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Editors: Jacco van Loon, Ambra Nanni and Albert Zijlstra

Editorial

Dear Colleagues,

It is our pleasure to present you the 286$^{\text{th}}$ issue of the AGB Newsletter. A healthy 30 postings are sure to keep you inspired.

Now that the Leuven workshop has happened, we are gearing up to the IAU-sponsored GAPS 2021 virtual discussion meeting aimed to lay out a roadmap for cool evolved star research: we have got an exciting line-up of new talent as well as seasoned experts introducing the final session − all are encouraged to contribute to the meeting through 5-minute presentations or live discussion and the White Paper that will follow (see announcement at the back).

Those interested in the common envelope process will no doubt consider attending the CEPO 2021 virtual meeting on this topic organised at the end of August / star of September.

Great news on the job front: there are Ph.D. positions in Bordeaux, postdoc positions in Warsaw and another one in Nice.

Thanks to Josef Hron and Péter Ábrahám for ensuring the continuation of the Fizeau programme for exchange in the field of interferometry.

Last month's *Food for Thought* "What do we see when a tip-RGB star experiences a helium flash?" provoked an exciting response from Noam Soker:

"This is something we are just studying now. (Ealeal Bear, Noam Soker, and collaborators). We are studying the following process, that we did not see before for core helium flash.

Based on the calculations of Quataert & Shiode (2012) and Shiode & Quataert (2014) for pre-supernova of massive stars (core collapse supernovæ), we consider the possibility that the vigorous core convection during the core helium flash excites waves that expand into the envelope (as the excitation of waves by strong core convection during oxygen and silicon burning in pre-supernova massive stars). The maximum power in convective motion during the He-flash is $> 10^9$ L$_\odot$ (for the stellar model we use), and for about 4 years it stays $> 10^6$ L$_\odot$. We estimate that, according to the two papers mentioned above, the power in the waves that expand into the envelope is $L_{\rm wave} > 10^4$ L$_\odot$ for about 4 years, reaching a maximum of $L_{\rm wave}(\max) = 10^7$ $L_\odot$ for a short time. We are in the process of estimating the influence of the waves on the envelope. We expect some envelope-expansion, but are not sure yet for the luminosity. We hope to finish this project in 2–3 months."

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

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

Food for Thought

This month's thought-provoking statement is:

Please send us a suggestion for next month's "Food for Thought"

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

Infrared excesses around bright white dwarfs from Gaia and unWISE – I.

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Studies of excess infrared radiation around white dwarfs provide important constraints on the evolution of planetary systems and low-mass companions beyond the main-sequence stage. In this paper series, we focus on identifying and characterizing bright white dwarfs with an infrared excess. Here, we present 188 infrared excess candidates from Gaia and unWISE, 147 of which are new discoveries. Further characterization of this sample can significantly increase the current list of white dwarf debris disks and white dwarfs with low-mass companions.

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Available from https://arxiv.org/abs/2009.00193
and from https://iopscience.iop.org/article/10.3847/1538-4357/abb3fc/pdf

PION: Simulating bow shocks and circumstellar nebulæ

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Expanding nebulæ are produced by mass loss from stars, especially during late stages of evolution. Multi-dimensional simulation of these nebulæ requires high resolution near the star and permits resolution that decreases with distance from the star, ideally with adaptive timesteps. We report the implementation and testing of static mesh-refinement in the radiation-magnetohydrodynamics code PION, and document its performance for 2D and 3D calculations. The bow shock produced by a hot, magnetized, slowly rotating star as it moves through the magnetized ISM is simulated in 3D, highlighting differences compared with 2D calculations. Latitude-dependent, time-varying magnetized winds are modelled and compared with simulations of ring nebulæ around blue supergiants from the literature. A 3D simulation of the expansion of a fast wind from a Wolf–Rayet star into the slow wind from a previous red supergiant phase of evolution is presented, with results compared with results in the literature and analytic theory. Finally the wind–wind collision from a binary star system is modelled with 3D MHD, and the results compared with previous 2D hydrodynamic calculations. A python library is provided for reading and plotting simulation snapshots, and the generation of synthetic infrared emission maps using TORUS is also demonstrated. It is shown that state-of-the-art 3D MHD simulations of wind-driven nebulæ can be performed using PION with reasonable computational resources. The source code and user documentation is made available for the community under a BSD3 licence.

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A double power-law fit to the computed stellar $\log(\tau/\mathrm{yr})$–$\log(M/\mathrm{M}_\odot)$ relation – II. Zero-metallicity stars

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The computed $\log(\tau/\mathrm{yr})$–$\log(M/\mathrm{M}_\odot)$ relation for stellar initial mass range, $0.7 \leq M/\mathrm{M}_\odot \leq 100.0$ (Marigo et al. 2001); $120 \leq M/\mathrm{M}_\odot \leq 1000$ (Marigo et al. 2003); $0.3 \cdot 10^5 \leq M/\mathrm{M}_\odot \leq 1.5 \cdot 10^5$ (Woods et al. 2020); and stellar initial metallicity, $Z = 0$, is fitted to a good extent by a four-parameter curve, expressed by a double power-law, which can be reduced to a single power-law. Relative errors, $R[\log(\tau/\mathrm{yr})] = 1 - \log(\tau_{\mathrm{fit}}/\mathrm{yr})/\log(\tau/\mathrm{yr})$, do not exceed about 0.5% and 1.5%, respectively. Interpolation curves are constrained to an asymptotic value, $\tau_\infty = \lim_{M\to+\infty} \tau(M)$, equal to H-burning main sequence lifetime for monolithic supermassive stars, $\tau_{\mathrm{H}} \approx 1.6 \cdot 10^6$ yr (Woods et al. 2020).

Published in Applied Mathematical Sciences, 15, 141 (2021)
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The white dwarfs of the old, solar-metallicity open star cluster Messier 67:properties and progenitors

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The old, solar-metallicity open cluster Messier 67 has long been considered a lynchpin in the study and understanding of the structure and evolution of solar-type stars. The same is arguably true for stellar remnants; the white dwarf population of M 67 provides crucial observational data for understanding and interpreting white dwarf populations and evolution. In this work, we determine the white dwarf masses and derive their progenitor star masses using high signal-to-noise spectroscopy of warm ($\geq 10,000$ K) DA white dwarfs in the cluster. From this, we are able to derive each white dwarf's position on the initial–final mass relation (IFMR), with an average $M_{\mathrm{WD}} = 0.60 \pm 0.01$ $\mathrm{M}_\odot$ and progenitor mass $M_i = 1.52 \pm 0.04$ $\mathrm{M}_\odot$. These values are fully consistent with recently published linear and piecewise linear fits to the semi-empirical IFMR and provide a crucial, precise anchor point for the IFMR for solar-metallicity, low-mass stars. The mean mass of M 67 white dwarfs is also consistent with the sharp narrow peak in the local field white dwarf mass distribution, indicating that a majority of recently formed field white dwarfs come from stars with progenitor masses of ≈ 1.5 $\mathrm{M}_\odot$. Our results enable more precise modeling of the Galactic star formation rate encoded in the field white dwarf mass distribution.

