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Editorial

Dear Colleagues,

It is a pleasure to present you the 169th issue of the AGB Newsletter.

Last month's Food for Thought provoked two responses. One of them pointed out that *"There is always competition between all stellar layers in the sense of heat exchange, and this is depicted in the thermal time scale (TTS) for each layer. Those layers whose TTS coincides with a resonant oscillation eigenperiod of the model – or is larger than that – are potentially capable of driving the pulsations. In the bluer part of HRD, this occurs at the iron opacity bump. Hence these partial ionization zones have been suggested as the main drivers for instabilities in β Cep or δ Sct (He bump) stars et cetera. This is indeed the concept of non-adiabaticity and excitation vs. damping of modes. The following pioneering works still apply to the cases of hot stars: http://adsabs.harvard.edu/abs/1993MNRAS.262..204D and http://adsabs.harvard.edu/abs/1993MNRAS.265..588D"* while another pointed out *"three papers on that. One pedagogical, defining the post-AGB phase: http://adsabs.harvard.edu/abs/2008ApJ...674L..49S. Earlier, in 1999 Amos Harpaz and Noam Soker wrote a paper, where they noted that the relatively short thermal time must result in a strong irregular behavior of the envelope because dynamical motions, such as pulsations and convective motion, can cause large thermal perturbations in the envelope. This is discussed in short in the first section. Soker, N. & Harpaz, A. 1999, MNRAS, 310, 1158. Earlier even, in 1992 a paper appeared suggesting that this might be related to mode switching – http://adsabs.harvard.edu/abs/1992PASP..104..923S. The important equation is 4.1 there, where pulsation period is compared with the thermal time of the transition layer."* Many thanks to both for your contributions.

Please see the announcement of the IAU Symposium on astrophysical masers.

The next issue is planned to be distributed at the start of September 2011.

Editorially Yours,
Jacco van Loon and Albert Zijlstra

Food for Thought

This month's thought-provoking statement is:

Thermo-dynamic resonance (between dynamical and thermal time scales) leads to the ejection of a Planetary Nebula

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

Refereed Journal Papers

The first fluorine abundance determinations in extragalactic AGB carbon stars

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Fluorine (^{19}F) abundances (or upper limits) are derived in six extragalactic AGB carbon stars from the HF(1–0) R9 line at 2.3358 μm in high resolution spectra. The stars belong to the Local Group galaxies LMC, SMC and Carina dwarf spheroidal, spanning more than a factor 50 in metallicity. This is the first study to probe the behaviour of F with metallicity in intrinsic extragalactic C-rich AGB stars. Fluorine could be measured only in four of the target stars, showing a wide range in F-enhancements. Our F abundance measurements together with those recently derived in Galactic AGB carbon stars show a correlation with the observed carbon and *s*-element enhancements. The observed correlations however, display a different dependence on the stellar metallicity with respect to theoretical predictions in low mass, low metallicity AGB models. We briefly discuss the possible reasons for this discrepancy. If our findings are confirmed in a larger number of metal-poor AGBs, the issue of F production in AGB stars will need to be revisited.

Accepted for publication in ApJ Letters

Dust around R Coronae Borealis stars: I. *Spitzer*/IRS observations

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Spitzer/IRS spectra from 5 to 37 μm for a complete sample of 31 R Coronae Borealis stars (RCBs) are presented. These spectra are combined with optical and near-infrared photometry of each RCB at maximum light to compile a spectral energy distribution (SED). The SEDs are fitted with blackbody flux distributions and estimates made of the ratio of the infrared flux from circumstellar dust to the flux emitted by the star. Comparisons for 29 of the 31 stars are made with the IRAS fluxes from three decades earlier: *Spitzer* and IRAS fluxes at 12 μm and 25 μm are essentially equal for all but a minority of the sample. For this minority, the IRAS to *Spitzer* flux ratio exceeds a factor of three. The outliers are suggested to be stars where formation of a dust cloud or dust puff is a rare event. A single puff ejected prior to the IRAS observations may have been reobserved by Spitzer as a cooler puff at a greater distance from the RCB. RCBs which experience more frequent optical declines have, in general, a circumstellar environment containing puffs subtending a larger solid angle at the star and a quasi-constant infrared flux. Yet, the estimated subtended solid angles and the blackbody temperatures of the dust show a systematic evolution to lower solid angles and cooler temperatures in the interval between IRAS and *Spitzer*. Dust emission by these RCBs and those in the LMC is similar in terms of total 24 μm luminosity and [8.0]–[24.0] color index.

