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Editors: Jacco van Loon, Ambra Nanni and Albert Zijlstra

Editorial

Dear Colleagues,

It is our pleasure to present you the 292nd issue of the AGB Newsletter. Don't miss the review paper by Karen Kwitter and Richard Henry.

We congratulate Adrian Lucy on their Ph.D. thesis, well done!

There are jobs for postdoctoral researchers in Uppsala (Sweden) and Brussels (Belgium).

The recently launched Hypatia colloquium series invites suggestions, and the Fizeau interferometry support programme continues.

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

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

Food for Thought

This month's thought-provoking statement is:

How important is aluminium oxide for silicate grain formation?

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)

Refereed Journal Papers

Forbidden electron capture on ^{24}Na and ^{27}Al in degenerate oxygen–neon cores

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Background: Stars with an initial mass of $\sim$ 7–11 solar masses form degenerate oxygen–neon cores following carbon burning. Electron captures in such cores can trigger runaway oxygen burning, resulting in either a collapse or a thermonuclear explosion. Previous work constrained the contribution of the forbidden $0^+_{\mathrm{g.s.}} \to 2^+_{\mathrm{g.s.}}$ transition to the $^{20}\mathrm{Ne}(\mathrm{e}^-, \nu_\mathrm{e})^{20}\mathrm{F}$ rate and discussed its significance for the evolution of the core.
Purpose: We provide a detailed description of the formalism used in previous work and apply it to two further forbidden transitions that are relevant to degenerate oxygen–neon cores: the $4^+_{\mathrm{g.s.}} \to 2^+_1$ transition in $^{24}\mathrm{Na}(\mathrm{e}^-, \nu_\mathrm{e})^{24}\mathrm{Ne}$ and the $5/2^+_{\mathrm{g.s.}} \to 1/2^+_{\mathrm{g.s.}}$ transition in $^{27}\mathrm{Al}(\mathrm{e}^-, \nu_\mathrm{e})^{27}\mathrm{Mg}$.
Method: The relevant nuclear matrix elements are determined through shell model calculations and constraints from CVC theory. We then investigate the astrophysical impact using the stellar evolution code MESA (Modules for Experiment in Stellar Astrophysics) and through timescale arguments.
Results: In the relevant temperature range, the forbidden transitions substantially reduce the threshold densities for $^{24}\mathrm{Na}(\mathrm{e}^-, \nu_\mathrm{e})^{24}\mathrm{Ne}$ and $^{27}\mathrm{Al}(\mathrm{e}^-, \nu_\mathrm{e})^{27}\mathrm{Mg}$. In the MESA models, $^{24}\mathrm{Na}(\mathrm{e}^-, \nu_\mathrm{e})^{24}\mathrm{Ne}$ now occurs immediately following the onset of $^{24}\mathrm{Mg}(\mathrm{e}^-, \nu_\mathrm{e})^{24}\mathrm{Na}$. The impact on the overall evolution is uncertain: this is due to known difficulties in accounting for convective instabilities triggered by the $A = 24$ electron captures. The transition between ^{27}Al and ^{27}Mg may have a minor effect on the early evolution but is unlikely to affect the outcome.
Conclusions: The studied transitions should be included when calculating weak interaction rates between ^{24}Na and ^{24}Ne for temperatures $\log_{10}(T[\mathrm{K}]) \lesssim 8.5$ and between ^{27}Al and ^{27}Mg for $\log_{10}(T[\mathrm{K}]) \lesssim 8.8$.

