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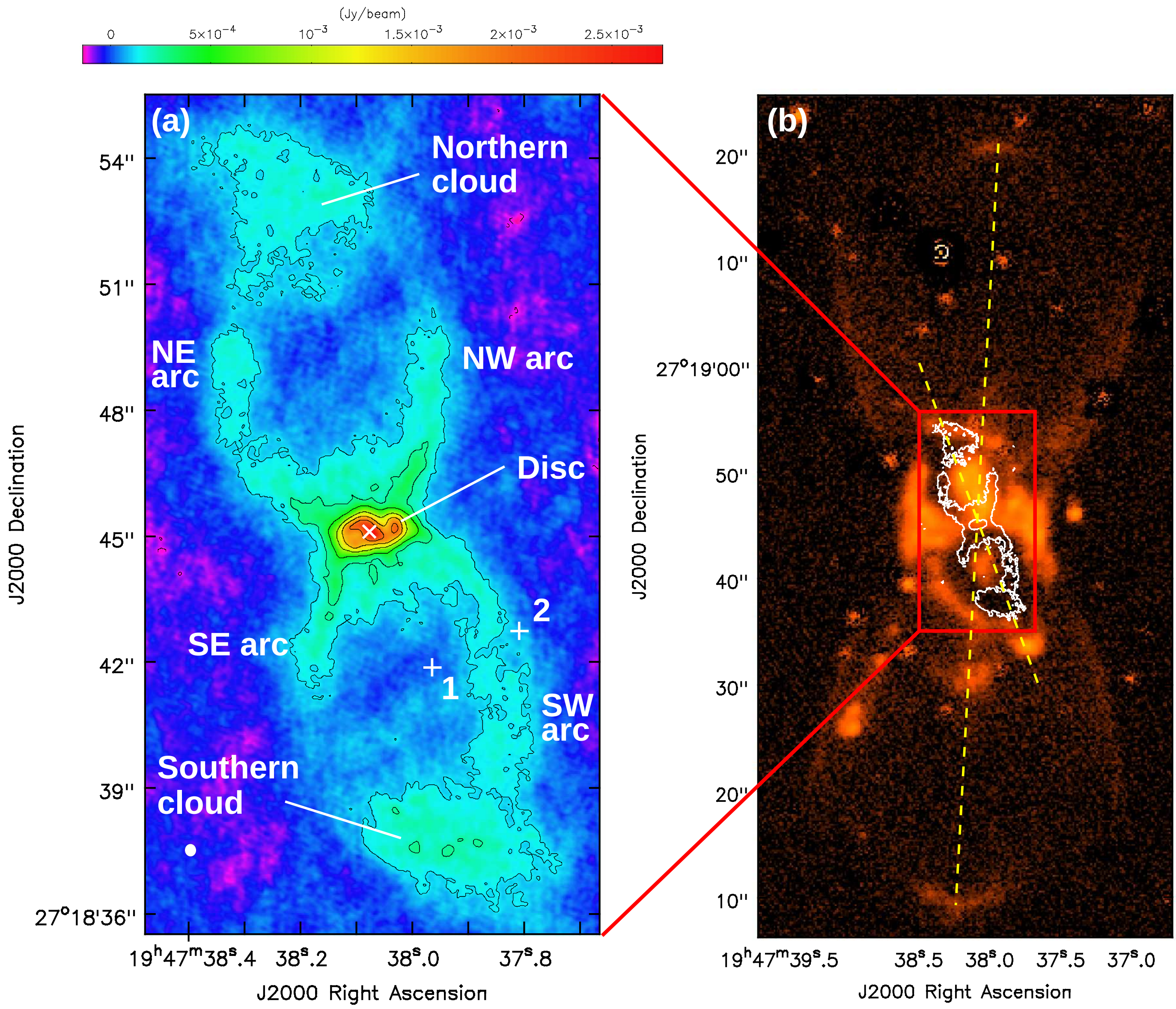

Figure 1: CK Vulpeculæ is believed to be the product of a merger of a white dwarf and a brown dwarf. For more details see https://arxiv.org/abs/1809.05849.

Editorial

Dear Colleagues,

It is a pleasure to present you the 255th issue of the AGB Newsletter.

Note the announcements of two conferences, one in France and the other in the USA.

