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Editors: Jacco van Loon and Albert Zijlstra

Editorial

Dear Colleagues,

It is a pleasure to present you the 185$^{\rm th}$ issue of the AGB Newsletter.

Congratulations to Taha Sochi on her Ph.D. thesis; we wish her all the best.

Have a look at the two meeting announcements, on symbiotic binaries and binary post-AGB stars in Wierzba, Poland, and on eclipsing cool giants in Monterey, U.S.A.

John Eldridge responded to last month's Food for Thought. He has been making binary evolution models. As many models need to be made to account for different initial binary parameters the grids become huge: his new binary grid is estimated to take up 1.5 Tb. Also, there are a lot of uncertainties regarding mass transfer, tidal forces, Roche-lobe overflow, common envelope evolution, supernova kicks, rotation in binaries, and more. Quoting John: "The results of the binary population and spectral synthesis are already publicly available (bpass.org.uk). I am also working towards making my new binary models available but it's time consuming! Other alternative is to use rapid population synthesis to make binary models quickly. I've checked the difference between my models and rapid models and the outcome of binary interactions can vary significantly."

The next issue is planned to be distributed around the 3$^{\rm rd}$ of January, 2013. With the Season's Greetings,

Editorially Yours,
Jacco van Loon and Albert Zijlstra

Food for Thought

This month's thought-provoking statement is:

AGB stars are supernova progenitors

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

Circumstellar shell formation in symbiotic recurrent novæ

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We present models of spherically symmetric recurrent nova shells interacting with circumstellar material in a symbiotic system composed of a red giant expelling a wind, and a white dwarf accreting from this material. Recurrent nova eruptions periodically eject material at high velocities ($\gtrsim 10^3$ km s^{-1}) into the red giant wind profile, creating a decelerating shock wave as circumstellar material is swept up. High circumstellar material densities cause the shocked wind and ejecta to have very short cooling times of days to weeks. Thus, the late time evolution of the shell is determined by momentum conservation instead of energy conservation. We compute and show evolutionary tracks of shell deceleration, as well as post-shock structure. After sweeping up all the red giant wind, the shell coasts at a velocity ~ 100 km s^{-1}, depending on system parameters. These velocities are similar to those measured in blue-shifted circumstellar material from the symbiotic nova RS Oph, as well as a few Type Ia supernovæ that show evidence of circumstellar material, such as 2006X, 2007le, and PTF 11kx. Supernovæ occurring in such systems may not show circumstellar material interaction until the inner nova shell gets hit by the supernova ejecta, days to months after the explosion.

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The Keck Aperture Masking Experiment: dust enshrouded red giants

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While the importance of dusty asymptotic giant branch (AGB) stars to galactic chemical enrichment is widely recognised, a sophisticated understanding of the dust formation and wind-driving mechanisms has proven elusive due in part to the difficulty in spatially-resolving the dust formation regions themselves. We have observed twenty dust-enshrouded AGB stars as part of the Keck Aperture Masking Experiment, resolving all of them in multiple near-infrared bands between 1.5 μm and 3.1 μm. We find 45% of the targets to show measurable elongations that, when correcting for the greater distances of the targets, would correspond to significantly asymmetric dust shells on par with the well-known cases of IRC +10°216 or CIT 6. Using radiative transfer models, we find the sublimation temperature of 1130 ± 90 K and 1170 ± 60 K for silicates and amorphous carbon respectively, both somewhat lower than expected from laboratory measurements and vastly below temperatures inferred from the inner edge of YSO disks. The fact that O-rich and C-rich dust types showed the same sublimation temperature was surprising as well. For the most optically-thick shells ($\tau > 2$ at 2.2 μm), the temperature profile of the inner dust shell is observed to change substantially, an effect we suggest could arise when individual dust clumps become optically-thick at the highest mass-loss rates.