Submitted to Phys. Rev. C
Available from https://arxiv.org/abs/2104.02614

New models for the rapid evolution of the central star of the Stingray Nebula

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We present stellar evolution calculations from the asymptotic giant branch (AGB) to the planetary nebula (PN) phase for models of initial mass 1.2 and 2.0 $\mathrm{M}_\odot$ that experience a late thermal pulse (LTP), a helium shell flash that occurs following the AGB and causes a rapid looping evolution between the AGB and PN phase. We use these models to make comparisons to the central star of the Stingray Nebula, V839 Ara (SAO 244567). The central star has been observed to be rapidly evolving (heating) over the last 50–60 yr and rapidly dimming over the past 20–30 yr. It has been reported to belong to the youngest known PN, now rapidly fading in brightness. In this paper, we show that the observed timescales, sudden dimming, and increasing $\log(g)$, can all be explained by LTP models of a specific variety. We provide a possible explanation for the nebular ionization, the 1980s sudden mass-loss episode, the sudden decline in mass-loss, and the nebular recombination and fading.

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YY Hya and its interstellar environment

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Context: During a search for previously unknown Galactic emission nebulæ, we discovered a faint 36-arcmin diameter Hα emission nebula centered around the periodic variable YY Hya. Although this star has been classified as RR Lyr variable, such a stellar classification is inconsistent with the formation of such a large nebula especially if at YY Hya's estimated Gaia distance of ≈ 450 pc. GALEX image data also shows YY Hya to have a strong UV excess, suggesting the existence of a hot, compact binary companion.
Aims: We aim to clarify the nature of YY Hya and its nebula.
Methods: In addition to our discovery image data, we obtained a 2.5 × 2.5 deg^2 image mosaic of the whole region with CHILESCOPE facilities and time-series spectroscopy at MDM observatory. Also, we used data from various space missions to derive an exact orbital period and a spectral energy distribution (SED). The binary star model code Binary Maker 3 (BM3), and Kurucz atlas9 stellar atmospheres were used to derive a synthetic light curve and a model SED of the compact binary system, respectively.
Results: We find that YY Hya is a compact binary system containing a K dwarf star which is strongly irradiated by a hot white dwarf (WD) companion. The spectral characteristics of the emission lines, visible only during maximum light of the perfectly sinusoidal optical light curve, when the side of the K star fully illuminated by the WD points to the observer, shows signatures much like members of the BE UMa variable family. These are post common envelope pre-cataclysmic variables. However the companion star here is more massive than found in other group members and the progenitor of the white dwarf must have been a 3–4 $M_\odot$ star. The nebula seems to be an ejected common envelope shell with a mass in the order of one solar mass and an age of 500 000 years. This makes it to be the biggest hitherto known such shell. Alignment of neighboring nebulosities some 45 arcmin to the northeast and southwest of YY Hya suggests that the system had strong bipolar outflows. We briefly speculate it might be related to the 1065 BP "guest-star" reported in ancient Chinese records as well.

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A massive open cluster hiding in full sight

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Obscuration and confusion conspire to limit our knowledge of the inner Milky Way. Even at moderate distances, the identification of stellar systems becomes compounded by the extremely high density of background sources. Here we provide a very revealing example of these complications by unveiling a large, massive, young cluster in the Sagittarius arm that has escaped detection until now despite containing more than 30 stars brighter than $G = 13$ mag. By combining Gaia DR2 astrometry, Gaia and 2MASS photometry and optical spectroscopy, we find that the new cluster,

which we name Valparaiso 1, located at ~ 2.3 kpc, is about 75 Ma old and includes a large complement of evolved stars, among which we highlight the 4-d classical Cepheid CM Sct and an M-type giant that probably represents the first detection of an AGB star in a Galactic young open cluster. Although strong differential reddening renders accurate parameter determination unfeasible with the current dataset, direct comparison to clusters of similar age suggests that Valparaiso 1 was born as one of the most massive clusters in the Solar Neighbourhood, with an initial mass close to $10\,000\ M_\odot$.