Last month's 'Food for Thought' queried the possibility that the chemical alterations of white dwarf photospheres be due to material from a post-AGB disc. Ben Zuckerman pointed out that most chemically altered white dwarves are not found in binary systems that would have had a circumbinary disc: "most polluted WDs are apparently single stars, not binaries. With the publication of the Gaia DR2 catalog, in combination with data from other all-sky optical and infrared catalogs, it is now virtually impossible to hide the existence of a low-mass companion star to a WD. Thus we can be quite certain that apparently single, polluted, WDs are in fact single stars." See also Zuckerman & Young (2017) in the 'Handbook of Exoplanets'.

The next issue is planned to be distributed around the 1st of November.

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

Food for Thought

This month's thought-provoking statement is:

Rotation affects pulsation, pulsation affects mass loss, and mass loss affects rotation.

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)

Warm CO in evolved stars from the THROES catalogue I. *Herschel*-PACS spectroscopy of O-rich envelopes

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In this work (paper I), we analyse *Herschel*-PACS spectroscopy for a subsample of 23 O-rich and 3 S-type evolved stars, in different evolutionary stages from the asymptotic giant branch (AGB) to the planetary nebula (PN) phase, from the THROES catalogue. (C-rich targets are separately studied in paper II, in prep.). The broad spectral range covered by PACS ($\sim$ 55–210 μm) includes a large number of high-J CO lines, from $J = 14$–13 to $J = 45$–44 ($v = 0$), that allow us to study the warm inner layers of the circumstellar envelopes (CSEs) of these objects, at typical distances from the star of $\sim 10^{14}$–10^{15} cm and $\sim 10^{16}$ cm for AGBs and post-AGB-PNe, respectively.We have generated CO rotational diagrams for each object to derive the rotational temperature, total mass within the CO-emitting region and average mass-loss rate during the ejection of these layers. We present first order estimations of these basic physical parameters using a large number of high-J CO rotational lines, with upper-level energies from $E_{\rm up} = 580$ to 5000 K, for a relatively big set of evolved low-to-intermediate mass stars in different AGB-to-PN evolutionary stages. We derive rotational temperatures ranging from $T_{\rm rot} = 200$ to 700 K, with typical values around 500K for AGBs and systematically lower, $\sim$ 200 K, for objects in more advanced evolutionary stages (post-AGBs and PNe). Our values of $T_{\rm rot}$ are one order or magnitude higher than the temperatures of the outer CSE layers derived from low-J CO line studies. The total mass of the inner CSE regions where the PACS CO lines arise is found to range from $M_{\rm H2} \sim 10^{-6}$ to $\sim 10^{-2}$ M$_\odot$, which is expected to represent a small fraction of the total CSE mass. The mass-loss rates estimated are in the range $\dot{M} \sim 10^{-7}$–10^{-4} M$_\odot$ yr^{-1}, in agreement (within uncertainties) with values found in the literature.We find a clear anti-correlation between $M_{\rm H2}$ and $\dot{M}$ versus $T_{\rm rot}$ that probably results from a combination of most efficient line cooling and higher line opacities in high mass-loss rate objects. For some strong CO emitters in our sample, a double temperature (hot and warm) component is inferred. The temperatures of the warm and hot components are $\sim$ 400–500K and $\sim$ 600–900 K, respectively. The mass of the warm component ($\sim 10^{-5}$–8×10^{-2} M$_\odot$) is always larger than that of the hot component, by a factor of between two and ten. The warm-to-hot $M_{\rm H2}$ and $T_{\rm rot}$ ratios in our sample are correlated and are consistent with an average temperature radial profile of $\propto r^{-0.5\pm0.1}$, that is, slightly shallower than in the outer envelope layers, in agreement with recent studies.