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Systematic errors in dust mass determinations: insights from laboratory opacity measurements

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The thermal emission of dust is one of the most important tracers of the interstellar medium: multiwavelength photometry in the far-infrared (FIR) and submillimetre (submm) can be fitted with a model, providing estimates of the dust mass. The fit results depend on the assumed value for FIR/submm opacity, which in most models – due to the scarcity, until recently, of experimental measurements – is extrapolated from shorter wavelengths. Lab measurements of dust analogues, however, show that FIR opacities are usually higher than the values used in models and depend on temperature, which suggests that dust mass estimates may be biased. To test the extent of this bias, we create multiwavelength synthetic photometry for dusty galaxies at different temperatures and redshifts, using experimental results for FIR/submm dust opacity and then we fit the synthetic data using standard dust models. We find that the dust masses recovered by typical models are overestimated by a factor of 2–20, depending on how the experimental opacities are treated. If the experimental dust samples are accurate analogues of interstellar dust, therefore, current dust masses are overestimated by up to a factor of 20. The implications for our understanding of dust, both Galactic and at high redshift, are discussed.

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Parasite common envelope evolution by triple-star systems

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We study a scenario by which a giant wide tertiary star engulfs and forces a tight binary system of a white dwarf (WD) and a main sequence (MS) star to enter a common envelope evolution (CEE) with each other, and then unbinds the WD–MS common envelope. The WD–MS binary system, now with the WD inside the MS envelope, does not have sufficient orbital energy to unbind their common envelope. However, as they approach the center of the giant star Roche lobe overflow to the core of the giant star and/or merger of the WD with the core remove a large fraction of the WD–MS common envelope or all of it. Namely, the energy source for unbinding the WD–MS tight common envelope is the triple-star CEE. For that we term this scenario a parasite CEE. Overall, the destruction of the MS star absorbs energy from the triple-star system, a process that might lead to WD–core merger during the triple-star CEE. The parasite CEE leaves behind either one massive WD that in some cases might explode as a peculiar type Ia supernova or two close WDs that at later time might explode as a type Ia supernova. We very crudely estimate the rate of the parasite CEE to be a fraction of about 0.001 out of all evolved triple stars.

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Topology and obliquity of core magnetic fields in shaping seismic properties of slowly rotating evolved stars

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It is thought that magnetic fields must be present in the interiors of stars to resolve certain discrepancies between theory and observation (e.g., angular momentum transport), but such fields are difficult to detect and characterise. Asteroseismology is a powerful technique for inferring the internal structures of stars by measuring their oscillation frequencies, and succeeds particularly with evolved stars, owing to their mixed modes, which are sensitive to the deep interior. The goal of this work is to present a phenomenological study of the combined effects of rotation and magnetism in evolved stars, where both are assumed weak enough that first-order perturbation theory applies, and we focus on the regime where Coriolis and Lorentz forces are comparable. Axisymmetric "twisted-torus" field configurations are used, which are confined to the core and allowed to be misaligned with respect to the rotation axis. Factors such as the field radius, topology and obliquity are examined. We observe that fields with finer-scale radial structure and/or smaller radial extent produce smaller contributions to the frequency shift. The interplay of rotation and magnetism is shown to be complex: we demonstrate that it is possible for nearly symmetric multiplets of apparently low multiplicity to arise even under a substantial field, which might falsely appear to rule out its presence. Our results suggest that proper modelling of rotation and magnetism, in a simultaneous fashion, may be required to draw robust conclusions about the existence/non-existence of a core magnetic field in any given object.

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On the cosmic origin of fluorine

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The cosmic origin of fluorine, the ninth element of the Periodic Table, is still under debate. The reason for this fact is the large difficulties in observing stellar diagnostic lines, which can be used for the determination of the fluorine abundance in stars. Here we discuss some recent work on the chemical evolution of fluorine in the Milky Way and discuss the main contributors to the cosmic budget of fluorine.

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and from https://link.springer.com/article/10.1007%2Fs12036-020-09657-4

ATOMIUM : The astounding complexity of the near circumstellar environment of the M-type AGB star R Hydræ – I. Morpho-kinematical interpretation of CO and SiO emission

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Evolved low- to intermediate-mass stars are known to shed their gaseous envelope into a large, dusty, molecule-rich circumstellar nebula which typically develops a high degree of structural complexity. Most of the large-scale, spatially correlated structures in the nebula are thought to originate from the interaction of the stellar wind with a companion. As part of the ATOMIUM large programme, we observed the M-type asymptotic giant branch (AGB) star R Hydræ with the Atacama Large Millimeter/submillimeter Array (ALMA). The morphology of the inner wind of R Hya,which has a known companion at ~ 3500 au, was determined from maps of CO and SiO obtained at high angular resolution. A map of the CO emission reveals a multi-layered structure consisting of a large elliptical feature at an angular scale of $\sim 10''$ that is oriented along the north–south axis. The wind morphology within the elliptical feature is dominated by two hollow bubbles. The bubbles are on opposite sides of the AGB star and lie along an axis with a position angle of $\sim 115^{\circ}$. Both bubbles are offset from the central star, and their appearance in the SiO channel maps indicates that they might be shock waves travelling through the AGB wind. An estimate of the dynamical age of the bubbles yields an age of the order of 100 yr, which is in agreement with the previously proposed elapsed time since the star last underwent a thermal pulse. When the CO and SiO emission is examined on subarcsecond angular scales, there is evidence for an inclined, differentially rotating equatorial density enhancement, strongly suggesting the presence of

a second nearby companion. The position angle of the major axis of this disc is $\sim 70°$ in the plane of the sky. We tentatively estimate that a lower limit on the mass of the nearby companion is ~ 0.65 $M_{\odot}$ on the basis of the highest measured speeds in the disc and the location of its inner rim at ~ 6 au from the AGB star.