Published in MNRAS 505, 1618 (2021)
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New multi-element isotopic compositions of presolar SiC grains: implications for their stellar origins

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We report NanoSIMS Si and Mg–Al isotopic data (and C, N, and Ti isotopic data when available) for 85 submicron- to micron-sized presolar SiC grains from the CM2 Murchison meteorite, including 60 MS, 8 AB1, 8 X, 7 AB2, and 2 Y grains. The MS and Y grain data demonstrate that (1) C and N contamination mainly appears as surface contamination, and sufficient presputtering is needed to expose a clean grain surface for obtaining intrinsic C and N signals, and (2) Mg and Al contamination appears as adjacent grains and rims, and high-resolution imaging and the choice of small regions of interest during data reduction together are effective in suppressing the contamination. Our results strongly indicate that previous studies on presolar SiC grains could have sampled differing degrees of contamination for C, N, Mg, and Al. Compared to the literature data, our new MS and Y grains are in better agreement with carbon star observations for both the C and N isotopic ratios. By comparing our new, tighter distributions of $^{12}C/^{13}C$, $^{14}N/^{15}N$, and initial $^{26}Al/^{27}Al$ ratios for MS and Y grains with FRUITY AGB stellar models, we provide more stringent constraints on the occurrence of cool bottom processing and the production of ^{26}Al in N-type carbon stars, classical asymptotic giant branch stars.

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Bottom-up dust nucleation theory in oxygen-rich evolved stars I. Aluminium oxide clusters

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Aluminum oxide (alumina, Al_2O_3) is a promising candidate as a primary dust condensate in the atmospheres of oxygen-rich evolved stars. Therefore, alumina seed particles might trigger the onset of stellar dust formation and of stellar mass loss in the wind. However, the formation of alumina dust grains is not well understood. We aim to shed light on the initial steps of cosmic dust formation (i.e. nucleation) in oxygen-rich environments by a quantum-chemical bottom-up approach. Starting with an elemental gas-phase composition, we construct a detailed chemical-kinetic network describing the formation and destruction of aluminium-bearing molecules and dust-forming $(Al_2O_3)_n$ clusters up to the size of dimers ($n = 2$) coagulating to tetramers ($n = 4$). Intermediary species include the prevalent gas-phase molecules AlO and AlOH, and Al_xO_y clusters with $x = 1$–5, $y = 1$–6. The resulting extensive network is applied to two model stars, representing a semi-regular variable and a Mira-type, and to different circumstellar gas trajectories including a non-pulsating outflow and a pulsating model. The growth of larger-sized $(Al_2O_3)_n$ clusters with $n = 4$–10 is described by the temperature-dependent Gibbs free energies of the most favourable structures (i.e. the global minima clusters) as derived from global optimisation techniques and calculated by density functional theory. We provide energies, bond characteristics, electrostatic properties and vibrational spectra of the clusters as a function of size n and compare these to corundum corresponding to the crystalline bulk limit ($n \to \infty$). The circumstellar aluminium gas-phase chemistry in oxygen-rich giants is primarily controlled by AlOH and AlO, which are tightly coupled by the reactions $AlO+H_2$, $AlO+H_2O$, and their reverse. Models of semi-regular variables show comparatively higher AlO abundances, and a later onset and a lower efficiency of alumina cluster formation when compared to Mira-like models. The Mira-like models exhibit an efficient cluster production accounting for more than 90% of the available aluminium content, which is in agreement with the most recent ALMA observations. Chemical equilibrium calculations fail to predict the alumina cluster formation, as well as the abundance trends of AlO and AlOH in the AGB dust formation zone. Furthermore, we report the discovery of hitherto unreported global minima candidates and low-energy isomers for cluster sizes $n = 7$, 9, and 10. A homogeneous nucleation scenario, where Al_2O_3 monomers are successively added, is energetically viable. However, the formation of the Al_2O_3 monomer itself represents an energetic bottleneck. Therefore, we provide a bottom-up interpolation of the cluster characteristics towards the bulk limit by excluding the monomer, approximately following a $n^{-1/3}$ dependence.