Accepted for publication in Astronomy & Astrophysics

Available from https://www.aanda.org/component/article?access=doi&doi=10.1051/0004-6361/201833177

Spatially resolving the thermally inhomogeneous outer atmosphere of the red giant Arcturus in the 2.3 μm CO lines

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The outer atmosphere of K giants shows thermally inhomogeneous structures consisting of the hot chromospheric gas and the cool molecular gas. We present spectro-interferometric observations of the multicomponent outer atmosphere of the well-studied K1.5 giant Arcturus (α Boo) in the CO first overtone lines near 2.3 μm. We observed Arcturus with the AMBER instrument at the Very Large Telescope Interferometer (VLTI) at 2.28–2.31 μm with a spectral resolution of

12 000 and at projected baselines of 7.3, 14.6, and 21.8 m. The high spectral resolution of the VLTI/AMBER instrument allowed us to spatially resolve Arcturus in the individual CO lines. Comparison of the observed interferometric data with the MARCS photospheric model shows that the star appears to be significantly larger than predicted by the model. It indicates the presence of an extended component that is not accounted for by the current photospheric models for this well-studied star. We found out that the observed AMBER data can be explained by a model with two additional CO layers above the photosphere. The inner CO layer is located just above the photosphere, at 1.04 ± 0.02 stellar radii, with a temperature of 1600 ± 400 K and a CO column density of $10^{20\pm0.3}$ cm^{-2}. On the other hand, the outer CO layer is found to be as extended as to 2.6 ± 0.2 stellar radii with a temperature of 1800 ± 100 K and a CO column density of $10^{19\pm0.15}$ cm^{-2}. The properties of the inner CO layer are in broad agreement with those previously inferred from the spatially unresolved spectroscopic analyses. However, our AMBER observations have revealed that the quasi-static cool molecular component extends out to 2–3 stellar radii, within which region the chromospheric wind steeply accelerates.

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Expansion patterns and parallaxes for planetary nebulæ

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We aim to determine individual distances to a small number of rather round, quite regularly shaped planetary nebulæ by combining their angular expansion in the plane of the sky with a spectroscopically measured expansion along the line of sight.
We combined up to three epochs of *Hubble* Space Telescope imaging data and determined the angular proper motions of rim and shell edges and of other features. These results are combined with measured expansion speeds to determine individual distances by assuming that line of sight and sky-plane expansions are equal. We employed 1-D radiation-hydrodynamics simulations of nebular evolution to correct for the difference between the spectroscopically measured expansion velocities of rim and shell and of their respective shock fronts.
Rim and shell are two independently expanding entities, driven by different physical mechanisms, although their model-based expansion timescales are quite similar. We derive good individual distances for 15 objects, and the main results are as follows: (i) distances derived from rim and shell agree well; (ii) comparison with the statistical distances in the literature gives reasonable agreement; (iii) our distances disagree with those derived by spectroscopic methods; (iv) central-star 'plateau' luminosities range from about 2000 $L_\odot$ to well below 10 000 $L_\odot$, with a mean value at about 5000 $L_\odot$, in excellent agreement with other samples of known distance (Galactic bulge, Magellanic Clouds, and K 648 in the globular cluster M 15); (v) the central-star mass range is rather restricted: from about 0.53 to about 0.56 $M_\odot$, with a mean value of 0.55 $M_\odot$.
The expansion measurements of nebular rim and shell edges confirm the predictions of radiation-hydrodynamics simulations and offer a reliable method for the evaluation of distances to suited objects.

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The white dwarf initial–final mass relation for progenitor stars from 0.85 to 7.5 $M_\odot$

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We present the initial–final mass relation (IFMR) based on the self-consistent analysis of Sirius B and 79 white dwarfs from 13 star clusters. We have also acquired additional signal on eight white dwarfs previously analyzed in the NGC 2099 cluster field, four of which are consistent with membership. These reobserved white dwarfs have masses ranging from 0.72 to 0.97 $M_\odot$, with initial masses from 3.0 to 3.65 $M_\odot$, where the IFMR has an important change in slope that these new data help to observationally confirm. In total, this directly measured IFMR has small scatter ($\sigma = 0.06$ $M_\odot$) and spans from progenitors of 0.85 to 7.5 $M_\odot$. Applying two different stellar evolutionary models to infer two different sets of white dwarf progenitor masses shows that when the same model is also used to derive the cluster ages, the resulting IFMR has weak sensitivity to the adopted model at all but the highest initial masses (> 5.5 $M_\odot$). The non-linearity of the IFMR is also clearly observed with moderate slopes at lower masses (0.08 $M_{\rm final}/M_{\rm initial}$) and higher masses (0.11 $M_{\rm final}/M_{\rm initial}$) that are broken up by a steep slope (0.19 $M_{\rm final}/M_{\rm initial}$) between progenitors from 2.85 to 3.6 $M_\odot$. This IFMR shows total stellar mass loss ranges from 33% of $M_{\rm initial}$ at 0.83 $M_\odot$ to 83% of $M_{\rm initial}$ at 7.5 $M_\odot$. Testing this total mass loss for dependence on progenitor metallicity, however, finds no detectable sensitivity across the moderate range of $-0.15 < [{\rm Fe/H}] < +0.15$.

