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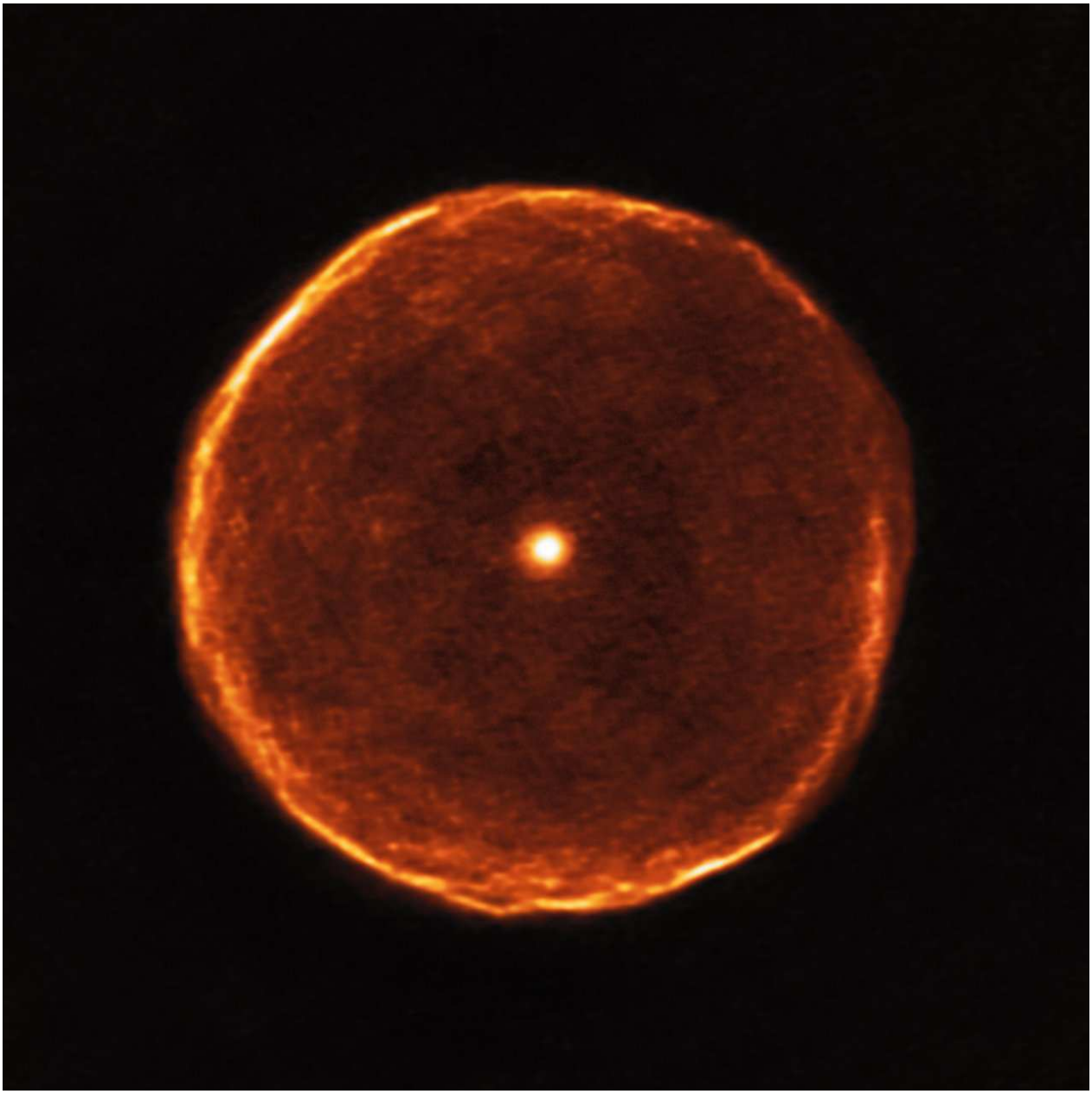

Figure 1: U Antliæ as seen with ALMA. See Kerschbaum et al. in this issue.

Editorial

Dear Colleagues,

It is a pleasure to present you the 243$^{\rm rd}$ issue of the AGB Newsletter. You've been very busy over Summer, hence the large number of new works and announcements. Spectacular results such as the images of U Antliæ (see cover picture), 3-D structure of IRC 10°216 and W Aquilæ, and atmospheric chaos on Antares bridge the gap between the tiniest scales of nucleosynthesis and grain properties, to the scales of entire galaxies.

Unfortunately we must bring you the sad news that one of our cherished colleagues, Angels Riera has passed away – living on in many a heart and soul. Martín Guerrero kindly wrote an obituary in her memory.

On a more positive note, several Ph.D. positions are available in Göttingen – please direct your most promising undergraduate or masters students to this opportunity.

Please consider attending the ALMA/(sub)-mm meeting in Sendai, Japan; stellar surface imaging meeting in Germany or applying for the Fizeau interferometry initiative exchange programme in light of the above exciting results. And, of course, we hope to see you all in Vienna next year for the fourth edition of the "Why Galaxies Care About AGB Stars" conference – granted IAU Symposium status!

Last month's Food for Thought ("What do the surface abundances of white dwarfs tell us about the planets that orbited its progenitor star?") met a wall of silence – does this mean it has *nothing* to say about planets? Are we confused? What are the main issues in making this connection?

The next issue is planned to be distributed around the 1$^{\rm st}$ of November.

Editorially Yours,
Jacco van Loon, Ambra Nanni and Albert Zijlstra

Food for Thought

This month's thought-provoking statement is:

Planets around AGB stars do not affect the star's appearance and evolution.

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

Angels Riera

It is with great sadness that we announce that our friend and colleague Angels Riera passed away on Wednesday (September 27, 2017) in Barcelona after a courageous battle with cancer. She was the beloved wife of Joan Rosaura and mother of Julia and Oriol.

Angels started her research career at the Instituto de Astrofísica de Canarias, where she got her Ph.D. on the study of the physical and kinematical properties of planetary nebulæ. Then she became Professor at the Universitat Politècnica de Catalunya (UPC, Barcelona). Her contributions to the study of collimated outflows in young planetary nebulæ and young stars are numerous, with great significance in the assessment of the effects of shocks on the emission of collimated outflows. She discovered the bipolar nebula IRAS 17423−1755 (Henize 3-1475), previously known as an OH/IR star. This remains one of the most beautiful of all such stars known. Later she worked on its high velocity outflow. The collimated outflows remained her research focus, with work on IC 4634, IRAS 22568+6141, the Red Rectangle, CRL 618 (where she measured the expansion from HST images), and Hen 401. She also worked on planetary nebulæ, HH objects and high-mass stars, in a varied career.