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Pulsating red giants in a globular cluster: 47 Tucanæ

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We have carried out time-series analysis of a sample of 12 pulsating red giants (PRGs) in the globular cluster 47 Tuc, using observations from the ASAS-SN database, and the AAVSO software package VStar. Most (11/12) of the stars were classified by ASAS-SN as semiregular (SR). We have determined pulsation periods (P) for all 12 of them, and "long secondary periods" (LSPs) for 11 of them. This confirms that LSPs are common in Population II stars. In the context of recent explanations for LSPs, our results imply that many Population II red giants have accreting planetary companions, surrounded by dust. In over half the stars, the period given in the ASAS-SN catalogue is actually the LSP, not the pulsation period. About half the stars show some evidence of a second pulsation period, presumably a second pulsation mode. The amplitudes of the pulsation periods vary by up to a factor of 3.4, on time scales of 10 to 35 pulsation periods (median value 18). The average ratio of LSP to P is 9.0, but the values cluster around 5 and 10. This suggests that some of the stars are pulsating in a lower-order mode, but most are pulsating in a higher-order mode, and half are pulsating in both. The complex variability of the stars in our sample is similar to that of nearby PRGs with a solar composition. The fact that there are about 150 Galactic globular clusters, each with potentially-variable red giants, means that there are many opportunities for studies, like ours, by students and by amateur astronomers with an interest in data analysis, as well as by professional astronomers.

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The symbiotic binary St 2-22: orbital and stellar parameters and jet evolution following its 2019 outburst

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St 2-22 is a relatively poorly-studied S-type symbiotic system that belongs to a small group of jet-producing systems as a result of disc-accretion onto a white dwarf fed by its red giant companion.
The goal of this paper is to analyse the nature and derive the basic parameters of St 2-22, and to follow the jet evolution.
Photometric monitoring through over 16 yrs and high-quality spectroscopic data enabled us to shed new light on its nature. The high-resolution SALT spectra and $VI_{\rm C}$ photometry obtained during and between the last two outbursts have been used to search for periodic changes, to derive spectroscopic orbits of both system components, and to study the outburst and jet evolution.
We present the orbital and stellar parameters of the system components. The orbital period is $P_{\rm orb} = 918 \pm 6$ d. The double-line spectroscopic orbits indicate the mass ratio $q = M_{\rm g} M_{\rm h}^{-1} = 3.50 \pm 0.53$, and the components masses $M_{\rm g} \sin^3 i \sim 2.35$ M$_\odot$, and $M_{\rm h} \sin^3 i \sim 0.67$ M$_\odot$. The orbit shows significant eccentricity, $e = 0.16 \pm 0.07$. The orbital inclination is close to 70 degrees. During outbursts, accelerating and decelerating jets are observed with changes of their radial velocity component in a range from ~ 1500 up to nearly 1800 km s^{-1}. St 2-22 turned out to be a classical symbiotic system very similar to the precursor of the group – Z And.

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V838 Monocerotis as seen by ALMA: a remnant of a binary merger in a triple system

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Context: V838 Mon erupted in 2002, quickly becoming the prototype of a new type of stellar eruption known today as the (luminous) red nova. Red nova outbursts are thought to be caused by stellar mergers. The merger in V838 Mon took place in a triple or higher system involving two B-type stars.
Aims: We wish to characterize the merger remnant ~ 17 yr after the eruption to learn more about the remaining system, the progenitor, and the merger physics.
Methods: We mapped the merger site with ALMA at a resolution of ~ 25 mas, or 148 au for a distance of 5.9 kpc, in continuum dust emission and in rotational lines of simple molecules, including CO, SiO, SO, SO_2, AlOH, and H_2S. We use radiative transfer calculations to reproduce the architecture of the remnant at the epoch of the ALMA observations. We also make use of optical spectroscopy data obtained mainly with VLT/X-shooter and SALT/HRS.
Results: For the first time, we identify the position of the B-type companion relative to the outbursting component