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Available from arXiv:1107.1185

The Great Escape: How exoplanets and smaller bodies desert dying stars

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Mounting discoveries of extrasolar planets orbiting post-main sequence stars motivate studies aimed at understanding the fate of these planets. In the traditional "adiabatic" approximation, a secondary's eccentricity remains constant during stellar mass loss. Here, we remove this approximation, investigate the full two-body point-mass problem with isotropic mass loss, and illustrate the resulting dynamical evolution. The magnitude and duration of a star's mass loss combined with a secondary's initial orbital characteristics might provoke ejection, modest eccentricity pumping, or even circularisation of the orbit. We conclude that Oort clouds and wide-separation planets may be dynamically ejected from 1–7 $M_\odot$ parent stars during AGB evolution. The vast majority of planetary material which survives a supernova from a 7–20 $M_\odot$ progenitor will be dynamically ejected from the system, placing limits on the existence of first-generation pulsar planets. Planets around > 20 $M_\odot$ black hole progenitors may easily survive or readily be ejected depending on the core collapse and superwind models applied. Material ejected during stellar evolution might contribute significantly to the free-floating planetary population.

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Spatial distribution and evolution of the stellar populations and candidate star clusters in the blue compact dwarf I Zwicky 18

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The evolutionary properties and spatial distribution of I Zwicky 18 stellar populations are analyzed by means of HST/ACS deep and accurate photometry. The comparison of the resulting colour–magnitude diagrams with stellar evolution models indicates that stars of all ages are present in all the system components, including objects possibly up to 13 Gyr old, intermediate age stars and very young ones. The colour–magnitude diagrams show evidence of thermally pulsing asymptotic giant branch and carbon stars. Classical and ultra-long period Cepheids, as well as long period variables have been measured. About 20 objects could be unresolved star clusters, and are mostly concentrated in the North–West (NW) portion of the Main Body (MB). If interpreted with simple stellar population models, these objects indicate a particularly active star formation over the past hundred Myr in I Zw 18. The stellar spatial distribution shows that the younger ones are more centrally concentrated, while old and intermediate age stars are distributed homogeneously over the two bodies, although more easily detectable at the system periphery. The oldest stars are best visible in the Secondary Body (SB) and in the South East (SE) portion of the MB, where crowding is less severe, but are present also in the rest of the MB, although measured with larger uncertainties. The youngest stars are a few Myr old, are located predominantly in the MB and mostly concentrated in its NW portion. The SE portion of the MB appears to be in a similar, but not as young evolutionary stage as the NW, while the SB stars are older than at least 10 Myr. There is then a sequence of decreasing age of the younger stars from the Secondary Body to the SE portion of the MB to the NW portion. All our results suggest that I Zw 18 is not atypical compared to other BCDs.

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Outflow dynamics of dust-driven wind models and implications for cool envelopes of PNe

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The density profiles of cool envelopes of young Planetary Nebulae (PNe) are reminiscent of the final AGB outflow history of the central star, so far as these have not yet been transformed by the hot wind and radiation of the central star. Obviously, the evolution of the mass loss rate of that dust-driven, cool wind of the former giant in its final AGB stages must have shaped these envelopes to some extent. Less clear is the impact of changes in the outflow velocity. Certainly, larger and fast changes would lead to significant complications in the reconstruction of the mass-loss history from a cool envelope's density profile.
Here, we analyse the outflow velocity $v_{\rm exp}$ in a consistent set of over 50 carbon-rich, dust-driven and well "saturated" wind models, and how it depends on basic stellar parameters. We find a relation of the kind of $v_{\rm exp} \propto (L/M)^{0.6}$. By contrast to the vast changes of the mass-loss rate in the final outflow phase, this relation suggest only very modest variations in the wind velocity, even during a thermal pulse. Hence, we conclude that the density profiles of cool envelopes around young PNe should indeed compare relatively well with their recent mass-loss history, when diluted plainly by the equation of continuity.