Many of us had the luck to work together with her. She was a highly intuitive researcher, but a very hard worker at the same time, always open to a new discussion, to learn from others and to teach them. We remember her charm and cheerful nature, the smile on her face. She was a brave person, beloved by everyone around her. We are collecting condolences and memories to pass on to her family and colleagues, as a keep-sake in her memory. If you would like to take part, we would most welcome your contributions. Please send it to Martín Guerrero at mar@iaa.es

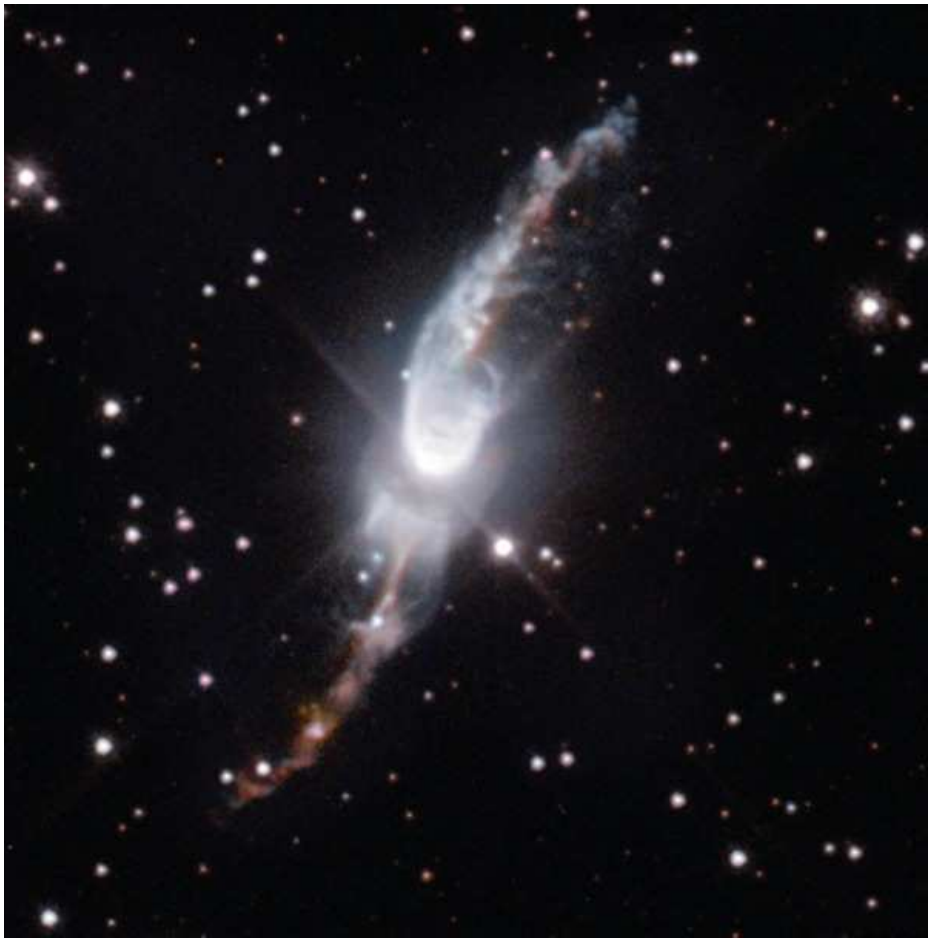

Figure 2: Hen 3-1475, or the "Cosmic Garden Sprinkler", discovered by Angels.

Refereed Journal Papers

Multi-band photometry and spectroscopy of an all-sky sample of bright white dwarfs

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The upcoming NASA Transiting Exoplanet Survey Satellite (TESS) will obtain space-based uninterrupted light curves for a large sample of bright white dwarfs distributed across the entire sky, providing a very rich resource for asteroseismological studies and the search for transits from planetary debris. We have compiled an all-sky catalogue of ultraviolet, optical, and infrared photometry as well as proper motions, which we propose as an essential tool for the preliminary identification and characterisation of potential targets. We present data for 1864 known white dwarfs and 305 high-probability white dwarf candidates brighter than 17 mag. We describe the spectroscopic follow-up of 135 stars, of which 82 are white dwarfs and 25 are hot subdwarfs. The new confirmed stars include six pulsating white dwarf candidates (ZZ Cetis), and nine white dwarf binaries with a cool main-sequence companion. We identify one star with a spectroscopic distance of only 25 pc from the Sun. Around the time TESS is launched, we foresee that all white dwarfs in this sample will have trigonometric parallaxes measured by the ESA Gaia mission next year.

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Available from https://arxiv.org/abs/1708.09394

The importance of Urca-process cooling in accreting ONe white dwarfs

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We study the evolution of accreting oxygen–neon (ONe) white dwarfs (WDs), with a particular emphasis on the effects of the presence of the carbon-burning products ^{23}Na and ^{25}Mg. These isotopes lead to substantial cooling of the WD via the ^{25}Mg–^{25}Na, ^{23}Na–^{23}Ne, and ^{25}Na–^{25}Ne Urca pairs. We derive an analytic formula for the peak Urca-process cooling rate and use it to obtain a simple expression for the temperature to which the Urca process cools the WD. Our estimates are equally applicable to accreting carbon–oxygen WDs. We use the Modules for Experiments in Stellar Astrophysics (MESA) stellar evolution code to evolve a suite of models that confirm these analytic results and demonstrate that Urca-process cooling substantially modifies the thermal evolution of accreting ONe WDs. Most importantly, we show that MESA models with lower temperatures at the onset of the ^{24}Mg and ^{24}Na electron captures develop convectively unstable regions, even when using the Ledoux criterion. We discuss the difficulties that we encounter in modeling these convective regions and outline the potential effects of this convection on the subsequent WD evolution. For models in which we do not allow convection to operate, we find that oxygen ignites around a density of $\log(\rho_c/\mathrm{g\,cm^{-3}}) \approx 9.95$, very similar to the value without Urca cooling. Nonetheless, the inclusion of the effects of Urca-process cooling is an important step in producing progenitor models with more realistic temperature

and composition profiles which are needed for the evolution of the subsequent oxygen deflagration and hence for studies of the signature of accretion-induced collapse.

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and from https://doi.org/10.1093/mnras/stx2169

On the production of He, C and N by low- and intermediate-mass stars: a comparison of observed and model-predicted planetary nebula abundances

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The primary goal of this paper is to make a direct comparison between the measured and model- predicted abundances of He, C and N in a sample of 35 well-observed Galactic planetary nebulæ (PN). All observations, data reductions, and abundance determinations were performed in house to ensure maximum homogeneity. Progenitor star masses ($M \leq 4$ M$_\odot$) were inferred using two published sets of post-AGB model tracks and L and $T_{\rm eff}$ values. We conclude the following: 1) the mean values of N/O across the progenitor mass range exceeds the solar value, indicating significant N enrichment in the majority of our objects; 2) the onset of hot bottom burning appears to begin around 2 M$_\odot$, i.e. lower than ~ 5 M$_\odot$ implied by theory; 3) most of our objects show a clear He enrichment, as expected from dredge-up episodes; 4) the average sample C/O value is 1.23, consistent with the effects of third dredge-up; and 5) model grids used to compare to observations successfully span the distribution over metallicity space of all C/O and many He/H data points but mostly fail to do so in the case of N/O. The evident enrichment of N in PN and the general discrepancy between the observed and model-predicted N/O abundance ratios signal the need for extra-mixing as an effect of rotation and/or thermohaline mixing in the models. The unexpectedly high N enrichment that is implied here for low mass stars, if confirmed, will likely impact our conclusions about the source of N in the Universe.

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Large Magellanic Cloud near-infrared synoptic survey. V. Period–luminosity relations of Miras

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We study the near-infrared properties of 690 Mira candidates in the central region of the Large Magellanic Cloud, based on time-series observations at $JHK_{\rm s}$. We use densely-sampled I-band observations from the OGLE project to generate template light curves in the near infrared and derive robust mean magnitudes at those wavelengths. We obtain near-infrared period–luminosity relations for oxygen-rich Miras with a scatter as low as 0.12 mag at $K_{\rm s}$. We study the period–luminosity–color relations and the color excesses of carbon-rich Miras, which show evidence for a substantially different reddening law.