of V838 Mon. The stellar remnant is surrounded by a clumpy wind with characteristics similar to those of the winds of red supergiants. The merger product is also associated with an elongated structure of 17.6×7.6 mas^2 (104×45 au^2) seen in continuum emission, and which we interpret as a disk seen at a moderate inclination. Maps of continuum and molecular emission also show a complex region of interaction between the B-type star (its gravity, radiation, and wind) and the flow of matter ejected in 2002. The remnant's molecular mass is about 0.1 $M_\odot$ and the dust mass is $8.3 \cdot 10^{-3}$ $M_\odot$. The mass of the atomic component remains unconstrained.
Conclusions: The most interesting region for understanding the merger of V838 Mon lies in its direct vicinity and appears elongated, but details of its substructure remain unknown. To study it further and in more detail will require even higher angular resolutions. ALMA maps show us an extreme form of interaction between the merger ejecta and the distant ($\sim$ 250 au) companion. This interaction is similar to that known from the Antares AB system but at a much higher mass-loss rate. The B-type star not only deflects the merger ejecta but also changes its molecular composition with an involvement of circumstellar shocks. The ALMA view of V838 Mon offers the best images of a merger site so far.

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The mid-infrared environment of the stellar merger remnant V838 Monocerotis

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In 2002, V838 Monocerotis (V838 Mon) erupted in a red novae event which has been interpreted to be a stellar merger. Soon after reaching peak luminosity, it began to cool, and its spectrum evolved to later spectral types. Dust was also formed in the post-merger remnant, making it bright in the mid-infrared. Interferometric studies at these wavelengths have suggested the presence of a flattened, elongated structure. We investigate, for the first time, the structure and orientation of the dusty envelope surrounding V838 Mon in the L (2.8–4.2 μm) band using recent observations with the MATISSE instrument at the VLTI. We perform simple geometrical modelling of the interferometric observables using basic models (disks, Gaussians, point sources, along with their combinations). We also reconstructed an image and analyzed the corresponding L-band spectrum. This study indicates the presence of an elongated, disk-like structure near 3.5 μm, similar to what has been observed in other wavelength regimes. In particular, the orientation at a position angle of -40° agrees with prior measurements in other bands. The dusty elongated structure surrounding V838 Mon appears to be a stable and long lived feature that has been present in the system for over a decade. Its substructure and origin remain unclear, but may be related to mass-loss phenomena that took place in the orbital plane of the merged binary.

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Spectroscopic variability of the compact planetary nebula Hb 12

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We present the results of our new low-resolution spectroscopic observations of the young compact planetary nebula

Hb 12 performed in 2011–2020 with SAI MSU telescopes. We have measured the intensities of more than 50 nebular emission lines in the spectral range $\lambda3687$–9532, detected interstellar absorption features, and conducted a search for absorptions belonging to the possible secondary component of the central star. The extinction coefficient has been estimated from the Balmer decrement to be $c(\mathrm{H}\beta) = 1.15 \pm 0.07$. The distance has been found by analyzing the interstellar extinction maps to be $D \approx 2400$ pc. We have traced the history of the spectroscopic observations of Hb 12, beginning with the first spectra taken by Aller (1951) in 1945. We have detected a systematic increase in the relative intensities of the nebular [O III] $\lambda4959$ and $\lambda5007$ lines and a decrease in the relative intensity of the auroral [O III] $\lambda4363$ line, which has led to an increase in the observed flux ratio $F(\lambda4959 + \lambda5007)/F(\lambda4363)$ by a factor of ~ 4 from 1945 to the present time. The [O III]/[O II] line ratio $F(\lambda4363)/F(\lambda3727 + \lambda3729)$ remains constant, suggesting that the degree of ionization, on average, for the nebula is invariable. The temperature of the exciting star has been estimated to be $T \approx 41\,000$ K. We conclude that a decrease in the electron temperature and, possibly, electron density in the [O III] line formation region is mainly responsible for the spectroscopic variability.

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Review Paper

Planetary nebulæ: sources of enlightenment

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In this review/tutorial we explore planetary nebulæ as a stage in the evolution of low-to-intermediate-mass stars, as major contributors to the mass and chemical enrichment of the interstellar medium, and as astrophysical laboratories. We discuss many observed properties of planetary nebulæ, placing particular emphasis on element abundance determinations and comparisons with theoretical predictions. Dust and molecules associated with planetary nebulæ are considered as well. We then examine distances, binarity, and planetary nebula morphology and evolution. We end with mention of some of the advances that will be enabled by future observing capabilities.