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Do the pulsation properties of red giants vary around their long secondary period cycle?

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We have used visual and Johnson V observations from the American Association of Variable Star Observers (AAVSO) International Database, and the AAVSO VSTAR time-series package, and (O–C) analysis to investigate possible changes in the pulsation period and amplitude of the pulsating red giants U Del, EU Del, X Her, and Y Lyn around the cycle of their long secondary periods (LSPs). We find no such changes in period or amplitude. This suggests (weakly) that the process – whatever it is – that causes the LSPs does not significantly change the physical properties of the visible hemisphere of the stars as the LSP cycle proceeds.

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Line identification and photometric history of the hot post-AGB star Hen 3-1013 (IRAS 14331−6435)

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We present a study of the high-resolution optical spectrum for the hot post-asymptotic giant branch (post-AGB) star, Hen 3-1013, identified as the optical counterpart of the infrared source IRAS 14331−6435. For the first time the detailed identifications of the observed absorption and emission features in the wavelength range 3700–9000 Å is carried out. Absorption lines of H I, He I, C I, N I, O I, Ne I, C II, N II, O II, Si II, S II, Ar II, Fe II, Mn II, Cr II, Ti II, Co II, Ni II, S III, Fe III and S IV were detected. From the absorption lines, we derived heliocentric radial velocities of $v_\mathrm{r} = -29.6 \pm 0.4$ km s^{-1}. We have identified emission permitted lines of O I, N I, Fe II, Mg II, Si II and Al II. The forbidden lines of [N I], [Fe II], [Cr II] and [Ni II] have been identified also. Analysis of [Ni II] lines in the gaseous shell gives an estimate for the electron density $N_\mathrm{e} \sim 10^7$ cm^{-3} and the expansion velocity of the nebula $v_\mathrm{exp} = 12$ km s^{-1}. The mean radial velocity as measured from emission features of the envelope is $v_\mathrm{r} = -36.0 \pm 0.4$ km s^{-1}. The Balmer lines Hα, Hβ and Hγ show P Cyg behaviour which indicate ongoing post-AGB mass-loss. Based on ASAS and ASAS-SN data, we have detected rapid photometric variability in Hen 3-1013 with an amplitude up to 0.2 mag in the V band. The star's low-resolution spectrum underwent no significant changes from 1994 to 2012. Based on archival data, we have traced the photometric history of the star over more than 100 years. No significant changes in the star brightness have been found.

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A study of pulsation and fadings in some R Coronæ Borealis stars

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We have measured the times of onset of fadings in four R CrB stars − V854 Cen, RY Sgr, R CrB, and S Aps. These times continue to be locked to the stars' pulsation periods, though with some scatter. In RY Sgr, the onsets of fadings tend to occur at or a few days after pulsation maximum. We have studied the pulsation properties of RY Sgr through its recent long maximum using (O–C) analysis and wavelet analysis. The period "wanders" by a few percent. This wandering can be modelled by random cycle-to-cycle period fluctuations, as in some other types of pulsating stars. The pulsation amplitude varies between 0.05 and 0.25 in visual light, non-periodically but on a time scale of about 20 pulsation periods.

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Nonlinear mixed modes in red giants