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Available from https://arxiv.org/abs/1708.04742

Post-main-sequence evolution of icy minor planets. III. Water retention in dwarf planets and exo-moons and implications for white dwarf pollution

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Studies suggest that the pollution of white dwarf (WD) atmospheres arises from the accretion of minor planets, but the exact properties of polluting material, and in particular the evidence for water in some cases are not yet understood. Previous works studied the water retention in minor planets around main-sequence and evolving host stars, in order to evaluate the possibility that water survives inside minor planets around WDs. However, all of these studies focused on small, comet-sized to moonlet-sized minor planets, when the inferred mass inside the convection zones of He-dominated WDs could actually also be compatible with much more massive minor planets. In this study we therefore explore for the first time, the water retention inside exo-planetary dwarf planets, or moderate-sized moons, with radii of the order of hundreds of kilometres. We now cover nearly the entire potential mass range of minor planets. The rest of the parameter space considered in this study is identical to that of our previous study, and also includes multiple WD progenitor star masses. We find that water retention in more massive minor planets is still affected by the mass of the WD progenitor, however not as much as when small minor planets were considered. We also find that water retention is now almost always greater than zero. On average, the detected water fraction in He-dominated WD atmospheres should be at least 5%, irrespective of the assumed initial water composition, if it came from a single accretion event of an icy dwarf planet or moon. This finding also strengthens the possibility of WD habitability. To finalize our previous and current findings, we provide a code which may be freely used as a service to the community. The code calculates ice and water retention by interpolation, spanning the full mass range of both minor planets and their host stars.

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Sodium abundances of AGB and RGB stars in Galactic globular clusters II. Analysis and results of NGC 104, NGC 6121 and NGC 6809

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Aims: We investigate the Na abundance distribution of AGB stars in Galactic globular clusters (GCs) and its possible dependence with GC global properties, especially age and metallicity.
Methods: We analyze high-resolution spectra of a large sample of AGB and RGB stars in the Galactic GCs NGC 104, NGC 6121, and NGC 6809 obtained with FLAMES/GIRAFFE at ESO/VLT, and determine their Na abundances. This is the first time that the AGB stars in NGC 6809 are targeted. Moreover, we re-analyze with the same method the data archive for NGC 6752. To investigate the dependence of AGB Na abundance dispersion on GC parameters, we compare the AGB [Na/H] distributions we obtained (including NGC 2808 presented in the first paper of this series) with literature data for four other GCs, i.e. a total of nine GCs, covering a wide range of GC parameters.
Results: NGC 104 and NGC 6809 have comparable AGB and RGB Na abundance distributions revealed by the K–S test, while NGC 6121 shows a lack of very Na-rich AGB star. By analyzing all the nine GCs, we find that the Na abundances and multiple populations of AGB stars show a complex picture. In some GCs, AGB stars have similar Na abundances and/or second-population fractions as their RGB counterparts, while some GCs do not have Na-rich second-population AGB star, and various cases exist between the two extremes. In addition, the fitted relations

between fractions of AGB second population and GC global parameters show that AGB second-population fraction slightly anticorrelates with GC central concentration, while no robust dependency can be confirmed with other GC parameters.
Conclusions: Current data roughly support the prediction of FRMS scenario. However, considering the weak observational and theoretical trends where scatter and exceptions exist, the fraction of second-population AGB stars can be affected by more than one or two factors, and may even be a result of stochasticity.

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A new interpretation of the period–luminosity sequences of long-period variables

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Period–luminosity (PL) sequences of long period variables (LPVs) are commonly interpreted as different pulsation modes, but there is disagreement on the modal assignment. Here, we re-examine the observed PL sequences in the Large Magellanic Cloud, including the sequence of long secondary periods (LSPs), and their associated pulsation modes. Firstly, we theoretically model the sequences using linear, radial, non-adiabatic pulsation models and a population synthesis model of the LMC red giants. Then, we use a semi-empirical approach to assign modes to the pulsation sequences by exploiting observed multi-mode pulsators. As a result of the combined approaches, we consistently find that sequences B and C′ both correspond to first overtone pulsation, although there are some fundamental mode pulsators at low luminosities on both sequences. The masses of these fundamental mode pulsators are larger at a given luminosity than the mass of the first overtone pulsators. These two sequences B and C′ are separated by a small period interval in which large amplitude pulsation in a long secondary period (sequence D variability) occurs, meaning that the first overtone pulsation is not seen as the primary mode of pulsation. Observationally, this leads to the splitting of the first overtone pulsation sequence into the two observed sequences B and C′. Our two independent examinations also show that sequences A′, A and C correspond to third overtone, second overtone and fundamental mode pulsation, respectively.

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An unusual white dwarf star may be a surviving remnant of a subluminous Type Ia supernova

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Subluminous Type Ia supernovæ, such as the Type Iax class prototype SN 2002cx, are described by a variety of models such as the failed detonation and partial deflagration of an accreting carbon–oxygen white dwarf star, or the explosion of an accreting, hybrid carbon–oxygen–neon core. These models predict that bound remnants survive such

events with, according to some simulations, a high kick velocity. We report the discovery of a high proper motion, low-mass white dwarf (LP 40-365) that travels at a velocity greater than the Galactic escape velocity and whose peculiar atmosphere is dominated by intermediate-mass elements. Strong evidence indicates that this partially burnt remnant was ejected following a subluminous Type Ia supernova event. This supports the viability of single-degenerate supernova progenitors.

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The study of correlation among different scattering parameters in an aggregate dust model

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We study the light scattering properties of aggregate particles in a wide range of complex refractive indices ($m = n+ik$, where $1.4 \leq n \leq 2.0$, $0.001 \leq k \leq 1.0$) and wavelengths ($0.45 \leq \lambda \leq 1.25$ μm) to investigate the correlation among different parameters e.g., the positive polarization maximum ($P_{\max}$), the amplitude of the negative polarization ($P_{\min}$), geometric albedo (A), (n, k) and λ. Numerical computations are performed by the Superposition T-matrix code with Ballistic Cluster–Cluster Aggregate (BCCA) particles of 128 monomers and Ballistic Aggregates (BA) particles of 512 monomers, where monomer's radius of aggregates is considered to be 0.1 μm. At a fixed value of k, $P_{\max}$ and n are correlated via a quadratic regression equation and this nature is observed at all wavelengths. Further, $P_{\max}$ and k are found to be related via a polynomial regression equation when n is taken to be fixed. The degree of the equation depends on the wavelength, higher the wavelength lower is the degree. We find that A and $P_{\max}$ are correlated via a cubic regression at $\lambda = 0.45$ μm whereas this correlation is quadratic at higher wavelengths. We notice that $|P_{\min}|$ increases with the decrease of $P_{\max}$ and a strong linear correlation between them is observed when n is fixed at some value and k is changed from higher to lower value. Further, at a fix value of k, $P_{\min}$ and $P_{\max}$ can be fitted well via a quartic regression equation when n is changed from higher to lower value. We also find that $P_{\max}$ increases with λ and they are correlated via a quartic regression.