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Infrared variable stars in the compact elliptical galaxy M 32

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Variable stars in the compact elliptical galaxy M 32 are identified, using three epochs of photometry from the *Spitzer* Space Telescope at 3.6 and 4.5 μm, separated by 32 to 381 days. We present a high-fidelity catalogue of sources detected in multiple epochs at both 3.6 and 4.5 μm, which we analysed for stellar variability using a joint probability error-weighted flux difference. Of these, 83 stars are identified as candidate large-amplitude, long-period variables, with 28 considered high-confidence variables. The majority of the variable stars are classified as asymptotic giant branch star candidates using colour–magnitude diagrams. We find no evidence supporting a younger, infrared-bright stellar population in our M 32 field.

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Binarity as the origin of long secondary periods in red giant stars

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Long secondary periods (LSPs), observed in a third of pulsating red giant stars, are the only unexplained type of large-amplitude stellar variability known at this time. Here we show that this phenomenon is a manifestation of a substellar or stellar companion orbiting the red giant star. Our investigation is based on a sample of about 16,000 well-defined LSP variables detected in the long-term OGLE photometric database of the Milky Way and Magellanic Clouds, combined with the mid-infrared data extracted from the NEOWISE-R archive. From this collection, we selected about 700 objects with stable, large-amplitude, well-sampled infrared light curves and found that about half of them exhibit secondary eclipses, thus presenting an important piece of evidence that the physical mechanism responsible for LSPs is binarity. Namely, the LSP light changes are due to the presence of a dusty cloud orbiting the red giant together with the companion and obscuring the star once per orbit. The secondary eclipses, visible only in the infrared wavelength, occur when the cloud is hidden behind the giant. In this scenario, the low-mass companion is a former planet that has accreted a significant amount of mass from the envelope of its host star and grown into a brown dwarf.

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Atmosphere of Betelgeuse before and during the Great Dimming event revealed by tomography

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Despite being the best studied red supergiant star in our Galaxy, the physics behind the photometric variability and mass loss of Betelgeuse is poorly understood. Moreover, recently the star has experienced an unusual fading with its visual magnitude reaching a historical minimum. We investigate the nature of this event with the help of a recently developed tomographic technique. Tomography allows us to probe different depths in the stellar atmosphere and to recover the corresponding disk-averaged velocity field. We apply the tomographic method to a few-year time-series high-resolution spectroscopic observations of Betelgeuse in order to relate its atmospheric dynamics to the photometric variability. Our results show that a sudden increase of the molecular opacity in the cooler upper atmosphere of Betelgeuse is likely the reason of the observed unusual decrease of the star's brightness.

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The origin of elements from carbon to uranium

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To reach a deeper understanding of the origin of elements in the periodic table, we construct Galactic chemical evolution (GCE) models for all stable elements from C ($A = 12$) to U ($A = 238$) from first principles, i.e. using theoretical nucleosynthesis yields and event rates of all chemical enrichment sources. This enables us to predict the origin of elements as a function of time and environment. In the solar neighborhood, we find that stars with initial masses of $M > 30$ M$_\odot$ can become failed supernovæ if there is a significant contribution from hypernovæ (HNe) at $M \sim 20$–50 M$_\odot$. The contribution to GCE from super-asymptotic giant branch (AGB) stars (with $M \sim 8$–10 M$_\odot$ at solar metallicity) is negligible, unless hybrid white dwarfs from low-mass super-AGB stars explode as so-called Type Iax supernovæ, or high-mass super-AGB stars explode as electron-capture supernovæ (ECSNe). Among neutron-capture elements, the observed abundances of the second (Ba) and third (Pb) peak elements are well reproduced with our updated yields of the slow neutron-capture process (s-process) from AGB stars. The first peak elements (Sr, Y, Zr) are sufficiently produced by ECSNe together with AGB stars. Neutron star mergers can produce rapid neutron-capture process (r-process) elements up to Th and U, but the timescales are too long to explain observations at low metallicities. The observed evolutionary trends, such as for Eu, can well be explained if $\sim 3\%$ of 25–50 M$_\odot$ HNe are magneto-rotational supernovæ producing r-process elements. Along with the solar neighborhood, we also predict the evolutionary trends in the halo, bulge, and thick disk for future comparison with Galactic archæology surveys.

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Fast outflows in protoplanetary nebulæ and young planetary nebulæ observed by *Herschel*/HIFI

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Fast outflows and their interaction with slow shells (generally known as the fossil circumstellar envelope of asymptotic giant branch stars) play an important role in the structure and kinematics of protoplanetary and planetary nebulæ (pPNe, PNe). To properly study their effects within these objects, we also need to observe the intermediate-temperature gas, which is only detectable in the far-infrared (FIR) and submillimetre (submm) transitions. We study the physical conditions of the outflows presented in a number of pPNe and PNe, with a focus on their temperature and excitation states. We carried out *Herschel*/HIFI observations in the submm lines of ^{12}CO in nine pPNe and nine PNe and complemented them with low-J CO spectra obtained with the IRAM 30m telescope and taken from the literature. The spectral resolution of HIFI allows us to identify and measure the different nebular components in the line profiles. The comparison with large velocity gradient (LVG) model predictions was used to estimate the physical conditions of the warm gas in the nebulæ, such as excitation conditions, temperature, and density. We found high kinetic temperatures for the fast winds of pPNe, typically reaching between 75 K and 200 K. In contrast, the high-velocity gas in the sampled PNe is colder, with characteristic temperatures between 25 K and 75 K, and it is found in a lower excitation state. We interpret this correlation of the kinetic temperature and excitation state of fast outflows with the amount of time elapsed since their acceleration (probably driven by shocks) as a consequence of the cooling that occurred during the pPN phase.

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Depletion of bright red giants in the Galactic center during its active phases

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Observations in the near-infrared domain showed the presence of the flat core of bright late-type stars inside ~ 0.5 pc from the Galactic center supermassive black hole (Sgr A*), while young massive OB/Wolf–Rayet stars form a cusp. Several dynamical processes were proposed to explain this apparent paradox of the distribution of the Galactic center stellar populations. Given the mounting evidence about a significantly increased activity of Sgr A* during the past million years, we propose a scenario based on the interaction between the late-type giants and a nuclear jet, whose past existence and energetics can be inferred from the presence of γ-ray *Fermi* bubbles and bipolar radio bubbles. Extended, loose envelopes of red giant stars can be ablated by the jet with kinetic luminosity in the range of $L_{\rm j} \approx 10^{41}$–$10^{44}$ erg s^{-1} within the inner ~ 0.04 pc of Sgr A* (S cluster region), which would lead to their infrared luminosity decrease after several thousand jet–star interactions. The ablation of the atmospheres of red giants is complemented by the process of tidal stripping that operates at distances of $\lesssim 1$ mpc, and by the direct mechanical interaction of stars with a clumpy disc at $\gtrsim 0.04$ pc, which can explain the flat density profile of bright late-type stars inside the inner half parsec from Sgr A*.

