy to hear from you. Preferably before the middle of the month.

If you would like to go yourself, the deadline for registration is May 4^{th}.

Albert Zijlstra, a.zijlstra@manchester.ac.uk

See also http://www.aoc.nrao.edu/events/evla_stars09/