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Available from https://arxiv.org/abs/2110.13993

Thesis

The detection and description of symbiotic accretion from cool evolved stars

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Symbiotic stars are binaries consisting of a cool evolved G-M/S/C I-III star accreting onto a smaller companion – but the accretion disk itself is rarely detected. Accretion signatures like hard X-rays and optical/ultraviolet flickering are usually suppressed or outshone by shell burning on the accreting white dwarf, the luminous giant, and the giant's wind nebula. In Chapters 2 and 3, we present a new way to find symbiotics that is less biased against accreting-only, non-burning symbiotics with directly detectable accretion disks. Our search methodology is based on finding outliers in SkyMapper Southern Sky Survey broad-band and intermediate-band photometry, using a parameter

space built from reconstructed $u-g$, $u-v$ snapshot colors and rapid variability between the three exposures of a 20-minute SkyMapper Main Survey filter sequence, from a sample of luminous red objects selected with 2MASS and Gaia.

In a pilot survey employing this new search design, we discovered 12 new symbiotics, including four symbiotics with optical accretion disk flickering and at least two with boundary-layer hard X-rays, as well as 10 new symbiotic candidates. We also discovered optical flickering in the known symbiotic V1044 Cen (CD $-36°8436$). We conclude that at least 20% of the true population of symbiotics exhibits detectable optical flickering from the inner accretion disk, a substantial fraction of which would not meet the usual Hα equivalent width detection thresholds typically used to find symbiotics with traditional narrow-band emission line photometry surveys. There is a significant population of optically-flickering symbiotics hidden both within and beyond the known catalogs of symbiotic stars – however, the question of whether the true population of accreting-only symbiotics is larger than the population of burning symbiotics remains unanswered. We also find that our methods probe a completely different region of parameter space than recent work by the Munari et al. (2021) search for accreting-only symbiotics, while being surprisingly in harmony with the Akras et al. (2019) infrared selection criteria.

As an intermediate step in our pilot survey, we explored several outlying regions in our SkyMapper parameter space with optical spectroscopy of 234 luminous red objects, which we present in a 248-page spectral atlas. Our results identify a zone of the $u-g$, $u-v$ snapshot color–color diagram in which virtually all objects are symbiotics. When all-sky uvg colors become available through future DRs of SkyMapper and MEPHISTO, between about 51 and 117 symbiotics missed by previous surveys (of which 11 to 17 have been reported in this work) will be discoverable using only this mostly-symbiotic zone of the color–color diagram, with a near-zero contamination rate. Main Survey filter-sequence variability is also a powerful tool for finding hidden, flickering symbiotics both inside and outside of the mostly-symbiotic color–color zone, but variability must still be used in conjunction with color; there must be enough of an accretion disk contribution to the u-band for it to exhibit detectable variability. We show that yellow post-AGB stars with strong Balmer jump absorption (along with the symbiotic Southern Crab) are outliers with large positive $u-v$, while some S and carbon stars are outliers with large negative $u-v$. We also show that it is important to correct the results of SkyMapper's catalog pipeline for variability when dealing with samples containing large-amplitude pulsating stars.

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Available from https://doi.org/10.7916/d8-352d-xr22

Job Adverts

Royal Observatory of Belgium and Université Libre de Bruxelles, Belgium

Long-term post-doctoral position in stellar spectroscopy of multiple systems

In the framework of the FED-tWIN programme, the Belgian Science Policy Office (BELSPO) aims at promoting research cooperation between the Federal Research Institutes and Universities in Belgium. In this context, the Astronomy and Astrophysics Department of the Royal Observatory of Belgium (ROB) and the Institut d'Astronomie et d'Astrophysique of the Université Libre de Bruxelles (ULB) are recruiting a postdoctoral researcher. The candidate will implement the selected research project Prf-2020-033 "BISTRO: The influence of binary stars on stellar and Galactic evolution, as revealed by current and large surveys".