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and from http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2966.2012.21543.x/abstract

Fluorine variations in the globular cluster NGC 6656 (M 22): implications for internal enrichment timescales

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Observed chemical (anti)correlations in proton-capture elements among globular cluster stars are presently recognised as the signature of self-enrichment from now extinct, previous generations of stars. This defines the multiple population scenario. Since fluorine is also affected by proton captures, determining its abundance in globular clusters provides new and complementary clues regarding the nature of these previous generations, and supplies strong observational constraints to the chemical enrichment timescales. In this paper we present our results on near-infrared CRIRES spectroscopic observations of six cool giant stars in NGC 6656 (M 22): the main objective is to derive the F content and its internal variation in this peculiar cluster, which exhibits significant changes in both light and heavy element abundances. We detected F variations across our sample beyond the measurement uncertainties and found that the F abundances are positively correlated with O and anticorrelated with Na, as expected according to the multiple population framework. Furthermore, our observations reveal an increase in the F content between the two different sub-groups, s-process rich and s-process poor, hosted within M 22. The comparison with theoretical models suggests that asymptotic giant stars with masses between 4–5 $M_{\odot}$ are responsible for the observed chemical pattern, confirming evidence from previous works: the difference in age between the two sub-components in M 22 must be not larger than a few hundreds Myr.

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A ballistic model for a precessing and orbiting jet with a time-dependent ejection velocity

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We have found that the ballistic trajectory of a precessing, orbiting and time-dependent velocity jet has a semi-analytical solution. Bipolar, multipolar and S-like morphologies, which are observed in young protoplanetary and planetary nebulæ (PPN and PN, respectively), can be reproduced by setting different values for the ratio between dynamical time and precession periods, the ratio between the precession and orbital periods, and the jet velocity variability period. We have also computed numerical simulations and find a good agreement with the semi-analytical solution for a jet 103 times denser than the surrounding environment.

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On the relationship between the H_2 emission and the physical structure of planetary nebulæ

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Mid-IR observations of planetary nebulæ (PNe) have revealed diffuse emission associated to their main nebular shells and outer envelopes or haloes. The interpretation of this emission is uncertain because the broad-band mid-IR images may include contributions of different components. In particular, the *Spitzer* IRAC 8-μm images, that best reveal these nebular features, can include contributions not only of H_2 lines, but also those of ionic species, PAH features, and thermal dust continuum emission. To investigate the nature of the emission detected in mid-IR observations of a sample of 10 PNe, we have obtained narrow-band near-IR H_2 2.122-μm and optical [N II] 6584-Å images. The comparison between these images confirm that a significant fraction of the emission detected in the IRAC 8-μm images can be attributed to molecular hydrogen, thus confirming the utility of these mid-IR images to investigate the molecular component of PNe. We have also detected H_2 emission from PNe whose physical structure cannot be described as bipolar, but rather as ellipsoidal or barrel-like. These detections suggest that, as more sensitive observations of PNe in the H_2 2.122-μm line are acquired, the detection of H_2 emission is not exclusive of bipolar PNe, although objects with this morphology are still the brightest H_2 emitters. Finally, we remark that the bright H_2 emission from the equatorial ring of a bipolar PN does not arise from a photo-dissociation region shielded from the UV stellar radiation by the ring itself, but from dense knots and clumps embedded within the ionized material of the ring.

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The ongoing pursuit of R Coronæ Borealis stars: ASAS-3 survey strikes again

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R Coronæ Borealis stars (RCBs) are rare, hydrogen-deficient, carbon-rich supergiant variable stars that are likely the evolved merger products of pairs of CO and He white dwarfs. Only 55 RCB stars are known in our galaxy and their distribution on the sky is weighted heavily by microlensing survey field positions. A less-biased wide-area survey would provide the ability to test competing evolutionary scenarios, understand the population or populations that produce RCBs and constraint their formation rate. The ASAS-3 survey monitored the sky south of declination +28° since 2000 to a limiting magnitude of $V = 14$. We searched ASAS-3 for RCB variables using a number of different methods to ensure that the probability of RCB detection was as high as possible and to reduce selection biases based on luminosity, temperature, dust production activity and shell brightness. Candidates whose light curves were visually inspected were pre-selected based on their infrared excesses due to warm dust in their circumstellar shells using the WISE and/or 2MASS catalogues, and criteria on light curve variability. We then acquired spectra of 104 stars to determine their real nature using the SSO/WiFeS spectrograph. We report 21 newly-discovered RCB stars and 2 new DY Per stars. Two previously suspected RCB candidates were also spectroscopically confirmed. Our methods allowed us to extend our detection efficiency to fainter magnitudes that would not have been easily accessible to discovery techniques based only on light curve variability. The overall detection efficiency is about 90% for RCBs with maximum light brighter than $V \sim 13$. This growing sample is of great value to constrain the peculiar and disparate atmosphere