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Turbulent motions in the convective envelope of red giants excite a rich spectrum of solar-like oscillation-modes. Observations by CoRoT and *Kepler* have shown that the mode amplitudes increase dramatically as the stars ascend the red giant branch, i.e. as the frequency of maximum power $\nu_{\rm max}$ decreases. Most studies nonetheless assume that the modes are well-described by the linearized fluid equations. We investigate to what extent the linear approximation is justified as a function of stellar mass M and $\nu_{\rm max}$, focusing on dipole mixed-modes with frequency near $\nu_{\rm max}$. A useful measure of a mode's nonlinearity is the product of its radial wavenumber and its radial displacement $k_{\rm r}\xi_{\rm r}$ (i.e. its shear). We show that $k_{\rm r}\xi_{\rm r} \propto \nu_{\rm max}^{-9/2}$, implying that the nonlinearity of mixed-modes increases significantly as a star evolves. The modes are weakly nonlinear ($k_{\rm r}\xi_{\rm r} > 10^{-3}$) for $\nu_{\rm max}\lesssim 150$ μHz and strongly nonlinear ($k_{\rm r}\xi_{\rm r} > 1$) for $\nu_{\rm max}\lesssim 30$ μHz, with only a mild dependence on M over the range we consider (1.2–2.0 $M_\odot$). A weakly nonlinear mixed-mode can excite secondary waves in the stellar core through the parametric instability, resulting in enhanced, but partial, damping of the mode. We find that mixed-modes lie near the instability threshold when $\nu_{\rm max}\lesssim 80$ μHz (200 μHz) for $M \simeq 1.2$ $M_\odot$ (2.0 $M_\odot$). By contrast, a strongly nonlinear mode breaks as it propagates through the core and is fully damped there. We conclude with a brief discussion of potentially observable signatures of nonlinear effects and propose investigating whether they can explain why some red giants exhibit dipole modes with unusually small amplitudes, known as depressed modes.

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Dust production and depletion in evolved planetary systems

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The infrared dust emission from the white dwarf GD 56 is found to rise and fall by 20 per cent peak-to-peak over 11.2 yr, and is consistent with ongoing dust production and depletion. It is hypothesized that the dust is produced via collisions associated with an evolving dust disc, temporarily increasing the emitting surface of warm debris, and is subsequently destroyed or assimilated within a few years. The variations are consistent with debris that does not

change temperature, indicating that dust is produced and depleted within a fixed range of orbital radii. Gas produced in collisions may rapidly re-condense onto grains, or may accrete onto the white dwarf surface on viscous timescales that are considerably longer than Poynting–Robertson drag for micron-sized dust. This potential delay in mass accretion rate change is consistent with multi-epoch spectra of the unchanging Ca II and Mg II absorption features in GD 56 over 15 yr, although the sampling is sparse. Overall these results indicate that collisions are likely to be the source of dust and gas, either inferred or observed, orbiting most or all polluted white dwarfs.

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ALMA reveals the aftermath of a white dwarf–brown dwarf merger in CK Vulpeculæ

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We present Atacama Large Millimeter-Submillimeter Array (ALMA) observations of CK Vulpeculæ which is identified with "Nova Vulpeculæ 1670". They trace obscuring dust in the inner regions of the associated nebulosity. The dust forms two cocoons, each extending $\sim 5''$ North and South of the presumed location of the central star. Brighter emission is in a more compact East–West structure ($2'' \times 1''$) where the cocoons intersect. We detect line emission in NH_2CHO, CN, four organic molecules and $C^{17}O$. CN lines trace bubbles within the dusty cocoons; CH_3OH a North–South S-shaped jet; and other molecules a central cloud with a structure aligned with the innermost dust structure. The major axis of the overall dust and gas bubble structure has a projected inclination of $\sim 24^\circ$ with respect to a $71''$ extended "hourglass" nebulosity, previously seen in Hα. Three cocoon limbs align with dark lanes in the inner regions of the same Hα images. The central $2'' \times 1''$ dust is resolved into a structure consistent with a warped dusty disc. The velocity structure of the jets indicates an origin at the centre of this disc and precession with an unknown period. Deceleration regions at both the Northern and Southern tips of the jets are roughly coincident with additional diffuse dust emission over regions approximately $2''$ across. These structures are consistent with a bipolar outflow expanding into surrounding high density material. We suggest that a white dwarf and brown dwarf merged between 1670 and 1672, with the observed structures and extraordinary isotopic abundances generated as a result.

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Mean density inversions for red giants and red clump stars

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Since the CoRoT and *Kepler* missions, the availability of high quality seismic spectra for red giants has made them the standard clocks and rulers for Galactic Archaeology. With the expected excellent data from the TESS and PLATO missions, red giants will again play a key role in Galactic studies and stellar physics, thanks to the precise masses and radii determined by asteroseismology. The determination of these quantities is often based on so-called scaling laws, which have been used extensively for main-sequence stars. We show how the SOLA inversion technique can provide robust determinations of the mean density of red giants within 1 per cent of the real value, using only radial oscillations. Combined with radii determinations from Gaia of around 2 per cent precision, this approach provides robust, less model-dependent masses with an error lower than 10 per cent. It will improve age determinations, helping to accurately dissect the Galactic structure and history. We present results on artificial data of standard models, models including an extended atmosphere from averaged 3D simulations and non-adiabatic frequency calculations to test surface effects, and on eclipsing binaries. We show that the inversions provide very robust mean density estimates, using at best seismic information. However, we also show that a distinction between red-giant branch and red-clump stars is required to determine a reliable estimate of the mean density. The stability of the inversion enables an implementation in automated pipelines, making it suitable for large samples of stars.