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Available from https://link.springer.com/article/10.1007/s10509-017-3130-z

Correlation among extinction efficiency and other parameters in an aggregate dust model

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We study the extinction properties of highly porous BCCA dust aggregates in a wide range of complex refractive indices ($1.4 \leq n \leq 2.0$, $0.001 \leq k \leq 1.0$) and wavelength (0.11 μm $\leq \lambda \leq 3.4$ μm). An attempt has been made for the first time to investigate the correlation among extinction efficiency (Q_{ext}), the composition of dust aggregates (n, k), the wavelength of radiation (λ) and size parameter of the monomers (x). If k is fixed at any value between 0.001 and 1.0, Q_{ext} increases with increase of n from 1.4 to 2.0. Q_{ext} and n are correlated via linear regression when the cluster size is small whereas the correlation is quadratic at moderate and higher sizes of the cluster. This feature is observed at all wavelengths (UV to optical to infrared). We also find that the variation of Q_{ext} with n is very small when λ is high. When n is fixed at any value between 1.4 and 2.0, it is observed that Q_{ext} and k are correlated via polynomial regression equation (of degree 1, 2, 3 or 4), where the degree of the equation depends on the cluster size, n and λ. The correlation is linear for small size and quadratic/cubic/quartic for moderate and higher sizes. We have also found that Q_{ext} and x are correlated via a polynomial regression (of degree 3,4 or 5) for all values of n. The

degree of regression is found to be n and k-dependent. The set of relations obtained from our work can be used to model interstellar extinction for dust aggregates in a wide range of wavelengths and complex refractive indices.

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St 2-22 – another symbiotic star with high-velocity bipolar jets

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We report finding high-velocity components in the Hα emission wings of St 2-22 spectra, obtained in 2005. This discovery have encouraged us to start the present study, aiming to show that this little studied object is a jet producing symbiotic system. We used high-resolution optical and low-resolution near infrared spectra, as well as available optical and infrared photometry, to evaluate some of the physical parameters of the St 2-22 components and the characteristics of the jets. The evaluated parameters of the components confirmed that St 2-22 is a S-type symbiotic star. Our results demonstrate that an unnoticed outburst of St 2-22, similar to those in classical symbiotics, occurred in the first half of 2005. During the outburst, collimated, bipolar jets were ejected by the hot component of St 2-22 with an average velocity of about 1700 km s^{-1}.

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The ^{95}Zr(n,γ)^{96}Zr cross section from the surrogate ratio method and its effect on the s-process nucleosynthesis

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The ^{95}Zr(n,γ)^{96}Zr reaction cross section is crucial in the modelling of s-process nucleosynthesis in asymptotic giant branch stars because it controls the operation of the branching point at the unstable ^{95}Zr and the subsequent production of ^{96}Zr. We have carried out the measurement of the ^{94}Zr(^{18}O,^{16}O) and ^{90}Zr(^{18}O,^{16}O) reactions and obtained the γ-decay probability ratio of ^{96}Zr* and ^{92}Zr* to determine the ^{95}Zr(n,γ)^{96}Zr reaction cross sections with the surrogate ratio method. Our deduced maxwellian-averaged cross section of 66$\pm$16 mb at 30 keV is close to the value recommended by Bao et al. (2000), but 30% and more than a factor of two larger than the values proposed by Toukan & Kappeler (1990) and Lugaro et al. (2014), respectively, and routinely used in s-process models. We tested the new rate in stellar models with masses between 2 and 6 M$_{\odot}$ and metallicities 0.014 and 0.03. The largest changes – up 80% variations in ^{96}Zr – are seen in models of mass 3–4 M$_{\odot}$, where the ^{22}Ne neutron source is mildly activated. The new rate can still provide a match to data from meteoritic stardust silicon carbide grains, provided the maximum mass of the parent

stars is below 4 $M_\odot$, for a metallicity of 0.03.

Accepted for publication in Astrophysical Journal

Non-stationary wind in the system of the infrared source RAFGL 5081

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For the first time, observations in the optical wavelength range of the weak unnamed star associated with the IR source RAFGL 5081 have been carried out. Based on long-term spectral monitoring with highly-resolution, the optical spectrum of this star has been studied. The spectral type of this star is close to G5–8 II, and its effective temperature is $T_{\rm eff} \approx 5400$ K. An unusual spectral phenomenon was discovered: splitting of the profiles of broad, stationary absorptions of medium and low intensity. The heliocentric radial velocities $v_{\rm r}$ of all components of metal absorptions, the Na I D lines, and the Hα line were measured for all the observation epochs. The constancy of the absorption lines rules out the possibility that the line splitting is due to binarity. The radial velocities of the wind components in the profiles of the Na I D and Hα lines reach -250 and -600 km s^{-1}, respectively. These profiles have narrow components, whose number, depth, and position vary with time. The time variability and multicomponent structure of the profiles of the Na I D and Hα lines indicates inhomogeneity and temporal instability of the circumstellar envelope of RAFGL 5081. The presence of components with velocity $v_{\rm r}({\rm IS}) = 65$ km s^{-1} in the Na I (1) lines provides evidence that RAFGL 5081 is located behind the Perseus arm, i.e. no closer than 2 kpc. It is noted that RAFGL 5081 is associated with the reflection nebula GN 02.44.7.

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MARVEL analysis of the measured high-resolution rovibrational spectra of C_2H_2

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Rotation-vibration energy levels are determined for the electronic ground state of the acetylene molecule, $^{12}C_2H_2$, using the Measured Active Rotational-Vibrational Energy Levels (MARVEL) technique. 37,813 measured transitions from 61 publications are considered. The distinct components of the spectroscopic network linking ortho and para states of the molecule are considered separately. The 20,717 ortho and 17,096 para transitions measured experimentally are used to determine 6013 ortho and 5200 para energy levels. The MARVEL results are compared with alternative compilations based on the use of effective Hamiltonians.

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Radiation-pressure-driven sub-Keplerian rotation of the disc around the AGB star L_2 Pup

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We study the sub-Keplerian rotation and dust content of the circumstellar material around the asymptotic giant branch (AGB) star L_2 Puppis. We find that the thermal pressure gradient alone cannot explain the observed rotation profile. We find that there is a family of possible dust populations for which radiation pressure can drive the observed sub-Keplerian rotation. This set of solutions is further constrained by the spectral energy distribution (SED) of the system, and we find that a dust-to-gas mass ratio of $\sim 10^{-3}$ and a maximum grain size that decreases radially outwards can satisfy both the rotation curve and SED. These dust populations are dynamically tightly coupled to the gas azimuthally. However grains larger than ~ 0.5 μm are driven outward radially by radiation pressure at velocities ~ 5 km s^{-1}, which implies a dust replenishment rate of $\sim 3\times10^{-9}$ M$_\odot$ yr^{-1}. This replenishment rate is consistent with observational estimates to within uncertainties. Coupling between the radial motion of the dust and gas is weak and hence the gas does not share in this rapid outward motion. Overall we conclude that radiation pressure is a capable and necessary mechanism to explain the observed rotation profile of L_2 Pup, and offers other additional constraints on the dust properties.

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IRC +10°216 in 3-D: morphology of a TP-AGB star envelope