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The close circumstellar environment of Betelgeuse – II. Diffraction-limited spectro-imaging from 7.76 to 19.50 μm with VLT/VISIR

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Context: Mass-loss occurring in red supergiants (RSGs) is a major contributor to the enrichment of the interstellar medium in dust and molecules. The physical mechanism of this mass loss is however relatively poorly known. Betelgeuse is the nearest RSG, and as such a prime object for high angular resolution observations of its surface (by interferometry) and close circumstellar environment.
Aims: The goal of our program is to understand how the material expelled from Betelgeuse is transported from its surface to the interstellar medium, and how it evolves chemically in this process. Methods: We obtained diffraction-limited images of Betelgeuse and a PSF calibrator (Aldebaran) in six filters in the N band (7.76 to 12.81 μm) and two filters in the Q band (17.65 and 19.50 μm), using the VLT/VISIR instrument.
Results: Our images show a bright, extended and complex circumstellar envelope at all wavelengths. It is particularly prominent longwards of 9–10 μm, pointing at the presence of O-rich dust, such as silicates or alumina. A partial circular shell is observed between 0.5 and 1.0″ from the star, and could correspond to the inner radius of the dust envelope. Several knots and filamentary structures are identified in the nebula, one of the knots, located at a distance of 0.9″ west of the star, being particularly bright and compact.
Conclusions: The circumstellar envelope around Betelgeuse extends at least up to several tens of stellar radii. Its relatively high degree of clumpiness indicates an inhomogeneous spatial distribution of the material lost by the star. Its extension corresponds to an important intermediate scale, where most of the dust is probably formed, between the hot and compact gaseous envelope observed previously in the near infrared and the interstellar medium.

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Surveying the Agents of Galaxy Evolution in the tidally-stripped, low metallicity Small Magellanic Cloud (SAGE–SMC). II. Cool Evolved Stars

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We investigate the infrared (IR) properties of cool, evolved stars in the Small Magellanic Cloud (SMC), including the red giant branch (RGB) stars and the dust-producing red supergiant (RSG) and asymptotic giant branch (AGB) stars using observations from the *Spitzer* Space Telescope Legacy program entitled: "Surveying the Agents of Galaxy Evolution in the tidally-stripped, low metallicity SMC", or SAGE–SMC. The survey includes, for the first time, full spatial coverage of the SMC bar, wing, and tail regions at infrared (IR) wavelengths (3.6–160 μm). We identify evolved stars using a combination of near-IR and mid-IR photometry and point out a new feature in the mid-IR color-magnitude diagram that may be due to particularly dusty O-rich AGB stars. We find that the RSG and AGB stars each contribute approximately 20% of the global SMC flux (extended + point-source) at 3.6 μm, which emphasizes the importance of both stellar types to the integrated flux of distant metal-poor galaxies. The equivalent SAGE survey of the higher-metallicity Large Magellanic Cloud (SAGE–LMC) allows us to explore the influence of metallicity on dust production. We find that the SMC RSG stars are less likely to produce a large amount of dust (as indicated by the [3.6]–[8] color). There is a higher fraction of carbon-rich stars in the SMC, and these stars appear to able to reach colors as red as their LMC counterparts, indicating that C-rich dust forms efficiently in both galaxies. A preliminary estimate of the dust production in AGB and RSG stars reveals that the extreme C-rich AGB stars dominate the dust input in both galaxies, and that the O-rich stars may play a larger role in the LMC than in the SMC.

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Is the post-AGB star SAO 40039 mildly hydrogen-deficient?