composition of RCBs. Most importantly, we show that the spatial distribution and apparent magnitudes of Galactic RCB stars is consistent with RCBs being part of the Galactic bulge population.

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Galactic archæology: mapping and dating stellar populations with asteroseismology of red-giant stars

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Our understanding of how the Galaxy was formed and evolves is severely hampered by the lack of precise constraints on basic stellar properties such as distances, masses, and ages. Here, we show that solar-like pulsating red giants represent a well-populated class of accurate distance indicators, spanning a large age range, which can be used to map and date the Galactic disc in the regions probed by observations made by the CoRoT and *Kepler* space telescopes. When combined with photometric constraints, the pulsation spectra of such evolved stars not only reveal their radii, and hence distances, but also provide well-constrained estimates of their masses, which are reliable proxies for the ages of the stars. As a first application we consider red giants observed by CoRoT in two different parts of the Milky Way, and determine precise distances for ~ 2000 stars spread across nearly 15,000 pc of the Galactic disc, exploring regions which are a long way from the solar neighbourhood. We find significant differences in the mass distributions of these two samples which, by comparison with predictions of synthetic models of the Milky Way, we interpret as mainly due to the vertical gradient in the distribution of stellar masses (hence ages) in the disc. In the future, the availability of spectroscopic constraints for this sample of stars will not only improve the age determination, but also provide crucial constraints on age–velocity and age–metallicity relations at different Galactocentric radii and heights from the plane.

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An interacting binary system powers precessing outflows of an evolved star

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Stars are generally spherical, yet their gaseous envelopes often appear nonspherical when ejected near the end of their lives. This quirk is most notable during the planetary nebula phase, when these envelopes become ionized. Interactions among stars in a binary system are suspected to cause the asymmetry. In particular, a precessing accretion disk

around a companion is believed to launch point-symmetric jets, as seen in the prototype Fleming 1. Our finding of a post–common-envelope binary nucleus in Fleming 1 confirms that this scenario is highly favorable. Similar binary interactions are therefore likely to explain these kinds of outflows in a large variety of systems.

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The star formation history of the Sculptor Dwarf Irregular Galaxy

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We study the resolved stellar populations and derive the star formation history of the Sculptor Dwarf Irregular Galaxy (SDIG), a gas-rich dwarf galaxy member of the NGC 7793 subgroup in the Sculptor group of galaxies. We construct a color-magnitude diagram using archival observations from the *Hubble* Space Telescope / Advanced Camera for Surveys in order to examine the stellar content of SDIG, as well as the spatial distribution of stars selected within different stellar evolutionary phases. We derive the star formation history of SDIG using a maximum-likelihood fit to the color–magnitude diagram. The color–magnitude diagram shows that SDIG contains stars from 10 Myr to several Gyr old, as revealed from the main sequence, blue loop, luminous asymptotic giant branch, and red giant branch stars. The young stars with ages less than ~ 250 Myr show a stellar spatial distribution confined to the central regions of SDIG, and additionally the young main sequence stars exhibit an off-center density peak. The intermediate-age and older stars as traced by the red giant branch stars are more spatially extended. SDIG is dominated by intermediate-age stars with an average age of $6.4^{+1.6}_{-1.4}$ Gyr. The average metallicity inferred from the CMD modelling is [M/H] ≈ -1.5 dex. SDIG has a star formation history consistent with a constant star formation rate, except for ages younger than ≈ 200 Myr. The lifetime average star formation rate is $1.3^{+0.4}_{-0.3} \times 10^{-3)}$ $M_\odot$ yr^{-1}. More recently than 100 Myr, there has been a burst of star formation at a rate $\sim$ 2–3 times higher than the average star formation rate. The inferred recent star formation rate from CMD modelling, $2.7(\pm 0.5) \times 10^{-3}$ $M_\odot$ yr^{-1}, is higher than inferred from the Hα flux of the galaxy; we interpret this to mean that the upper end of the initial mass function is not being fully sampled due to the low star formation rate. Additionally, an observed lack of bright blue stars in the CMD could indicate a downturn in star formation rate on 10^7-yr timescales. A previous star formation enhancement appears to have occurred between 600–1100 Myr ago, with amplitude similar to the most recent 100 Myr. Older bursts of similar peak star formation rate and duration would not be resolvable with these data. The observed enhancements in star formation suggest that SDIG is able to sustain a complex star formation history without the effect of gravitational interactions with its nearest massive galaxy. Integrating the star formation rate over the entire history of SDIG yields a total stellar mass equal to $1.77^{+0.71}_{-0.72} \times 10^7$ $M_\odot$, and a current V-band stellar mass-to-light ratio equal to 3.2 $M_\odot/L_\odot$.