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During their late pulsating phase, AGB stars expel most of their mass in the form of massive dusty envelopes, an event that largely controls the composition of interstellar matter. The envelopes, however, are distant and opaque to visible and NIR radiation: their structure remains poorly known and the mass-loss process poorly understood. Millimeter-wave interferometry, which combines the advantages of longer wavelength, high angular resolution and very high spectral resolution is the optimal investigative tool for this purpose. Mm waves pass through dust with almost no attenuation. Their spectrum is rich in molecular lines and hosts the fundamental lines of the ubiquitous CO molecule, allowing a tomographic reconstruction of the envelope structure. The circumstellar envelope IRC +10°216 and its central star, the C-rich TP-AGB star closest to the Sun, are the best objects for such an investigation. Two years ago, we reported the first detailed study of the CO(2–1) line emission in that envelope, made with the IRAM 30-m telescope. It revealed a series of dense gas shells, expanding at a uniform radial velocity. The limited resolution of the telescope (HPBW 11″) did not allow us to resolve the shell structure. We now report much higher angular resolution observations of CO(2–1), CO(1–0), CN(2–1) and C_4H(24–23) made with the SMA, PdB and ALMA interferometers (with synthesized half-power beamwidths of 3″, 1″ and 0.″3, respectively). Although the envelope appears much more intricate at high resolution than with an 11″ beam, its prevailing structure remains a pattern of thin, nearly concentric shells. The average separation between the brightest CO shells is 16″ in the outer envelope, where it appears remarkably constant. Closer to the star (< 40″), the shell pattern is denser and less regular, showing intermediary arcs. Outside the small ($r < 0.''3$) dust formation zone, the gas appears to expand radially at a constant velocity, 14.5 km s^{-1}, with small turbulent motions. Based on that property, we have reconstructed the 3-D structure of the outer envelope and have derived the gas temperature and density radial profiles in the inner ($r < 25''$) envelope. The shell–intershell density contrast is found to be typically 3. The over-dense shells have spherical or slightly oblate

shapes and typically extend over a few steradians, implying isotropic mass loss. The regular spacing of shells in the outer envelope supports the model of a binary star system with a period of 700 years and a near face-on elliptical orbit. The companion fly-by triggers enhanced episodes of mass loss near periastron. The densification of the shell pattern observed in the central part of the envelope suggests a more complex scenario for the last few thousand years.

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The cosmic dust rate across the Universe

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We investigate the evolution of interstellar dust in the Universe by means of chemical evolution models of galaxies of different morphological types, reproducing the main observed features of present day galaxies. We adopt the most updated prescriptions for dust production from supernovae and asymptotic giant branch (AGB) stars as well as for dust accretion and destruction processes. Then, we study the cosmic dust rate in the framework of three different cosmological scenarios for galaxy formation: i) a pure luminosity scenario (PLE), ii) a number density evolution scenario (DE), as suggested by the classical hierarchical clustering scenario and iii) an alternative scenario, in which both spirals and ellipticals are allowed to evolve in number on an observationally motivated basis. Our results give predictions about the evolution of the dust content in different galaxies as well as the cosmic dust rate as a function of redshift. Concerning the cosmic dust rate, the best scenario is the alternative one, which predicts a peak at $2 < z < 3$ and reproduces the cosmic star formation rate. We compute the evolution of the comoving dust density parameter $\Omega_{\rm dust}$ and find agreement with data for $z < 0.5$ in the framework of DE and alternative scenarios. Finally, the evolution of the average cosmic metallicity is presented and it shows a quite fast increase in each scenario, reaching the solar value at the present time, although most of the heavy elements are incorporated into solid grains, and therefore not observable in the gas phase.

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Where are the binaries? Results of a long-term search for radial velocity binaries in proto-planetary nebulæ

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We present the results of an expanded, long-term radial velocity search (25 yrs) for evidence of binarity in a sample of seven bright proto-planetary nebulæ (PPNe). The goal is to investigate the widely-held view that the bipolar or point-symmetric shapes of planetary nebulæ (PNe) and PPNe are due to binary interactions. Observations from three observatories were combined from 2007–2015 to search for variations on the order of a few years and then combined

with earlier observations from 1991–1995 to search for variations on the order of decades. All seven show velocity variations due to periodic pulsation in the range of 35–135 days. However, in only one PPN, IRAS 22272+5435, did we find even marginal evidence found for multi-year variations that might be due to a binary companion. This object shows marginally-significant evidence of a two-year period of low semi-amplitude which could be due to a low-mass companion, and it also displays some evidence of a much longer period of > 30 years. The absence of evidence in the other six objects for long-period radial velocity variations due to a binary companion sets significant constraints on the properties of any undetected binary companions: they must be of low mass, ≤ 0.2 $M_\odot$, or long period, > 30 years. Thus the present observations do not provide direct support for the binary hypothesis to explain the shapes of PNe and PPNe and severely constrain the properties of any such undetected companions.

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Rings and filaments: The remarkable detached CO shell of U Antliæ

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Aims: Our goal is to characterize the intermediate age, detached shell carbon star U Antliæ morphologically and physically in order to study the mass-loss evolution after a possible thermal pulse.
Methods: High spatial resolution ALMA observations of unprecedented quality in thermal CO lines allow us to derive first critical spatial and temporal scales and constrain modeling efforts to estimate mass-loss rates for both the present day as well as the ejection period of the detached shell.
Results: The detached shell is remarkably thin, overall spherically symmetric, and shows a barely resolved filamentary substructure possibly caused by instabilities in the interaction zone of winds with different outflow velocities. The expansion age of the detached shell is of the order of 2700 yr and its overall width indicates a high expansion-velocity and high mass-loss period of only a few hundred years at an average mass-loss rate of $\approx 10^{-5}$ $M_\odot$ yr^{-1}. The post-high-mass-loss-rate-epoch evolution of U Ant shows a significant decline to a substantially lower gas expansion velocity and a mass-loss rate amounting to 4×10^{-8} $M_\odot$ yr^{-1}, at present being consistent with evolutionary changes as predicted for the period between thermal pulses.

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Constraining cosmic scatter in the Galactic halo through a differential analysis of metal-poor stars

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Context: The chemical abundances of metal-poor halo stars are important to understanding key aspects of Galactic formation and evolution.

Aims: We aim to constrain Galactic chemical evolution with precise chemical abundances of metal-poor stars ($-2.8 \leq$ [Fe/H] ≤ -1.5).
Methods: Using high resolution and high S/N UVES spectra of 23 stars and employing the differential analysis technique we estimated stellar parameters and obtained precise LTE chemical abundances.
Results: We present the abundances of Li, Na, Mg, Al, Si, Ca, Sc, Ti, V, Cr, Mn, Co, Ni, Zn, Sr, Y, Zr, and Ba. The differential technique allowed us to obtain an unprecedented low level of scatter in our analysis, with standard deviations as low as 0.05 dex, and mean errors as low as 0.05 dex for [X/Fe].
Conclusions: By expanding our metallicity range with precise abundances from other works, we were able to precisely constrain Galactic chemical evolution models in a wide metallicity range ($-3.6 \leq$ [Fe/H] ≤ -0.4). The agreements and discrepancies found are key for further improvement of both models and observations. We also show that the LTE analysis of Cr II is a much more reliable source of abundance for chromium, as Cr I has important NLTE effects. These effects can be clearly seen when we compare the observed abundances of Cr I and Cr II with GCE models. While Cr I has a clear disagreement between model and oservations, Cr II is very well modeled. We confirm tight increasing trends of Co and Zn toward lower metallicities, and a tight flat evolution of Ni relative to Fe. Our results strongly suggest inhomogeneous enrichment from hypernovæ. Our precise stellar parameters results in a low star-to-star scatter (0.04 dex) in the Li abundances of our sample, with a mean value about 0.4 dex lower than the prediction from standard Big Bang Nucleosynthesis; we also study the relation between lithium depletion and stellar mass, but it is difficult to assess a correlation due to the limited mass range. We find two blue straggler stars, based on their very depleted Li abundances. One of them shows intriguing abundance anomalies, including a possible zinc enhancement, suggesting that zinc may have been also produced by a former AGB companion.