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We have conducted an LTE abundance analysis for SAO 40039, a warm post-AGB star whose spectrum is known to show surprisingly strong He I lines for its effective temperature and has been suspected of being H-deficient and He-rich. High-resolution optical spectra are analyzed using a family of model atmospheres with different He/H ratios. Atmospheric parameters are estimated from the ionization equilibrium set by neutral and singly ionized species of Fe and Mg, the excitation of Fe I and Fe II lines, and the wings of the Paschen lines. On the assumption that the He I lines are of photospheric and not chromospheric origin, a He/H ratio of approximately unity is found by imposing the condition that the adopted He/H ratio of the model atmosphere must equal the ratio derived from the observed He I triplet lines at 5876, 4471 and 4713 Å and singlet lines at 4922 and 5015 Å. Using the model with the best-fitting

atmospheric parameters for this He/H ratio, SAO 40039 is confirmed to exhibit mild dust-gas depletion, i.e. the star has an atmosphere deficient in elements of high condensation temperature. The star appears to be moderately metal-deficient with [Fe/H] $= -0.4$ dex. But the star's intrinsic metallicty as estimated from Na, S and Zn, elements of a low condensation temperature, is $[\mathrm{Fe/H}]_0 \sim -0.2$. The star is enriched in N and perhaps O too, changes reflecting the star's AGB past and the event that led to He enrichment.

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Runaway accretion of metals from compact debris disks onto white dwarfs

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It was recently proposed that metal-rich white dwarfs (WDs) accrete their metals from compact debris disks found to exist around more than a dozen of them. At the same time, elemental abundances measured in atmospheres of some WDs imply vigorous metal accretion at rates up to 10^{11} g s^{-1}, far in excess of what can be supplied solely by Poynting–Robertson drag acting on such debris disks. To explain this observation we propose a model, in which rapid transport of metals from the disk onto the WD naturally results from interaction between this particulate disk and spatially coexisting disk of metallic gas. The latter is fed by evaporation of debris particles at the sublimation radius located at several tens of WD radii. Because of pressure support gaseous disk orbits WD slower than particulate disk. Resultant azimuthal drift between them at speed $\lesssim$1 m s^{-1} causes aerodynamic drag on the disk of solids and drives inward migration of its constituent particles. Upon reaching the sublimation radius particles evaporate, enhancing the density of metallic gaseous disk and leading to positive feedback. Under favorable circumstances (low viscosity in the disk of metallic gas and efficient aerodynamic coupling between the disks) system evolves in a runaway fashion, destroying debris disk on time scale of $\sim 10^5$ yr, and giving rise to high metal accretion rates up to $\dot{M}_\mathrm{Z} \sim 10^{10}$–$10^{11}$ g s^{-1}, in agreement with observations.

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The formation of fullerenes: clues from new C60, C70, and (possible) planar C24 detections in Magellanic Cloud Planetary Nebulae

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We present ten new *Spitzer* detections of fullerenes in Magellanic Cloud Planetary Nebulae, including the first extra-galactic detections of the C70 molecule. These new fullerene detections together with the most recent laboratory data permit us to report an accurate determination of the C60 and C70 abundances in space. Also, we report evidence for the possible detection of planar C24 in some of our fullerene sources, as indicated by the detection of very unusual

emission features coincident with the strongest transitions of this molecule at ~ 6.6, 9.8, and 20 μm. The infrared spectra display a complex mix of aliphatic and aromatic species such as hydrogenated amorphous carbon grains (HACs), PAH clusters, fullerenes, and small dehydrogenated carbon clusters (possible planar C24). The coexistence of such a variety of molecular species supports the idea that fullerenes are formed from the decomposition of HACs. We propose that fullerenes are formed from the destruction of HACs, possibly as a consequence of shocks driven by the fast stellar winds, which can sometimes be very strong in transition sources and young PNe. This is supported by the fact that many of our fullerene-detected PNe show altered [Ne III]/[Ne II] ratios suggestive of shocks as well as P-Cygni profiles in their UV lines indicative of recently enhanced mass loss.