The long-term objective is to advance the understanding of single and binary star evolution in terms of chemistry and orbital parameters in order to gain insight in when and how binary components interact, and how the systems evolve across the Hertzsprung–Russell Diagram.

In the first two years the activities of the Fed-tWin Researcher will be dedicated to develop an automated spectral fitting package using machine-learning techniques relying on artificial neural networks for the study of single stars and multiple systems in current and future large spectral surveys.

See also https://aa.oma.be/Jobs

Department of Physics and Astronomy, Uppsala University, Sweden
Researcher in Astrophysics with focus on evolved stars

We invite applications for a 2-year researcher position at Uppsala University, within project EXWINGS.

Evolved stars play a crucial role for the cosmic matter cycle and the origin of life. Critical chemical elements, like carbon, are produced inside luminous cool giant stars, transported to the surface by turbulent gas flows, and ejected into interstellar space by massive outflows of gas and dust. The current knowledge of stellar winds is incomplete, and does not allow us to fully understand their effects on the evolution of stars, and how they enrich their surroundings with newly produced elements and cosmic dust. Project EXWINGS (https://www.astro.uu.se/exwings), funded by the European Research Council with an ERC Advanced Grant, aims at a breakthrough in understanding the winds of cool giant and supergiant stars by developing a new type of models: global dynamical star-and-wind-in-a-box simulations, in full 3D geometry. Astronomical instruments with high spatial resolution, which give images of the stellar atmospheres where the winds originate, will allow us to test the new models.

The researcher will be a member of the EXWINGS team, and work together with Susanne Höfner, Bernd Freytag, and other team members on studying the effects of stellar pulsation and convection on physical phenomena (shocks, dust formation, emergence of complex structures) in the extended atmosphere, where the stellar wind has its origin. Comparing new dynamic models for Asymptotic Giant Branch (AGB) and red supergiant (RSG) stars to state-of-the-art observations (in particular new high-angular-resolution data probing the stellar atmosphere and circumstellar envelope), the mechanisms which drive their winds will be explored.

To qualify for an employment as a researcher you must have a Ph.D. degree or a foreign degree equivalent to a Ph.D. degree in Astronomy or Physics. Practical experience with simulations of radiative transfer in stellar atmospheres and winds, linking their morphology to observable properties, or with relevant observational techniques (in particular interferometry at infrared and sub-mm wavelengths) applied to AGB and RSG stars, will be considered a merit.

The employment is a temporary position, 2 years. Starting date 2022-01-01 or as agreed. Number of reference: UFV-PA 2021/3941. Last application date: 2021-11-26

Submit your application through Uppsala University's recruitment system:
https://www.uu.se/en/about-uu/join-us/details/?positionId=440351

For further information about the position please contact: Susanne Höfner (susanne.hoefner@physics.uu.se), Professor of Theoretical Astrophysics.

See also https://www.uu.se/en/about-uu/join-us/details/?positionId=440351

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. From January 2021 onwards, applications to travel to VLTI Expertise Centres are priority, given the new financial rules applying to the programme. Applicants are strongly encouraged to seek also partial support from their home or host institutions.

The deadline for applications is November 15.
Fellowships can be awarded for missions to be carried out between January 2022 and July 2022!

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

The program is funded by OPTICON/RadioNET Pilot Program.

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

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

See also www.european-interferometry.eu

Hypatia Colloquium 2022: Call for Abstracts

Dear colleagues,

I would like to draw your attention on the call for abstracts to give the Hypatia Colloquium in 2022. This is a great opportunity of visibility for early career astronomers. Ph.D. students and early postdocs (max. 3 years from the Ph.D.) working in any field of theoretical and observational astronomy and astrophysics are invited to apply to be nominated as speaker.

The deadline for the abstracts is 19 November 2021, 1 pm CEST. More information at the link below.

Best regards
Claudia Paladini

See also https://www.eso.org/sci/publications/announcements/sciann17443.html