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Carbon abundances in starburst galaxies of the local Universe

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The cosmological origin of carbon, the fourth most abundant element in the Universe, is not well known and matter of heavy debate. We investigate the behavior of C/O to O/H in order to constrain the production mechanism of carbon. We measured emission-line intensities in a spectral range from 1600 to 10 000 Å on Space Telescope Imaging Spectrograph (STIS) long-slit spectra of 18 starburst galaxies in the local Universe. We determined chemical abundances through traditional nebular analysis and we used a Markov Chain Monte Carlo (MCMC) method to determine where our carbon and oxygen abundances lie in the parameter space. We conclude that our C and O abundance measurements are sensible. We analyzed the behavior of our sample in the [C/O] vs. [O/H] diagram with respect to other objects such as DLAs, neutral ISM measurements, and disk and halo stars, finding that each type of object seems to be located in a specific region of the diagram. Our sample shows a steeper C/O vs. O/H slope with respect to other samples, suggesting that massive stars contribute more to the production of C than N at higher metallicities, only for objects where massive stars are numerous; otherwise intermediate-mass stars dominate the C and N production.

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The circumstellar envelope around the S-type AGB star W Aql. Effects of an eccentric binary orbit

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Context: Recent observations at subarcsecond resolution, now possible also at submillimeter wavelengths, have shown intricate circumstellar structures around asymptotic giant branch (AGB) stars, mostly attributed to binary interaction. The results presented here are part of a larger project aimed at investigating the effects of a binary companion on the morphology of circumstellar envelopes (CSEs) of AGB stars.
Aims: AGB stars are characterized by intense stellar winds that build CSEs around the stars. Here, the CO($J = 3 \rightarrow 2$) emission from the CSE of the binary S-type AGB star W Aql has been observed at subarcsecond resolution using ALMA. The aim of this paper is to investigate the wind properties of the AGB star and to analyse how the known companion has shaped the CSE.
Methods: The average mass-loss rate during the creation of the detected CSE is estimated through modelling, using the ALMA brightness distribution and previously published single-dish measurements as observational constraints. The ALMA observations are presented and compared to the results from a 3D smoothed particle hydrodynamics (SPH) binary interaction model with the same properties as the W Aql system and with two different orbital eccentricities. Three-dimensional radiative transfer modelling is performed and the response of the interferometer is modelled and discussed.
Results: The estimated average mass-loss rate of W Aql is $\dot{M} = 3.0 \times 10^{-6}$ $M_\odot$ yr^{-1} and agrees with previous results based on single-dish CO line emission observations. The size of the emitting region is consistent with photodissociation models. The inner $10''$ of the CSE is asymmetric with arc-like structures at separations of 2–$3''$ scattered across the denser sections. Further out, weaker spiral structures at greater separations are found, but this is at the limit of the sensitivity and field of view of the ALMA observations.
Conclusions: The CO($J = 3 \rightarrow 2$) emission is dominated by a smooth component overlayed with two weak arc patterns with different separations. The larger pattern is predicted by the binary interaction model with separations of $\sim 10''$ and therefore likely due to the known companion. It is consistent with a binary orbit with low eccentricity. The smaller separation pattern is asymmetric and coincides with the dust distribution, but the separation timescale (200 yr) is not consistent with any known process of the system. The separation of the known companions of the system is large enough to not have a very strong effect on the circumstellar morphology. The density contrast across the envelope of a binary with an even larger separation will not be easily detectable, even with ALMA, unless the orbit is strongly asymmetric or the AGB star has a much larger mass-loss rate.

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SALT HRS discovery of a long period double-degenerate binary in the planetary nebula NGC 1360

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Whether planetary nebulæ (PNe) are predominantly the product of binary stellar evolution as some population synthesis models (PSM) suggest remains an open question. Around 50 short period binary central stars ($P \sim 1$ d) are known, but with only four with measured orbital periods over 10 d, our knowledge is severely incomplete. Here we report on the first discovery from a systematic SALT HRS survey for long period binary central stars. We find a 142 d orbital period from radial velocities of the central star of NGC 1360, HIP 16566. NGC 1360 appears to be the product of common-envelope (CE) evolution, with nebula features similar to post-CE PNe, albeit with an orbital period considerably longer than expected to be typical of post-CE PSM. The most striking feature is a newly-identified ring of candidate low-ionisation structures (LIS). Previous spatio-kinematic modelling of the nebula gives a nebula inclination of 30 ± 10 deg, and assuming the binary nucleus is coplanar with the nebula, multi-wavelength observations best fit a more massive, evolved WD companion. A WD companion in a 142 d orbit is not the focus of many PSM, making NGC 1360 a valuable system with which to improve future PSM work. HIP 16566 is amongst many central stars in which large radial velocity variability was found by low-resolution surveys. The discovery of its binary nature may indicate long period binaries may be more common than PSM models predict.

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C/O ratios in planetary nebulæ with dual-dust chemistry from faint optical recombination lines

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We present deep high-resolution ($R \sim 15,000$) and high-quality UVES optical spectrophotometry of nine planetary nebulae with dual-dust chemistry. We compute physical conditions from several diagnostics. Ionic abundances for a large number of ions of N, O, Ne, S, Cl, Ar, K, Fe and Kr are derived from collisionally excited lines. Elemental abundances are computed using state-of-the-art ionization correction factors.We derive accurate C/O ratios from optical recombination lines. We have re-analyzed additional high-quality spectra of 14 PNe from the literature following the same methodology. Comparison with asymptotic giant branch models reveal that about half of the total sample objects are consistent with being descendants of low-mass progenitor stars ($M < 1.5$ $M_\odot$). Given the observed N/O, C/O, and He/H ratios, we cannot discard that some of the objects come from more massive progenitor stars ($M > 3$–4 $M_\odot$) that have suffered a mild HBB. None of the objects seem to be a descendant of very massive progenitors.We propose that in most of the planetary nebulæ studied here, the PAHs have been formed through the dissociation of the CO molecule. The hypothesis of a last thermal pulse that turns O-rich PNe into C-rich PNe is discarded, except

in three objects, that show C/O > 1. We also discuss the possibility of a He pre-enrichment to explain the most He-enriched objects. We cannot discard other scenarios like extra mixing, stellar rotation or binary interactions to explain the chemical abundances behaviour observed in our sample.

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SiO maser survey towards off-plane O-rich AGBs around the orbital plane of the Sagittarius Stellar Stream

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We conducted an SiO maser survey towards 221 O-rich AGB stars with the aim of identifying maser emission associated with the Sagittarius stellar stream. In this survey, maser emission was detected in 44 targets, of which 35 were new detections. All of these masers are within 5 kpc of the Sun. We also compiled a Galactic SiO maser catalogue including $\sim$ 2300 SiO masers from the literature. The distribution of these SiO masers give a scale height of 0.40 kpc, while 42 sources deviate from the Galactic plane by more than 1.2 kpc, half of which were found in this survey. Regarding SiO masers in the disc, we found both the rotational speeds and the velocity dispersions vary with the Galactic plane distance. Assuming Galactic rotational speed $\Theta_0 = 240$ km s^{-1}, we derived the velocity lags are 15 km s^{-1} and 55 km s^{-1} for disc and off-plane SiO masers respectively. Moreover, we identified three groups with significant peculiar motions (with 70% confidence). The most significant group is in the thick disc that might trace stream/peculiar motion of the Perseus arm. The other two groups are mainly made up of off-plane sources. The northern and southern off-plane sources were found to be moving at $\sim$ 33 km s^{-1} and 54 km s^{-1} away from the Galactic plane, respectively. Causes of these peculiar motions are still unclear. For the two off-plane groups, we suspect they are thick disc stars whose kinematics affected by the Sgr stellar stream or very old Sgr stream debris.