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Limits in astrometric accuracy induced by surface brightness asymmetries in red supergiant stars

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Surface brightness asymmetries are a very common feature of stars. Among other effects they cause a difference between the projected barycentre and photocentre. The evolution of those surface features makes this difference time-dependent. In some cases, e.g., for supergiant stars, the displacement can be a non-negligible fraction of the star radius R, and if $R > 1$ AU, of the parallax. We investigate the impact of surface brightness asymmetries on both the Gaia astrometric solution and the data processing flow with a theoretical approach. We show that when the amplitude of the displacement is comparable to the epoch astrometric precision, the resulting astrometric solution of a genuine single star may be, in some cases, of low quality (with some parameters up to 10 σ off). In this case, we provide an analytical prediction of the impact of the photocentre motion on both χ squared and the uncertainty in the astrometric parameters. Non-single star solutions are found, if allowed for the closest stars. A closer look at the parameters of the orbital solutions reveals however that they are spurious (since the semi-major axis is smaller than either its error or the stellar radius). It is thus possible to filter out those spurious orbital solutions. Interestingly, for the stocastic solutions, the stochastic noise appears to be a good estimate of the photocentric noise.

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CNO and F abundances in the barium star HD 123396

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[Abridged] Barium stars are moderately rare chemically peculiar objects which are believed to be the result of the pollution of an otherwise normal star by material from an evolved companion on the asymptotic giant branch (AGB). We aim to derive carbon, nitrogen, oxygen, and fluorine abundances for the first time from infrared spectra of the barium red giant star HD 123396 to quantitatively test AGB nucleosynthesis models for producing barium stars via mass accretion. High-resolution and high S/N infrared spectra were obtained using the Phoenix spectrograph mounted at the Gemini South telescope. The abundances were obtained through spectrum synthesis of individual atomic and

molecular lines, using the MOOG stellar line analysis program together with Kurucz's stellar atmosphere models. The analysis was classical, using 1D stellar models and spectral synthesis under the assumption of local thermodynamic equilibrium. We confirm that HD 123396 is a metal-deficient barium star ([Fe/H] = −1.05), with A(C) = 7.88, A(N) = 6.65, A(O) = 7.93, and A(Na) = 5.28 in a logarithmic scale where A(H) = 12, leading to [(C+N)/Fe] ∼ 0.5. The A(CNO) group as well as the A(Na) abundances are in excellent agreement with those previously derived for this star using high resolution optical data. We also found A(F) = 4.16, which implies [F/O] = 0.39, a value that is substantially higher than the F abundances measured in globular clusters of a similar metallicity, noting that there are no F measurements in field stars of comparable metallicity. The observed abundance pattern of the light elements (CNO, F and Na) we recover here as well as the heavy elements (s-process) studied by Allen & Barbuy (2006) suggest that the surface composition of HD 123396 is well fitted by the predicted abundance pattern of a 1.5 $M_\odot$ AGB model star with $Z = 0.001$.

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Abundances in planetary nebulae: NGC 1535, NGC 6629, He 2-108, and Tc 1