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The RGB tip of galactic globular clusters and the revision of the axion–electron coupling bound

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Context: The production of neutrinos by plasma oscillations is the most important energy sink process operating in the degenerate core of low-mass red giant stars. This process counterbalances the release of energy induced by nuclear reactions and gravitational contraction, and determines the luminosity attained by a star at the moment of the He ignition. This occurrence coincides with the tip of the red giant branch (RGB), whose luminosity is extensively used as a calibrated standard candle in several cosmological studies.
Aims: We aim to investigate the possible activation of additional energy sink mechanisms, as predicted by many extensions of the so-called Standard Model. In particular, our objective is to test the possible production of axions or axion-like particles, mainly through their coupling with electrons.
Methods: By combining *Hubble* Space Telescope and ground-based optical and near-infrared photometric samples, we derived the RGB tip absolute magnitude of 22 galactic globular clusters (GGCs). The effects of varying the distance and the metallicity scales were also investigated. Then we compared the observed tip luminosities with those predicted by state-of-the-art stellar models that include the energy loss due to the axion production in the degenerate core of red giant stars.
Results: We find that theoretical predictions including only the energy loss by plasma neutrinos are, in general, in good agreement with the observed tip bolometric magnitudes, even though the latter are ~ 0.04 mag brighter on average. This small shift may be the result of systematic errors affecting the evaluation of the RGB tip bolometric magnitudes, or, alternatively, it could be ascribed to an axion–electron coupling causing a non-negligible thermal production of axions. In order to estimate the strength of this possible axion sink, we performed a cumulative likelihood analysis using the RGB tips of the whole set of 22 GGCs. All the possible sources of uncertainties affecting both the measured bolometric magnitudes and the corresponding theoretical predictions were carefully considered. As a result, we find that the value of the axion–electron coupling parameter that maximizes the likelihood probability is $g_{\rm ae}/10^{-13} \sim 0.60^{+0.32}_{-0.58}$. This hint is valid, however, if the dominant energy sinks operating in the core of red giant stars are standard neutrinos and axions coupled with electrons. Any additional energy-loss process, not included in the stellar models, would reduce such a hint. Nevertheless, we find that values $g_{\rm ae}/10^{-13} > 1.48$ can be excluded with 95% confidence.
Conclusions: The new bound we find represents the most stringent constraint for the axion–electron coupling available so far. The new scenario that emerges after this work represents a greater challenge for future experimental axion searches. In particular, we can exclude that the recent signal seen by the XENON1T experiment was due to solar axions.

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Toward the true number of flaring giant stars in the *Kepler* field: Are their flaring specialities associated with their being giant stars?

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We aim to give a reliable estimate of the number of flaring giant stars in the *Kepler* field. By analyzing the flaring activity of these stars, we explored their flare statistics and the released flare energies. The role of oscillation in suppressing magnetic activity was also investigated. We searched for flaring specialities that may be associated with the giant nature across a sample of flaring giant stars. We searched for flares using the $\sim$ 4-yr long *Kepler* data on

a sample of 706 stars compiled from two lists of flaring giants ($\log g \leq 3.5$) found in the literature. To lessen the probability of false positives two different pipelines are used independently for flare detection. Tests are carried out to correct the detection bias at low flare energies for a subsample of 19 further studied, frequently flaring stars. For these 19 stars flare energy distributions and flare frequency diagrams (FFDs) are constructed. For comparison purposes KIC 2852961 is re-analyzed with our present approach. From the 706 *Kepler* flaring giant candidates, we ruled out those where oscillations or pulsations were missclassified and those that turned out to be dwarf stars. Finally, we confirm only 61 stars as flaring giants. Among these 61 flaring giants, we found only six that also show oscillations; we suggest that a large fraction of the 61 flaring giants are members of spectroscopic binaries, which has already been proven for 11 of them. The number of detected flares on giant stars correlate only weakly with the rotational periods. The FFDs for the 19 most flaring stars were fit by power-law functions. Regarding log–log representation, the slopes of the individual fits lead to an average $\alpha = 2.01 \pm 0.16$ power-law index, but the ranges of flare energies scatter within almost two orders, showing the inherent heterogeneity of the sample of flaring giants. Broken power-law fits are applied for two giant stars that have similar flare energy ranges; however, the energy at the breakpoints of the power laws are different, unveiling possible differences in the magnetic field strengths and atmospheric structures of these stars. The average power-law index of $\alpha \sim 2$ is the same for the flaring giants, the (super)flaring G dwarfs, and dwarf stars between spectral types M6 and L0. The 61 confirmed flaring giant stars make up only $\sim 0.3\%$ of the entire giant star population in the Kepler database, which is in contrast with previous estimates of about an order higher percentage. We found that most of the false positives are in fact oscillating red giants. No strong correlation was found between the stellar properties and the flaring characteristics. The majority of the flaring specialities are hardly related to the giant nature, if at all. This, together with the finding that the observed flare durations correlate with flare energies, regardless of the flare energy level and stellar luminosity class, suggests common background physics in flaring stars, or in other words, a general scaling effect behind the flares on different stars.

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Astrometric membership tests for the Zinn–Newell–Gibson UV-bright stars in Galactic globular clusters

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In 1972, Zinn, Newell & Gibson (ZNG) published a list of 156 candidate UV-bright stars they had found in 27 Galactic globular clusters (GCs), based on photographs in the U and V bands. UV-bright stars lie above the horizontal branch (HB) and blueward of the asymptotic giant branch (AGB) and red giant branch in the clusters' color-magnitude diagrams. They are in rapid evolutionary phases – if they are members and not unrelated bright foreground stars. The ZNG list has inspired numerous follow-up studies, aimed at understanding late stages of stellar evolution. However, the ZNG candidates were presented only in finding charts, and celestial coordinates were not given. Using my own collection of CCD frames in u and V, I have identified all of the ZNG objects, and have assembled their coordinates, parallaxes, and proper motions from the recent Gaia Early Data Release 3 (EDR3). Based on the Gaia astrometry, I have determined which objects are probable cluster members (45% of the sample). For the members, using photometry from EDR3, I have assigned the stars to various evolutionary stages, including luminous post-AGB stars, and stars above the HB. I point out several ZNG stars of special interest that have still, to my knowledge, never been studied in detail. This study is an adjunct to a forthcoming survey of the Galactic GCs in the uBVI photometric system, designed for detection of low-gravity stars with large Balmer discontinuities.