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Multi-epoch VLTI-PIONIER imaging of the supergiant V766 Cen: Image of the close companion in front of the primary

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The star V766 Cen (= HR 5171A) was originally classified as a yellow hypergiant but lately found to more likely

be a 27–36 $M_\odot$ red supergiant (RSG). Recent observations indicated a close eclipsing companion in the contact or common-envelope phase. Here, we aim at imaging observations of V766 Cen to confirm the presence of the close companion. We used near-infrared H-band aperture synthesis imaging at three epochs in 2014, 2016, and 2017, employing the PIONIER instrument at the Very Large Telescope Interferometer (VLTI). The visibility data indicate a mean Rosseland angular diameter of 4.1 ± 0.8 mas, corresponding to a radius of 1575 ± 400 $R_\odot$. The data show an extended shell (MOLsphere) of about 2.5 times the Rosseland diameter, which contributes about 30% of the H-band flux. The reconstructed images at the 2014 epoch show a complex elongated structure within the photospheric disk with a contrast of about 10%. The second and third epochs show qualitatively and quantitatively different structures with a single very bright and narrow feature and high contrasts of 20–30%. This feature is located toward the South–Western limb of the photospheric stellar disk. We estimate an angular size of the feature of 1.7 ± 0.3 mas, corresponding to a radius of 650 ± 150 $R_\odot$, and giving a radius ratio of $0.42^{+0.35}_{-0.10}$ compared to the primary stellar disk. We interpret the images at the 2016 and 2017 epochs as showing the close companion, or a common envelope toward the companion, in front of the primary. At the 2014 epoch, the close companion is behind the primary and not visible. Instead, the structure and contrast at the 2014 epoch are typical of a single RSG harboring giant photospheric convection cells. The companion is most likely a cool giant or supergiant star with a mass of 5^{+15}_{-3} $M_\odot$.

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and from https://www.eso.org/public/images/potw1740a/

Tomography of silicate dust around M-type AGB stars I. Diagnostics based on dynamical models

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The heavy mass loss observed in evolved asymptotic giant branch stars is usually attributed to a two-step process: atmospheric levitation by pulsation-induced shock waves, followed by radiative acceleration of newly formed dust grains. Detailed wind models suggest that the outflows of M-type AGB stars may be triggered by photon scattering on Fe-free silicates with grain sizes of about 0.1–1 μm. As a consequence of the low grain temperature, these Fe-free silicates can condense close to the star, but they do not produce the characteristic mid-IR features that are often observed in M-type AGB stars. However, it is probable that the silicate grains are gradually enriched with Fe as they move away from the star, to a degree where the grain temperature stays below the sublimation temperature, but is high enough to produce emission features. We investigate whether differences in grain temperature in the inner wind region, which are related to changes in the grain composition, can be detected with current interferometric techniques, in order to put constraints on the wind mechanism.
We use phase-dependent radial structures of the atmosphere and wind of an M-type AGB star, produced with the 1D radiation-hydrodynamical code DARWIN, to investigate if current interferometric techniques can differentiate between the temperature structures that give rise to the same overall spectral energy distribution. The spectral energy distribution is found to be a poor indicator of different temperature profiles and therefore is not a good tool for distinguishing different scenarios of changing grain composition. However, spatially resolved interferometric observations have promising potential. They show signatures even for Fe-free silicates (found at 2–3 stellar radii), in contrast to the spectral energy distribution. Observations with baselines that probe spatial scales of about 4 stellar radii and beyond are suitable for tracing changes in grain composition, since this is where effects of Fe enrichment should be found.

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Vigorous atmospheric motion in the red supergiant star Antares

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Red supergiant stars represent a late stage of the evolution of stars more massive than about nine solar masses, in which they develop complex, multi-component atmospheres. Bright spots have been detected in the atmosphere of red supergiants using interferometric imaging. Above the photosphere of a red supergiant, the molecular outer atmosphere extends up to about two stellar radii. Furthermore, the hot chromosphere (5,000 to 8,000 K) and cool gas (less than 3,500 K) of a red supergiant coexist at about three stellar radii. The dynamics of such complex atmospheres has been probed by ultraviolet and optical spectroscopy. The most direct approach, however, is to measure the velocity of gas at each position over the image of stars as in observations of the Sun. Here we report the mapping of the velocity field over the surface and atmosphere of the nearby red supergiant Antares. The two-dimensional velocity field map obtained from our near-infrared spectro-interferometric imaging reveals vigorous upwelling and downdrafting motions of several huge gas clumps at velocities ranging from about -20 to $+20$ km s^{-1} in the atmosphere, which extends out to about 1.7 stellar radii. Convection alone cannot explain the observed turbulent motions and atmospheric extension, suggesting that an unidentified process is operating in the extended atmosphere.

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Conference Papers

The *s*-process nucleosynthesis: impact of the uncertainties in the nuclear physics determined by Monte Carlo variations

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We investigated the impact of uncertainties in neutron-capture and weak reactions (on heavy elements) on the *s*-process nucleosynthesis in low-mass stars and massive stars using a Monte-Carlo based approach. We performed extensive nuclear reaction network calculations that include newly evaluated temperature-dependent upper and lower limits for the individual reaction rates. We found β-decay rate uncertainties affect only a few nuclei near *s*-process branchings, whereas most of the uncertainty in the final abundances is caused by uncertainties in the neutron capture rates. We suggest a list of uncertain rates as candidates for improved measurement by future experiments.

Poster contribution, published in "The AGB–Supernovæ Mass Transition", held at Rome Observatory, March 27–31, 2017, Mem. Società Astronomica Italiana
Available from https://arxiv.org/abs/1708.01629

What is the role of wind mass transfer in the progenitor evolution of Type Ia Supernovæ?

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Type Ia supernovæ (SNe Ia) are thermonuclear explosions of carbon–oxygen white dwarfs (WDs) that accrete mass from a binary companion, which can be either a non-degenerate star (a main-sequence star or a giant) or an other WD in a binary merger (single- and double-degenerate scenario, respectively). In population-synthesis studies of SNe Ia the contribution of asymptotic giant branch (AGB) stars to either scenario is marginal. However, most of these studies adopt simplified assumptions to compute the effects of wind mass loss and accretion in binary systems. This work investigates the impact of wind mass transfer on a population of binary stars and discusses the role of AGB stars as progenitors of SNe Ia.

Oral contribution, published in "The AGB–Supernovæ Mass Transition", Monte Porzio Catone (Rome, Italy), Mem.S.A.It.
Available from https://arxiv.org/abs/1707.07988

Job Advert

International Max Planck Research School for Solar System Science Several Ph.D. positions

The International Max Planck Research School for Solar System Science at the University of Göttingen ("Solar System School") offers a research-oriented doctoral programme covering the physical aspects of Solar system science. It is jointly run by the Max Planck Institute for Solar System Research (MPS) and the University of Göttingen.

Research at the MPS covers three main areas:

- "Sun and Heliosphere";
- "Solar and Stellar Interiors";
- "Planets and Comets".

The Solar and Stellar Interiors department is active in asteroseismology studies.

Solar System School students collaborate with leading scientists in these fields and graduates are awarded a doctoral degree from the renowned University of Göttingen or, if they choose, another university.

The Solar System School is open to students from all countries and offers an international three-year Ph.D. program in an exceptional research environment with state-of-the-art facilities on the Göttingen Campus. Successful applicants will be offered a three-year doctoral support contract as well as postdoc wrap-up funding.

The language of the structured graduate program is English, with complementary German language courses offered (optional). The program includes an inspiring curriculum of scientific lectures and seminars as well as advanced training workshops and provides relocation costs and travel funds to attend international conferences.

Applicants to the Solar System School should have a keen interest in Solar system science and a record of academic excellence. They must have, or must be about to obtain, an M.Sc. degree or equivalent in physics, earth sciences or a related field, including a written Masters thesis, and must document a good command of the English language.