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Models have been made of stars of a given mass which produce planetary nebulae which usually begin on the AGB (although they may begin earlier) and run to the white dwarf stage. While these models cover the so-called dredge-up phases when nuclear reactions occur and the newly formed products are brought to the surface, it is important to compare the abundances predicted by the models with the abundances actually observed in PNe. The aim of the paper is to determine the abundances in a group of PNe with uniform morphological and kinematic properties. The PNe we discuss are circular with rather low-temperature central stars and are rather far from the galactic plane. We discuss the effect these abundances have on determining the evolution of the central stars of these PNe. The mid-infrared spectra of the planetary nebulae NGC 1535, NGC 6629, He 2-108, and Tc 1 (IC 1266) taken with the *Spitzer* Space Telescope are presented. These spectra were combined with the ultraviolet IUE spectra and with the spectra in the visual wavelength region to obtain complete, extinction-corrected spectra. The chemical composition of these nebulae is then found by directly calculating and adding individual ion abundances. For two of these PNe, we attempted to reproduce the observed spectrum by making a model nebula. This proved impossible for one of the nebulae and the reason for this is discussed. The resulting abundances are more accurate than earlier studies for several reasons, the most important is that inclusion of the far infrared spectra increases the number of observed ions and makes it possible to include the nebular temperature gradient in the abundance calculations. The abundances of the above four PNe have been determined and compared to the abundances found in five other PNe with similar properties studied earlier. These abundances are further compared with values predicted by the models of Karakas (2003). From this comparison we conclude that the central stars of these PNe originally had a low mass, probably between 1 and 2.5 $M_\odot$. A further comparison is made with the stellar evolution models on the HR diagram, from which we conclude that the core mass of these PNe is between 0.56 and 0.63 $M_\odot$. A consistent picture of the evolution of this group of PNe is found that agrees with the predictions of the models concerning the present nebular abundances, the individual masses, and luminosities of these PNe. The distance of these PNe can be determined as well.

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The nature of the Na I D lines in the Red Rectangle

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In this paper we examine the profiles of the complex Na I D lines in the Red Rectangle. The spectra were acquired with the ARCES échelle spectrograph ($R = 38,000$) on the 3.5-m telescope at the Apache Point Observatory. Additional spectra taken with STIS were acquired from the Hubble Legacy Archive (HLA) and were used to independently confirm the spatial origin of the spectral features. The profile of a single D-line consists of double-peaked emission, red-shifted absorption and blue-shifted absorption. We find that the double-peaked emission originates from the bipolar outflow, the red-shifted absorption feature is due to the photospheric line, and the blue-shifted absorption arises from the bipolar outflow as seen against the photosphere of the luminous post-AGB component in HD 44179. In order to better understand the Na I D-line profile, we examined the periodically variable asymmetric photospheric absorption lines. The asymmetric lines are interpreted as a signature of slow self-accretion following enhanced mass-loss around periastron. An empirical model was constructed to remove the photospheric component from the Na I D-line profile in order to study the nebular emission and absorption of sodium along the line-of-sight to the primary. This paper also discusses the different origins of the single-peaked emission, the double-peaked emission and the blue-shifted and red-shifted absorption components.

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Stellar evolution constraints on the triple-α reaction rate

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We investigate the quantitative constraint on the triple-α reaction rate based on stellar evolution theory, motivated by the recent significant revision of the rate proposed by nuclear physics calculations. Targeted stellar models were computed in order to investigate the impact of that rate in the mass range of $0.8 \leq M/\mathrm{M}_\odot \leq 25$ and in the metallicity range between $Z = 0$ and $Z = 0.02$. The revised rate has a significant impact on the evolution of low- and intermediate-mass stars, while its influence on the evolution of massive stars ($M \gtrsim 10$ $\mathrm{M}_\odot$) is minimal.
We find that employing the revised rate suppresses helium shell flashes on AGB phase for stars in the initial mass range $0.8 \leq M/\mathrm{M}_\odot \leq 6$, which is contradictory to what is observed. The absence of helium shell flashes is due to the weak temperature dependence of the revised triple-α reaction cross section at the temperature involved. In our models, it is suggested that the temperature dependence of the cross section should have at least $\nu > 10$ at $T = 1$–1.2×10^8 K where the cross section is proportional to T^ν. We also derive the helium ignition curve to estimate the maximum cross section to retain the low-mass first red giants. The semi-analytically derived ignition curves suggest that the reaction rate should be less than $\sim 10^{-29}$ cm^6 s^{-1} mole^{-2} at $\approx 10^{7.8}$ K, which corresponds to about three orders of magnitude larger than that of the NACRE compilation. In an effort to compromise with the revised rates, we calculate and analyze models with enhanced CNO cycle reaction rates to increase the maximum luminosity of the first giant branch. However, it is impossible to reach the typical RGB tip luminosity even if all the reaction rates related to CNO cycles are enhanced by more than ten orders of magnitude.