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Turbulent convection and pulsation stability of stars – III. Non-adiabatic oscillations of red giants

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We have computed linear non-adiabatic oscillations of luminous red giants using a non-local and anisotropic time-dependent theory of convection. The results show that low-order radial modes can be self-excited. Their excitation is the result of radiation and the coupling between convection and oscillations. Turbulent pressure has important effects on the excitation of oscillations in red variables.

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Developing a self-consistent AGB wind model: I. Chemical, thermal, and dynamical coupling

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The material lost through stellar winds of Asymptotic Giant Branch (AGB) stars is one of the main contributors to the chemical enrichment of galaxies. The general hypothesis of the mass loss mechanism of AGB winds is a combination of stellar pulsations and radiative pressure on dust grains, yet current models still suffer from limitations. Among others, they assume chemical equilibrium of the gas, which may not be justified due to rapid local dynamical changes in the wind. This is important as it is the chemical composition that regulates the thermal structure of the wind, the creation of dust grains in the wind, and ultimately the mass loss by the wind. Using a self-consistent hydrochemical model, we investigated how non-equilibrium chemistry affects the dynamics of the wind. This paper compares a hydrodynamical and a hydrochemical dust-free wind, with focus on the chemical heating and cooling processes. No sustainable wind arises in a purely hydrodynamical model with physically reasonable pulsations. Moreover, temperatures are too high for dust formation to happen, rendering radiative pressure on grains impossible. A hydrochemical wind is even harder to initiate due to efficient chemical cooling. However, temperatures are sufficiently low in dense regions for dust formation to take place. These regions occur close to the star, which is needed for radiation pressure on dust to sufficiently aid in creating a wind. Extending this model self-consistently with dust formation and evolution, and including radiation pressure, will help to understand the mass loss by AGB winds.

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Radioactive nuclei from cosmochronology to habitability

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In addition to long-lived radioactive nuclei like U and Th isotopes, which have been used to measure the age of the Galaxy, also radioactive nuclei with half-lives between 0.1 and 100 million years (short-lived radionuclides, SLRs) were present in the early Solar System (ESS), as indicated by high-precision meteoritic analysis. We review the most recent meteoritic data and describe the nuclear interaction processes responsible for the creation of SLRs in different types of stars and supernovæ. We show how the evolution of radionuclide abundances in the Milky Way Galaxy can be calculated based on their stellar production. By comparing predictions for the evolution of galactic abundances to the meteoritic data we can build up a time line for the nucleosynthetic events that predated the birth of the Sun, and investigate the lifetime of the stellar nursery where the Sun was born. We then review the scenarios for the circumstances and the environment of the birth of the Sun, within such a stellar nursery, that have been invoked to explain the abundances in the ESS of the SLRs with the shortest lives – of the order of million years or less. Finally, we describe how the heat generated by radioactive decay and in particular by the abundant ^{26}Al in the ESS had important consequences for the thermo-mechanical and chemical evolution of planetesimals, and discuss possible implications on the habitability of terrestrial-like planets. We conclude with a set of open questions and future directions related to our understanding of the nucleosynthetic processes responsible for the production of SLRs in stars, their evolution in the Galaxy, the birth of the Sun, and the connection with the habitability of extra-solar planets.