Review of applications for a starting date of September 2018 will begin on 15 November 2017. Two referees given by the applicant will be contacted by the School and will be asked to submit their letters through the online portal no later than November 20 2017.

To apply, please register then login at the Online application portal:

See also https://www.mps.mpg.de/phd/applynow

Announcements

ESO Workshop "Imaging of Stellar Surfaces"

First Announcement
ESO Workshop "Imaging of Stellar Surfaces"
http://www.eso.org/sci/meetings/2018/Imaging-Stellar-Surfaces.html
March 5–9, 2018
Venue: ESO Headquarters, Garching, Germany
Maximum number of participants: 70

Scientific Rationale:
Until very recently, all information about mechanisms affecting the stellar surface came either from indirect observations or from studies of the Sun. The stellar surface is the locus where we first interface with the mechanisms happening at the interior of the stars such as convection, magnetic field, and diffusion producing abundance anomalies. Studying stellar surfaces is important for advancing our understanding of these physical processes.

There is currently a tremendous advance of different observational techniques that enable us to resolve the surfaces of stars other than the sun. The Very Large Telescope Interferometer (VLTI) is transitioning from its first generation instruments, which focused on spectro-interferometry, to the second generation instruments, which focus on spectro-imaging and astrometry. The VLTI instrument PIONIER has already shown its capabilities and great potential to resolve stellar surfaces, while the instruments GRAVITY and MATISSE are coming into operations. The VLT instrument SPHERE is resolving the surfaces of the apparently largest stars as well. At the same time, ALMA observations have suceeded to resolve stellar surfaces at millimetre wavelengths with its long baselines. A number of other interferometers at optical and radio wavelengths have been successful to resolve stellar surfaces as well, including CHARA, VLA, e-MERLIN.

In the last one or two years we have seen great progress in resolving surfaces of active stars such as ζ And, of red giants such as R Dor, of asymptotic giant branch stars such as Mira or R Scl, and of red supergiants such as Betelgeuse, Antares, VY CMa, with these different techniques at multiple wavelengths from the visual to the radio.

Stellar atmosphere models have also been advancing, during a similar time frame, from 1D models to 3D models including the effects of convection. Interaction between observations and theory of stellar atmospheres is of utmost importance to constrain the models and to advance our understanding of physical processes such as pulsation, convection, chromospheric activity.

This workshop aims to bring together observers from different techniques and wavelengths and theoreticians working on stellar atmosphere and stellar structure. Presentations will include recent individual results of stellar surface mapping and the corresponding modelling. Observational strategies to advance in this field will be discussed. In addition, we will dedicate a session to the prospect of resolving stellar surfaces of stars other than the sun with future facilities such as the ELT or the JWST, or with intensity interfermetry/CTA.

We also aim to share technical, observational, and modeling expertise with a larger community. We will discuss how the different communities (VLT, VLTI, CHARA, ALMA, HST/JWST) deal with the image reconstruction problem and with the physical interpretation of the images.

We aim at a focused workshop with ample of time for discussions on recent images of stellar surfaces and atmospheres (out to below a few stellar radii), the observational strategies, and the relevant physical processes. The number of participants will be limited to 70.

SOC:
Bernd Freytag (Uppsala University, Sweden), Xavier Haubois (ESO), Liz Humphreys (ESO, co-chair), Lynn Matthews (MIT Haystack, USA), Claudia Paladini (ESO), Oskar von der Luehe (Albert-Ludwigs-Universität Freiburg, Germany), Markus Wittkowski (ESO, co-chair)

Invited Speakers: to be confirmed

Topics:

- The Sun as a star: Physical processes affecting the Sun's surface and overviews of recent observations at optical and sub-mm wavelengths.
- Physical processes:
  - Convection
  - Pulsation
  - Magnetic fields
  - Chromospheric activity
  - Close companions
  - Rotation
- Red giants including active giants;
- Asymptotic giant branch stars;
- Red supergiants;
- Imaging techniques and observational strategies;
- Future facilities.

We plan to start the workshop on Monday lunchtime and to finish on Friday lunchtime.

Contact: ioss@eso.org

See also http://www.eso.org/sci/meetings/2018/Imaging-Stellar-Surfaces.html

Fizeau exchange visitors program – call for applications

Dear colleagues!

The Fizeau exchange visitors program in optical interferometry funds (travel and accommodation) visits of researchers to an institute of his/her choice (within the European Community) to perform collaborative work and training on one of the active topics of the European Interferometry Initiative. The visits will typically last for one month, and strengthen the network of astronomers engaged in technical, scientific and training work on optical/infrared interferometry. The program is open for all levels of astronomers (Ph.D. students to tenured staff), with priority given to Ph.D. students and young postdocs. Non-EU based missions will only be funded if considered essential by the Fizeau Committee. Applicants are strongly encouraged to seek also partial support from their home or host institutions.

The deadline for applications is October 15. Fellowships can be awarded for missions to be carried out between December 2017 and May 2018!

Further informations and application forms can be found at www.european-interferometry.eu

The program is funded by OPTICON/H2020.

Please distribute this message also to potentially interested colleagues outside of your community!

Looking forward to your applications,
Josef Hron & Péter Ábrahám
(for the European Interferometry Initiative)

See also www.european-interferometry.eu

IAU Symposium 343
Why Galaxies Care About AGB Stars
A Continuing Challenge through Cosmic Time

Next year, during the XXX$^{\text{th}}$ General Assembly of the International Astronomical Union we will have the 4$^{\text{th}}$ incarnation of our GALAGB meeting series from August 20–23, 2018.

This IAU symposium aims to build a bridge between research on Asymptotic Giant Branch (AGB) stars themselves and its application to the modelling of stellar populations and the chemical evolution of galaxies and the Universe as a whole. Current developments and challenges seen from both domains will be discussed to reach an understanding of possibilities, limitations, and needs in both areas, and hence to improve our understanding of the role of AGB stars in the context of galaxies over cosmic time.

Registration is open, we wait for your abstracts!

See also http://astronomy2018.univie.ac.at/

ALMA Workshop on Stars – What can we really do with ALMA?

18–19 January 2018
Tohoku University, Sendai, Japan

This series of the ALMA Workshop on Stars has been organized almost annually in Japan since 2011, covering a wide variety of topics related to evolved stars and their circumstellar matter in the Milky Way Galaxy and nearby Universe. Now into its Cycle 5, ALMA has evolved into a true workhorse for our science purposes, from detecting hundreds of emission lines to mapping in detail dust continuum from circumstellar envelopes. Meanwhile, radio interferometry remains to be a relatively specialized technique seemingly left only for experts.

In the next ALMA Workshop on Stars, we aim to come back to the basics and rethink how we can really take advantage of the astonishing power of ALMA as one of existing viable approaches (e.g., optical and infrared observations, laboratory experiments, and numerical simulations) at different scales of interests (from stellar surfaces to boundaries with the interstellar space) in conjunction with other East-Asian millimeter/submillimeter facilities including Nobeyama 45 m and JCMT 15 m telescopes.

With this in mind, we would like to welcome participants with various levels of proficiency in radio astronomy – experts, experienced, novice, and even those with just interest – to contribute to discuss directions in the study of the final stages of stellar evolution and their environments near and far using radio astronomy. Tentative speakers include people from the East-Asia ALMA Regional Center and active ALMA users in the field. More information will be available from the workshop LOC.

LOC/SOC: Hiroshi Imai (chair, hiroimai@sci.kagoshima-u.ac.jp), Yoshifusa Ita, Issei Yamamura, Toshiya Ueta