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Deep mixing in evolved stars. II. Interpreting Li abundances in RGB and AGB stars

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We reanalyze the problem of Li abundances in red giants of nearly solar metallicity. After an outline of the problems affecting our knowledge of the Li content in low-mass stars ($M \leq 3$ M$_\odot$), we discuss deep-mixing models for the RGB stages suitable to account for the observed trends and for the correlated variations of the carbon isotope ratio; we find that Li destruction in these phases is limited to masses below about 2.3 M$_\odot$. Subsequently, we concentrate on the final stages of evolution for both O-rich and C-rich AGB stars. Here, the constraints on extra-mixing phenomena previously derived from heavier nuclei (from C to Al), coupled to recent updates in stellar structure models (including both the input physics and the set of reaction rates used), are suitable to account for the observations of Li abundances below $A(\mathrm{Li}) \equiv \log e(\mathrm{Li}) \approx 1.5$ (and sometimes more). Also their relations with other nucleosynthesis signatures of AGB phases (like the abundance of F, the C/O and ^{12}C/^{13}C ratios) can be explained. This requires generally moderate efficiencies ($\dot{M} \lesssim 0.3$–0.5×10^{-6} M$_\odot$ yr^{-1}) for non-convective mass transport. At such rates, slow extra-mixing does not modify remarkably Li abundances in early-AGB phases; on the other hand, faster mixing encounters a physical limit in destroying Li, set by the mixing velocity. Beyond this limit, Li starts to be produced; therefore its destruction on the AGB is modest. Li is then significantly produced by the third dredge up. We also show that effective circulation episodes, while not destroying Li, would easily bring the ^{12}C/^{13}C ratios to equilibrium, contrary to the evidence in most AGB stars, and would burn F beyond the limits shown by C(N) giants. Hence, we do not confirm the common idea that efficient extra-mixing drastically reduces the Li content of C-stars with respect to K–M giants. This misleading appearance is induced by biases in the data, namely: i) the difficulty of measuring very low Li abundancesin O-rich AGB stars, due to the presence of TiO bands; and ii) the fact that many, relatively massive ($M > 3$ M$_\odot$) K- and M-type giants may remain Li rich, not evolving to the C-rich stages. Efficient extra-mixing on the AGB is instead typical of very low masses ($M \lesssim 1.5$ M$_\odot$). It also characterizes CJ stars, where it produces Li and reduces F and the carbon isotope ratio, as observed in these peculiar objects.

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Chemical abundances and kinematics of a sample of metal-rich barium stars

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We determined the atmospheric parameters and abundance pattern for a sample of metal-rich barium stars. We used high-resolution optical spectroscopy. Atmospheric parameters and abundances were determined using the local thermodynamic equilibrium atmosphere models of Kurucz and the spectral analysis code MOOG. We show that the stars have enhancement factors, [s/Fe], from 0.25 to 1.16. Their abundance pattern of the Na, Al, α-elements, and iron group elements as well as their kinematical properties are similar to the characteristics of the other metal-rich and super metal-rich stars already analyzed. We conclude that metal-rich barium stars do not belong to the bulge population. We also show that metal-rich barium stars are useful targets for probing the *s*-process enrichment in high-metallicity environments.

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Announcement

IAU Symposium 287 Cosmic Masers: From OH to H_0

January 29 – February 3, 2012, Stellenbosch, South Africa

website:http://iau287.ska.ac.za/
email: iaus287@hartrao.ac.za

Scientific Rationale:

Masers have left their mark across large areas of astrophysical research. They are observed in the interstellar medium near star-forming regions, they can probe the envelopes around dying stars and planetary nebulae and they occur in supernova remnants; they are even observed within the solar system in comets and at cosmological distances in galaxies where water masers have been observed at red shifts, $z > 2$.