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Two luminous post-AGB stars in the Galactic globular cluster M 19

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We report the discovery of a luminous ”yellow” post-asymptotic giant branch (PAGB) star in the globular cluster (GC) M 19 (NGC 6273), identified during our uBVI survey of Galactic GCs. The uBVI photometric system is optimized to detect stars with large Balmer discontinuities, indicating very low surface gravities and high luminosities. The spectral energy distribution (SED) of the star is consistent with an effective temperature of about 6250 K and a surface gravity of $\log g = 0.5$. We use Gaia data to show that the star's proper motion and radial velocity are consistent with cluster membership. One aim of our program is to test yellow PAGB stars as candidate Population II standard candles for determining extragalactic distances. We derive a visual absolute magnitude of $M_V = -3.39 \pm 0.09$ for the M 19 star. This is in close agreement with the M_V values found for yellow PAGB stars in the GCs ω Cen, NGC 5986, and M 79, indicating a very narrow luminosity function. These objects are 4 mag brighter than RR Lyræ variables, and they can largely avoid the issues of interstellar extinction that are a problem for Population I distance indicators. We also identified a second luminous PAGB object in M 19, this one a hotter ”UV-bright” star. Its SED is consistent with an effective temperature of about 11,750 K and $\log g = 2.0$. The two objects have nearly identical bolometric luminosities, $\log(L/\mathrm{L}_\odot) = 3.24$ and 3.22, respectively.

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BD +14°3061: a luminous yellow post-AGB star in the Galactic halo

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I report the discovery that the ninth-mag Galactic-halo star BD +14°3061 is a member of the rare class of luminous metal-poor ”yellow post-AGB” stars. Its Gaia DR2 parallax implies an absolute magnitude of $M_V = -3.44 \pm 0.27$, and it is a very high-velocity star moving in a retrograde Galactic orbit. BD +14°3061 is a field analog of the half-dozen yellow PAGB stars known in Galactic globular clusters, which have closely similar absolute magnitudes. These objects are the visually brightest members of old stellar populations; their apparently narrow luminosity function makes them potentially useful as Population II standard candles. The spectral-energy distribution of BD +14°3061 out to 22 μm shows no evidence for circumstellar dust. The star is a low-amplitude semiregular pulsating variable, with typical periods of 30–32 days. A radial-velocity study suggests that it is a spectroscopic binary with a period of 429.6 days, making it similar to known binary yellow PAGB stars such as HD 46703 and BD +39°4926.

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Detection of PAH and nbL features in planetary nebulæ NGC 7027 and BD +30°3639 with TIRCAM2 instrument on 3.6 m DOT

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High resolution infrared imaging observations of the young planetary nebulæ NGC 7027 and BD +30°3639, taken with the newly installed TIFR Infrared Camera-II (TIRCAM2) on 3.6m Devasthal Optical Telescope (DOT), ARIES,

Nainital, are being reported. The images are acquired in J, H, K, polycyclic aromatic hydrocarbon (PAH) and narrow-band L (nbL) filters. The observations show emission from warm dust and PAHs in the circumstellar shells. The imaging of the two objects are among the first observations in PAH and nbL bands using TIRCAM2 on DOT. The NGC 7027 images in all bands show similar elliptical morphology with $\sim 6\farcs7$ and $\sim 4\farcs5$ semi-major and semi-minor axes. Considering size up to 10% of peak value the nebula extends upto $8''$ from the central star revealing a multipolar evolution. The relatively cooler BD +30°3639 shows a rectangular-ring shaped nebula. In J and H bands it shows an angular diameter of $\sim 8''$, while a smaller $\sim 6\farcs9$ size is observed in K, PAH and nbL bands. The 3.28-μm emission indicates presence of PAHs at about 6000 and 5000 au from the central stars in NGC 7027 and BD +30°3639 respectively. Analysis suggests domination of neutral PAHs in BD +30°3639, while in NGC 7027 there is higher ionization and more processed PAH population.

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Line identification and excitation of autoionizing states in a late-type, low-mass Wolf–Rayet star

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Identifications of a large fraction of previously unidentified lines in the complex spectrum of the low mass, late-type LMC [WC11] star J 060819.93−715737.4 have been made utilizing electronic databases. There are an exceptionally large number of C II emission lines originating from autoionizing (AI) levels. Resonance fluorescence between the C II ground state and excited AI levels is shown to be an important photoabsorption process that is competitive with dielectronic recombination in exciting AI emission lines in stellar winds, and has broad application to many types of emission-line stars. In addition, numerous C II quartet multiplets appear in emission that are not excited directly by recombination or resonance fluorescence, signifying high wind densities in the emission region that enhance collisional transfer between doublet and quartet states.

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The impact of (n,γ) reaction rate uncertainties of unstable isotopes on the i-process nucleosynthesis of the elements from Ba to W

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The abundances of n-capture elements in the CEMP-r/s stars agree with predictions of intermediate n-density nucleosynthesis, at $N_{\rm n} \sim 10^{13}$–10^{15} cm^{-3}, in rapidly-accreting white dwarfs (RAWDs). We have performed Monte-Carlo

simulations of this i-process nucleosynthesis to determine the impact of (n,γ) reaction rate uncertainties of 164 unstable isotopes, from ^{131}I to ^{189}Hf, on the predicted abundances of 18 elements from Ba to W. The impact study is based on two representative one-zone models with constant values of $N_{\rm n} = 3.16 \times 10^{14}$ cm^{-3} and $N_{\rm n} = 3.16 \times 10^{13}$ cm^{-3} and on a multi-zone model based on a realistic stellar evolution simulation of He-shell convection entraining H in a RAWD model with [Fe/H] = −2.6. For each of the selected elements, we have identified up to two (n,γ) reactions having the strongest correlations between their rate variations constrained by Hauser–Feshbach computations and the predicted abundances, with the Pearson product-moment correlation coefficients $|r_{\rm P}| > 0.15$. We find that the discrepancies between the predicted and observed abundances of Ba and Pr in the CEMP-i star CS 31062-050 are significantly diminished if the rate of ^{137}Cs(n,γ)^{138}Cs is reduced and the rates of ^{141}Ba(n,γ)^{142}Ba or ^{141}La(n,γ)^{142}La increased. The uncertainties of temperature-dependent β-decay rates of the same unstable isotopes have a negligible effect on the predicted abundances. One-zone Monte-Carlo simulations can be used instead of computationally time-consuming multi-zone Monte-Carlo simulations in reaction rate uncertainty studies if they use comparable values of $N_{\rm n}$. We discuss the key challenges that RAWD simulations of i process for CEMP-i stars meet by contrasting them with recently published low-Z AGB i process.