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Available from https://arxiv.org/abs/1808.00233
and from https://www.sciencedirect.com/science/article/pii/S0146641018300358?via%3Dihub (open access)

Pulsation-triggered dust production by asymptotic giant branch stars

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Eleven nearby (< 300 pc), short-period (50–130 days) asymptotic giant branch (AGB) stars were observed in the CO J =2–1 line. Detections were made towards objects that have evidence for dust production ($K_{\rm s} - [22] \gtrsim 0.55$ mag; AK Hya, V744 Cen, RU Crt, α Her). Stars below this limit were not detected (BQ Gem, ϵ Oct, NU Pav, II Hya, CL Hyi, ET Vir, SX Pav). K_s–[22] colour is found to trace mass-loss rate to well within an order of magnitude. This confirms existing results, indicating a factor of 100 increase in AGB-star mass-loss rates at a pulsation period of $\sim$ 60 days, similar to the known "superwind" trigger at $\sim$ 300 days. Between $\sim$ 60 and $\sim$ 300 days, an approximately constant mass-loss rate and wind velocity of $\sim 3.7 \times 10^{-7}$ M$_{\odot}$ yr^{-1} and $\sim$ 8 km s^{-1} is found. While this has not been corrected for observational biases, this rapid increase in mass-loss rate suggests a need to recalibrate the treatment of AGB mass loss in stellar evolution models. The comparative lack of correlation between mass-loss rate and luminosity (for $L \lesssim 6300$ L$_{\odot}$) suggests that the mass-loss rates of low-luminosity AGB-star winds are set predominantly by pulsations, not radiation pressure on dust, which sets only the outflow velocity. We predict that mass-loss rates from low-luminosity AGB stars, which exhibit optically thin winds, should be largely independent of metallicity, but may be strongly dependent on stellar mass.

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Available from https://arxiv.org/abs/1809.07965

Conference Papers

The morphology of the outflow in the grazing envelope evolution

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We study the grazing envelope evolution (GEE), where a secondary star, which orbits the surface of a giant star, accretes mass from the giant envelope and launches jets. We conduct simulations of the GEE with different half-opening angles and velocities, and simulate the onset phase and the spiralling-in phase. We discuss the resulting envelope structure and the outflow geometry. We find in the simulations of the onset phase with narrow jets that a large fraction of the ejected mass outflows along the polar directions. The mass ejected at these directions has the fastest velocity and the highest angular momentum magnitude. In the simulations of the spiralling-in phase, a large fraction of the ejected mass concentrates around the orbital plane. According to our findings, the outflow with the highest velocity is closer to the poles as we launch narrower jets. The outflow has a toroidal shape accompanied by two faster rings, one ring at each side of the equatorial plane. The interaction of the jets with the giant envelope causes these outflow structures, as we do not include in our simulations the secondary star gravity and the envelope self-gravity.

Oral contribution, published in "Asymmetrical Planetary Nebulæ VII", Galaxies special edition
Available from https://arxiv.org/abs/1809.01928
and from http://www.mdpi.com/2075-4434/6/3/96/htm

On the circumstellar envelopes of semi-regular long-period variables

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The mass loss process along the AGB phase is crucial for the formation of circumstellar envelopes (CSEs), which in the post-AGB phase will evolve into planetary nebulae (PNe). There are still important issues that need to be further explored in this field; in particular, the formation of axially symmetric PNe from spherical CSEs. To address the problem, we have conducted high S/N IRAM 30m observations of $_{12}$CO J = 1–0 and J = 2–1, and ^{13}CO J = 1–0 in a volume-limited unbiased sample of semi-regular variables (SRs). We also conducted Yebes 40m SiO J = 1–0 observations in 1/2 of the sample in order to complement our ^{12}CO observations. We report a moderate correlation between mass loss rates and the ^{12}CO(1–0)-to-^{12}CO(2–1) intensity ratio, introducing a possible new method for determining mass loss rates of SRs with short analysis time. We also find that for several stars the SiO profiles are very similar to the ^{12}CO profiles, a totally unexpected result unless these are non-standard envelopes.

Oral contribution, published in IAU Symposium 343: "Why Galaxies Care About AGB Stars: A Continuing Challenge through Cosmic Time"
Available from https://arxiv.org/abs/1809.03244

Review Paper

Binary post-AGB stars as tracers of stellar evolution

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In this review the focus is on the properties of post-Asymptotic Giant Branch (post-AGB) stars in binary systems. Their Spectral Energy Distributions (SEDs) are very characteristic: they show a near-infrared excess, indicative of the presence of warm dust, while the central stars are too hot to be in a dust production evolutionary phase. This allows for an efficient detection of binary post-AGB candidates. It is now well established that the near-infrared excess is produced by the inner rim of a stable dusty disc that surrounds the binary system. These discs are scaled-up versions of protoplanetary discs and form a second generation of stable Keplerian discs. They are likely formed during a binary interaction process when the primary was on ascending the AGB. I will summarise what we have learned from the observational properties of these post-AGB binaries. The impact of the creation, lifetime and evolution of the circumbinary discs on the evolution of the system are yet to be fully understood.