Due to their brightness and compactness, masers give information on the structure and kinematics of a wide variety of sources on extremely small scales. They have therefore been important targets for high resolution observations with radio interferometers, such as MERLIN in the UK, the European VLBI Network (EVN), the Very Large Array, (VLA) and the Very Long Baseline Array (VLBA) in the US, VERA in Japan, and the Australia Telescope Compact Array (ATCA). VLBI observations of, e.g., Galactic water masers give information on the dynamics of star formation regions on scales of less than 0.1–1 AU at a distance of 1 kpc, as well as accurate distances to these sources.

We are now contemplating the advent of a new golden age in radio astronomy, with the Sub-millimetre Array (SMA), *Herschel*, the Korean VLBI Network (KVN), dedicated earlier this year and which will target millimeter wavelength masers, the Atacama Large Millimeter Array (ALMA), upgrades of the Plateau de Bure Interferometer (PdBI), VLA, ATCA and MERLIN and further developments of real-time (e)VLBI and the start of construction of the Square Kilometer Array (SKA) pre-cursors, MeerKAT and ASKAP. Studies of molecular masers are prime goals for these new and improved instruments, so maser research is undergoing a rapid growth and continues to provide answers to many important astrophysical questions.

This meeting will be the fourth international symposium on astrophysical masers. Developments in maser research have accelerated over the past years and will continue to do so while new instruments come online. The first results of ALMA are expected towards the end of 2011. The upgraded EVLA and eMERLIN have already started producing science, while the SKA pre-cursors in Australia (ASKAP) and South Africa (MeerKAT) are on the near horizon, planning their early science. The new capabilities of these instruments for maser research will be highlighted by these early results. By bringing together maser researchers, this meeting aims to lead to the development of new observational programmes intended to answer a range of fundamental astrophysical questions. The meeting will also provide a forum for maser observers to interact with theorists working on the physics that must be understood for a full analysis of the wealth of new data.

Specific focus areas for this symposium will include:

- Advances in maser theory
- Polarisation and magnetic fields
- Star formation masers
- Stellar masers
- Maser surveys
- Astrometry using masers
- AGN and megamasers
- Cosmology and the *Hubble* constant
- New masers and other developments in maser physics

- Masers with new mm facilities

Confirmed Review Speakers:

- Anna Bartkiewicz
- Shuji Deguchi
- Christian Henkel
- Karl Menten
- Mark Reid
- Anita Richards
- Vladimir Strelnitski
- Andrea Tarchi
- Dinh Van Trung

Scientific Organizing Committee:

- Anna Bartkiewicz (Torun)
- Athol Kemball (Illinois)
- Huib van Langevelde (JIVE/Leiden)
- Jim Moran (Harvard/SAO)
- Jessica Chapman (CSIRO)
- Kee-Tae Kim (KASI)
- Liz Humphreys (ESO), co-Chair
- Malcolm Gray (Manchester)
- Mareki Honma (NAOJ)
- Moshe Elitzur (Kentucky)
- Roy Booth (SA SKA), Chair
- Simon Ellingsen (Tasmania)
- Valentin Bujarrabal (OAN)
- Wouter Vlemmings (Chalmers), co-Chair
- Yolanda Gómez (UNAM)

Local Organizing Committee:

- Johan van der Walt (North-West University)
- Kim de Boer (SKA SA)
- Michael Gaylard (Hartebeesthoek RAO)
- Patricia Whitelock (SAAO & UCT)
- Simon Fishley (SAAO)
- Anja Schröder (SKA SA)
- Nadeem Oozeer (SKA SA)
- Sean Passmoor (SKA SA)
- Rose Hames (SKA SA)
- Roy Booth (SKA SA), Chair
- Sharmila Goedhart (SKA SA), co-Chair

Travel Grants:

A limited amount of travel support will be available.

Important dates/deadlines:

- Pre-registration opens: July 15
- Registration opens: August 1
- Application for IAU travel support deadline: September 16
- Abstract submission deadline: November 1 (with a late deadline in January for new results)
- Early registration closes: December 1 (after that a late registration fee will be applied)

See also http://iau287.ska.ac.za/