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A new look into K-giants' chromospheres

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We report the preliminary modeling of archival CHARA/VEGA interferometric data of a K-giant star using the PHOENIX atmosphere code. We find that our preparatory model that includes only the chromospheric contribution closely reproduces the observed infrared Ca II triplet line profiles of a test star: the K-giant β Cet. This preliminary work requires the additional modeling of the wind contribution to improve the agreement with observations. We plan to perform a systematic study of K-giants chromospheric emission with multi-wavelength and multi-technique observations and modeling. Our plans include extending the modeling work to include the underlying wind component for a larger set of stars. SPICA, the second-generation instrument at CHARA, will be the ideal instrument to perform such observations and reveal the chromospheric activity of K-giants.

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Most lithium-rich low-mass evolved stars revealed as red clump stars by asteroseismology and spectroscopy

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Lithium has confused scientists for decades at almost every scale of the universe. Lithium-rich giants are peculiar stars with lithium abundances greater than model prediction. A large fraction of lithium-rich low-mass evolved stars are traditionally supposed to be red giant branch (RGB) stars. Recent studies, however, report that red clump (RC) stars are more frequent than RGB stars. Here, we present a uniquely large systematic study that combines direct asteroseismic analysis and spectroscopy of the lithium-rich stars. The majority of lithium-rich stars are confirmed to be RCs, whereas RGBs are a minority. We reveal that the distribution of lithium-rich RGBs declines steeply with increasing lithium abundance, with an upper limit of around 2.6 dex, whereas the lithium abundances of RCs extend to much higher values. We also find that the distributions of mass and nitrogen abundance are notably different between RC and RGB stars. These findings indicate that there is still an unknown process that significantly affects surface chemical composition in low-mass stellar evolution.

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Common envelope shaping of planetary nebulæ – III. The launching of jets in proto-planetary nebulæ

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We compute successfully the launching of two magnetic winds from two circumbinary disks formed after a common envelope event. The launching is produced by the increase of magnetic pressure due to the collapse of the disks. The collapse is due to internal torques produced by a weak poloidal magnetic field. The first wind can be described as a

wide jet, with an average mass-loss rate of $\sim 1.3 \times 10^{-7}$ M$_\odot$ yr^{-1} and a maximum radial velocity of ~ 230 km s^{-1}. The outflow has a half-opening angle of $\sim 20°$. Narrow jets are also formed intermittently with velocities up to 3,000 km s^{-1}, with mass-loss rates of $\sim 6 \times 10^{-12}$ M$_\odot$ yr^{-1} during short periods of time. The second wind can be described as a wide X-wind, with an average mass-loss rate of $\sim 1.68 \times 10^{-7}$ M$_\odot$ yr^{-1} and a velocity of ~ 30 km s^{-1}. A narrow jet is also formed with a velocity of 250 km s^{-1}, and a mass-loss rate of $\sim 10^{-12}$ M$_\odot$ yr^{-1}.
The computed jets are used to provide inflow boundary conditions for simulations of proto-planetary nebulæ. The wide jet evolves into a molecular collimated outflow within a few astronomical units, producing proto-planetary nebulæ with bipolar, elongated shapes, whose kinetic energies reach $\sim 4 \times 10^{45}$ erg at 1,000 years. Similarities with observed features in W 43A, OH 231.8+4.2, and Hen 3-1475 are discussed.
The computed wide X-wind produces proto-planetary nebulæ with slower expansion velocities, with bipolar and elliptical shapes, and possible starfish type and quadrupolar morphology.

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Extremely precise age and metallicity of the open cluster NGC 2506 using detached eclipsing binaries

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Accurate stellar parameters of stars in open clusters can help constrain models of stellar structure and evolution. Here, we wish to determine the age and metallicity content of the open cluster NGC 2506. To this end, we investigated three detached eclipsing binaries (DEBs; V 2032, V 4, and V 5) for which we determined their masses and radii, as well as four red giant branch stars for which we determined their effective temperatures, surface gravities, and metallicities. Three of the stars in the DEBs have masses close to the cluster turn-off mass, allowing for extremely precise age determination. Comparing the values for the masses and radii of the binaries to BaSTI (a Bag of Stellar Tracks and Isochrones) isochrones, we estimated a cluster age of 2.01 ± 0.10 Gyr.This does depend on the models used in the comparison, where we have found that the inclusion of convective core-overshooting is necessary to properly model the cluster. From red giant branch stars, we determined values for the effective temperatures,the surface gravities, and the metallicities. From these we find a cluster metallicity of -0.36 ± 0.10 dex. Using this value and the values for the effective temperatures, we determine the reddening to be $E(b - y) = 0.057 \pm 0.004$ mag. Furthermore, we derived the distance to the cluster from Gaia parallaxes and found 3.101 ± 0.017 kpc, and we have performed a radial velocity membership determination for stars in the field of the cluster. Finally, we report on the detection of oscillation signals in γ Dor and δ Scuti members in data from the Transiting Exoplanet Survey Satellite (TESS) mission, including the possible detection of solar-like oscillations in two of the red giants.

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Luminous type II short-plateau supernovæ 2006Y, 2006ai, and 2016egz: a transitional class from stripped massive red supergiants

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The diversity of type II supernovæ (SNe II) is thought to be driven mainly by differences in their progenitor's hydrogen-rich (H-rich) envelope mass, with SNe IIP having long plateaus (~ 100 days) and the most massive H-rich envelopes. However, it is an ongoing mystery why SNe II with short plateaus (tens of days) are rarely seen. Here we present optical/near-infrared photometric and spectroscopic observations of luminous type II short-plateau SNe 2006Y, 2006ai, and 2016egz. Their plateaus of about 50–70 days and luminous optical peaks ($\lesssim -18.4$ mag) indicate significant pre-explosion mass loss resulting in partially-stripped H-rich envelopes and early circumstellar material (CSM) interaction. We compute a large grid of MESA+STELLA single-star progenitor and light-curve models with various progenitor zero-age main-sequence (ZAMS) masses, mass-loss efficiencies, explosion energies, ^{56}Ni masses, and CSM densities. Our model grid shows a continuous population of SNe IIP–IIL–IIb-like light-curve morphology in descending order of H-rich envelope mass. With large ^{56}Ni masses ($\gtrsim 0.05$ M$_\odot$), short-plateau SNe II lie in a confined parameter space as a transitional class between SNe IIL and IIb. For SNe 2006Y, 2006ai, and 2016egz, our findings suggest high-mass red supergiant (RSG) progenitors ($M_{\rm ZAMS} \simeq 18$–22 M$_\odot$) with small H-rich envelope masses ($M_{\rm H_{env}} \simeq 1.7$ M$_\odot$) that experience enhanced mass loss ($\dot{M} \simeq 10^{-2}$ M$_\odot$ yr^{-1}) for the last few decades before the explosion. If high-mass RSGs result in rare short-plateau SNe II, then these events might ease some of the apparent under-representation of higher-luminosity RSGs in observed SN II progenitor samples.