Published in "The Impact of Binaries on Stellar Evolution", eds. G. Beccari & H.M.J. Boffin.
Available from https://arxiv.org/abs/1809.00871

Celebrating 40 years of Alexander Tielens' contribution to science: the physics and chemistry of the ISM

First announcement

We are happy to announce the conference to be held September 2–6, 2019 in Avignon, France.

Xander Tielens has been driving research in the fields of interstellar physics and chemistry and the cosmic cycle of matter with outstanding contributions for 40 years. With this meeting, we wish to celebrate his scientific achievements and discuss future research directions opened up by his contributions.

The meeting will focus on the fields strongly influenced by Xander, involving the physical and chemical processes that control the interstellar medium and its life cycle: PDRs, interstellar and circumstellar dust, PAHs, ices and astrochemistry. We will especially emphasize future opportunities offered by the powerful telescopes at our disposal such as, for example, ALMA, SOFIA, and JWST.

The meeting will consist of invited reviews, contributed talks, and posters. The second announcement will be made in December 2018.

Location: Centre International de Congres du Palais des Papes, Avignon, France (http://www.avignon-congres.com/)

Scientific Organizing Committee:

- Cecilia Ceccarelli (chair)
- Alessandra Candian (co-chair)
- Jan Cami
- Carsten Dominik
- Liv Hornekær
- Kay Justtanont
- Els Peeters
- Mark Wolfire

Local Organizing Committee: Bertrand Lefloch (chair)

2019 STScI Spring Symposium: The Deaths and Afterlives of Stars

First Announcement

April 22–24, 2019
Space Telescope Science Institute
Baltimore, Maryland

Scientific Rationale

The stellar evolution lifecycle ends with a dramatic transformation of stars from their equilibrium state. Stellar deaths involve violent and often rapid expulsions of matter and energy, a process that itself represents an initial condition for many astrophysical topics. The rich diversity of stellar outcomes, their connections to progenitor properties, and the influence of these afterlife processes on shaping galaxies remain among the most exciting fields of astrophysics today and have been further sparked by the discovery of new classes of transients and the first detections of gravitational waves.

The Space Telescope Science Institute is excited to host the 2019 STScI Spring Symposium, "The Deaths and Afterlives of Stars". The symposium will bring together leading experts that are pushing new research in this exciting field of astrophysics. The discussion will include,

- The thresholds for stellar evolution that culminate in different types of stellar deaths
- The physical effects that control stellar death
- The processes through which stars die
- Astrophysical influences from the afterlives of stars

Important Dates:

- September 21st 2018 – First announcement
- February 1st 2019 – Abstract deadline
- mid-February 2019 – Acceptance notifications from SOC to speakers
- March 22nd 2019 – Registration deadline (w/ $200 payment)

Confirmed Invited Speakers:

- Jennifer Andrews (University of Arizona, USA)
- Iair Arcavi (Las Cumbres Observatory, USA)
- Selma de Mink (University of Amsterdam, The Netherlands)
- JJ Eldridge (University of Auckland, New Zealand)
- Jay Farihi (UCL, London UK)
- Tim Heckman (JHU, USA)
- Jennifer Johnson (OSU, USA)
- Laura Lopez (OSU, USA)
- Ragnhild Lunnan (CfA, USA)
- Maryam Modjaz (NYU, USA)

- Ambra Nanni (University of Padova, Italy)
- Enrico Ramirez-Ruiz (UC Santa Cruz, USA)
- Sofia Ramstedt (Uppsala University, Sweden)
- Ken Shen (UC Berkeley, USA)
- Stephen Smartt (Queens University, Belfast, UK)
- Tuguldur Sukhbold (OSU, USA)
- Eleonora Troja (UMD, USA)
- Stan Woosley (UC Santa Cruz, USA)

Scientific and Local Organizing Committee:

- Jason Kalirai (STScI) – Chair
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- Armin Rest (STScI)
- Ben Sargent (STScI)
- Tea Temim (STScI)

See also http://www.stsci.edu/institute/conference/spring2019