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Exploring the mass loss histories of the red supergiants

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We report mid- to far-infrared imaging and photomety from 7 to 37 μm with SOFIA/FORCAST and 2 μm adaptive optics imaging with LBTI/LMIRCam of a large sample of red supergiants (RSGs) in four Galactic clusters; RSG C1, RSG C2 = Stephenson 2, RSG C3, and NGC 7419. The red supergiants in these clusters cover the expected range in luminosity and initial mass from ≈ 9 to more than 25 $M_{\odot}$. The population includes examples of very late-type RSGs such as MY Cep which may be near the end of the RSG stage, high mass losing maser sources, yellow hypergiants and post-RSG candidates. Many of the stars and almost all of the most luminous have spectral energy distributions (SEDs) with extended infrared excess radiaton at the longest wavelengths. To best model their SEDs we use Dusty with a variable density distribution function to etimate their mass loss rates. Our $\dot{M}$–luminosity relation for 42 RSGs basically parallels the classical de Jager curve, but at luminosities below 10^5 $L_{\odot}$ we find a significant population of red supergiants with $\dot{M}$ below the de Jager relation. At luminosities above 10^5 $L_{\odot}$ there is a rapid transition to higher mass-loss rates that approximates and overlaps the de Jager curve. We recommend that instead of using a linear relation or single curve, the empirical $\dot{M}$–luminosity relation is better represented by a broad band.

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The mass-loss history of the red hypergiant VY CMa

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Imaging and spectroscopy of the knots, clumps, and extended arcs in the complex ejecta of VY CMa confirm a record of high mass loss events over the past few hundred years. HST/STIS spectroscopy of numerous small knots close to the star allow us to measure their radial velocities from the strong K I emission and determine their separate motions, spatial orientations, and time since ejecta. Their ages concentrate around 70, 120, 200 and 250 years ago. A K I emission knot only 50 mas from the star ejected as recently as 1985–1995 may coincide with an H_2O maser. Comparison with VY CMa's historic light curve from 1800 to the present, shows several knots with ejection times that correspond with extended periods of variability and deep minima. The similarity of this correspondence in VY CMa with the remarkable recent dimming of Betelgeuse and an outflow of gas is apparent. The evidence for similar outflows from the surface of a more typical red supergiant suggests that discrete ejections are more common and surface or convective activity is a major source of mass loss for red supergiants.

Published in The Astronomical Journal, 161, 92 (2021)

Job Adverts

Ph.D. position: WaterStars, from observation to experiments on water in space

Water is the third most abundant molecule in the interstellar medium. It has been observed in various objects, but it is only in the extended atmosphere of the envelope of O-rich evolved stars that the very rich spectrum of rotational, vibrational and ro-vibrational transitions of water is observed, and sometimes in surprisingly excited energy states. To understand the excitation of water in these environments, it is necessary to model the excitation of water not only by the radiation from the central star and by radiative coupling with the background radiation, but also by collisions with its most abundant partners (H_2, He, H, e^-). This implies knowing the collision rates for pure rotational transitions within the first four excited vibrational states ($v_1 = 1$, $v_2 = 1$, 2 and $v_3 = 1$) as well as the rotational transitions between the ground state and these excited states. The first objective is therefore to obtain these collision rates. The second is to include these in an advanced radiative transfer code to reproduce the ALMA observations (ATOMIUM consortium, (https://fys.kuleuven.be/ster/research-projects/aerosol/atomium/atomium) and interpret them. The crossed molecular beam experiment in Bordeaux allows the study of inelastic collisions down to very low collision energies, where quantum effects may be observed. The experimental studies will be used to validate theoretical methods in order to provide reliable data to astrophysicists. The first objective of the thesis will be to extend our first experimental studies on H_2O and $D_2O + H_2$ to vibrationally excited water molecules. To model the emission of water lines from highly excited levels we will use a radiative transfer code published by Gray, Baudry et al. (2016). The next step will be to include the results of the experimental or theoretical work done at the ISM, i.e. to incorporate the new collision rates, and to extend the code to the first four vibrational levels of water in an attempt to model all the lines observed in ATOMIUM.

Additional information: The Ph.D. student will work mainly at ISM, together with Fabrice Herpin (LAB) and Astrid Bergeat (ISM) and other WaterStars team members, in close collaboration with the ATOMIUM team. More information on the Laboratoire d'Astrophysique de Bordeaux and Institut des Sciences Moléculaires can be found at https://astrophy.u-bordeaux.fr and http://www.ism.u-bordeaux.fr, respectively. The 3-year paid thesis contract requires a Master's degree in Astronomy, Physics or Physical Chemistry (or equivalent), obtained before the start of the contract. The start date of the thesis will be between 1 October 2021 and 1 March 2022. Applications should include a brief description of research interests and a summary of previous experience relevant to the subject, a CV, copies of Master's and Bachelor's degrees, Master's certificates or transcripts and internships, as well as contact details of the Master's supervisor and internship supervisors. Applications are open until the vacancy is filled and should be sent to Fabrice Herpin (fabrice.herpin@u-bordeaux.fr) or Astrid Bergeat (astrid.bergeat@u-bordeaux.fr). A complete description of the position can be found at https://www.ism.u-bordeaux.fr/spip.php?article354

Funding details: secured financing (ANR Ph-D fellowship)

Two postdoc positions

The Astrophysics Division at the National Centre for Nuclear Research, Warsaw, invites applications for two postdoctoral research positions for 2 years + a possible extension. The successful candidates will be hired under a full-time employment contract with a competitive salary of about 120 000 PLN/year (gross), plus a travel budget.

The successful candidates will work with:

- dr. hab. Katarzyna Małek under the project "ASTROdust: a complete census of dust attenuation in galaxies based on the analysis of millions of galaxies observed by *Herschel*", starting as soon as possible. The candidate is expected to work on statistical studies of the attenuation of dust in galaxies and its dependence on the types of galaxies in different space ages.
- dr. Ambra Nanni under the project "DINGLE: Dust IN Galaxies: Looking through its Emission", starting from October 2021. The candidate is expected to model the evolution of dust in galaxies and its infrared emission to be compared with multi-wavelength observations.

We offer an environment of a young and active team, with a broad spectrum of expertise and interests in the area of extragalactic astrophysics and observational cosmology. There is a possibility to join projects in which our team and the Division are currently participating (i.e. HELP, LOFAR, LSST, VIPERS, NEP, CTA).

The successful candidates can also co-supervise Ph.D. students.

For inquiries about the jobs please contact Katarzyna Małek (katarzyna.malek@ncbj.gov.pl) for ASTROdust or Ambra Nanni (ambra.nanni@ncbj.gov.pl) for DINGLE.

See also https://www.ncbj.gov.pl/en/praca/postdoc-bp4-2-positions

2 years postdoc

Dear colleagues,

A postdoctoral position in stellar astrophysics is proposed in the framework of the funded ANR project PEPPER (https://lagrange.oca.eu/fr/welcome-to-anr-pepper)

The post-doctoral researcher will work at the Observatory of Côte d'Azur (OCA, Nice) together with Dr. Andrea Chiavassa (Lagrange laboratory, OCA, Nice) and Dr. Bernd Freytag (Uppsala University, Sweden) on the computation/analysis of a new grid of evolved stars simulations including the magnetic field. These simulations (of paramount importance for the project) will provide knowledge basis on mechanisms launching evolved stars winds, thanks to the magneto-convection processes.

The successful candidate should have a Ph.D. degree or a foreign degree equivalent to a Ph.D. degree in Astronomy or Physics.

By June, 30, enthusiastic candidates should send:

i) a CV including a publication list (4 pages max),

ii) a statement of research interests (2 pages max),

iii) arrange for three letters of reference to be provided separately to andrea.chiavassa@oca.eu using "PEPPER postdoc" in the email header.

More information can be found here:
https://lagrange.oca.eu/images/LAGRANGE/pages_perso/chiavassa/PEPPER/postdoc_nice.pdf

Best wishes,
Andrea Chiavassa

See also https://lagrange.oca.eu/images/LAGRANGE/pages_perso/chiavassa/PEPPER/postdoc_nice.pdf

Announcements

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 May 15. Fellowships can be awarded for missions to be carried out between mid-July 2021 and December 2021!

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

The program is funded by the OPTICON/RadioNet Pilot Program.

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

SECOND ANNOUNCEMENT
GAPS 2021 – unsolved problems in red Giants And suPergiantS

14–18 June 2021

A virtual and free conference organized by the International Astronomical Union's Working Group on Red Giants and Supergiants under the auspices of Commission G3 "Stellar Evolution"

Important dates:

- 15 May 2021: deadline for submitting an abstract for a prerecorded 5' contributed talk.
- 31 May 2021: registration closes.
- 14–18 June 2021: meeting sessions, the exact timings of which are not yet finalized; we aim to accommodate different time zones.

Format:

The meeting will have nine topics, and one wrap-up session, spread over five days. This means two sessions a day of one hour each. Each of the nine topics are introduced by two plenary speakers:

- Internal structure, mixing processes, and evolution
- Nucleosynthesis and meteoritic evidence
- Atmospheric and circumstellar structure, dust formation
- Instabilities
- Feedback (mass loss)
- End products (white dwarfs, neutron stars, black holes, planetary nebulæ)
- Interaction with stellar and planetary companions
- Importance for ISM chemistry and the role of laboratory astrophysics
- Diagnostics in nearby and distant galaxies

The plenary speaker volunteer call has closed, and the invited-speakers plenary speakers have been announced: https://gaps2021.wixsite.com/conference/.

The 5-minute contributed prerecorded talks will be made available via YouTube, ahead of the sessions. For registered participants detailed instructions on how to do so will come via email, after the deadline of May 15$^{\text{th}}$.

During the whole week, GatherTown will be used as a virtual space where to exchange ideas and gather virtually together. Slack will be used to moderate discussion, and a link will be sent to the participants before the conference starts.

The meeting will end with a panel discussion with the panel composed of the plenary speakers, and the discussion moderated by one of the scientific organizing committee (SOC) members. The plenary sessions will take place on Zoom and live broadcasted and recorded via Youtube.

We will post a report on arXiv shortly after the meeting and solicit further input from the community before we finalize the "White Paper".

We expect to then select a topic we have a reasonable chance of success to solve, to focus on and coordinate in the following triennium. In doing so we also wish to seek out and support new talent who have the promise to make key contributions to this objective.

Scientific Organizing Committee:

- Carolyn Doherty (Konkoly Observatory)
- Jan Eldridge (University of Auckland)
- Domingo Aníbal García-Hernández (Instituto de Astrofísica de Canarias)
- Josef Hron (University of Vienna, Institute for Astrophysics)
- Biwei Jiang (Beijing Normal University)
- Tomasz Kamiński (Nicolaus Copernicus Astronomical Center)
- John Lattanzio (Monash University)
- Emily Levesque (University of Washington)
- Maria Lugaro (Hungarian Academy of Sciences)
- Marcelo Miller Bertolami (Instituto de Astrofísica de La Plata)
- Keiichi Ohnaka (Universidad Católica del Norte)
- Gioia Rau (NASA GSFC) – co-Chair
- Jacco van Loon (Keele University) – co-Chair

Registration:

Registration is free but required in order to access the meeting and recordings. Registration is open on the meeting website: https://gaps2021.wixsite.com/conference/registration-contribution The registration form allows you to propose a pre-recorded contribution.

More information:

Website: https://gaps2021.wixsite.com/conference
E-mail: gaps2021.conference@gmail.com
Twitter: @GAPS2021

We are looking forward to a fruitful and inclusive meeting!

Common Envelope Physics and Outcomes (CEPO 2021): A virtual meeting August 30 – September 3, 2021

The meeting will run over five days (13:00–19:00 GMT) to accommodate a broad range of common envelope evolution topics and to give the participants plenty of time for real-time (virtual) discussions (tentatively planned to span at least 1 hour each day in dedicated time slots).

The 2021 virtual meeting is intended as a continuation and extension of the European Astronomical Society (EAS) meeting 2020 session "Common-envelope systems: progenitors, mergers and survivors". CEPO 2021 is also foreseen to be followed up by an in-situ CEPO meeting in 2023.

See also https://phsites.technion.ac.il/common-envelope-physics-and-outcomes/