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The triple evolution dynamical instability: stellar collisions in the field and the formation of exotic binaries

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Physical collisions and close approaches between stars play an important role in the formation of exotic stellar systems. Standard theories suggest that collisions are rare, occurring only via random encounters between stars in dense clusters. We present a different formation pathway, the triple evolution dynamical instability (TEDI), in which mass loss in

an evolving triple star system causes orbital instability. The subsequent chaotic orbital evolution of the stars triggers close encounters, collisions, exchanges between the stellar components, and the dynamical formation of eccentric compact binaries (including Sirius-like binaries). We demonstrate that the rate of stellar collisions due to the TEDI is approximately 10^{-4} yr^{-1} per Milky Way Galaxy, which is nearly 30 times higher than the total collision rate due to random encounters in the Galactic globular clusters. Moreover, we find that the dominant type of stellar collision is qualitatively different; most collisions involve asymptotic giant branch stars, rather than main sequence or slightly evolved stars, which dominate collisions in globular clusters. The TEDI mechanism should lead us to revise our understanding of collisions and the formation of compact, eccentric binaries in the field.

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Cyanogen in NGC 1851 RGB and AGB stars: quadrimodal distributions

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The Galactic globular cluster NGC 1851 has raised much interest since Hubble Space Telescope photometry revealed that it hosts a double subgiant branch. Here we report on our homogeneous study into the cyanogen (CN) band strengths in the red giant branch (RGB) population (17 stars) and asymptotic giant branch (AGB) population (21 stars) using AAOmega/2dF spectra with $R \sim 3000$. We discover that NGC 1851 hosts a quadrimodal distribution of CN band strengths in its RGB and AGB populations. This result supports the merger formation scenario proposed for this cluster, such that the CN quadrimodality could be explained by the superposition of two "normal" bimodal populations. A small sample overlap with an abundance catalog allowed us to tentatively explore the relationship between our CN populations and a range of elemental abundances. We found a striking correlation between CN and [O/Na]. We also found that the four CN peaks may be paired – the two CN-weaker populations being associated with low Ba and the two CN-stronger populations with high Ba. If true, then s-process abundances would be a good diagnostic for disentangling the two original clusters in the merger scenario. More observations are needed to confirm the quadrimodality and also the relationship between the subpopulations. We also report CN results for NGC 288 as a comparison. Our relatively large samples of AGB stars show that both clusters have a bias toward CN-weak AGB populations.

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Aluminium oxide in the optical spectrum of VY Canis Majoris

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We report the first identification of the optical bands of the B–X system of AlO in the red supergiant VY CMa. In addition to TiO, VO, ScO, and YO, which were recognized in the optical spectrum of the star long time ago, AlO

is another refractory molecule which displays strong emission bands in this peculiar star. Simulating the bands of AlO, we derive a rotational temperature of the circumstellar gas of $T_{\rm rot} = 700$ K. By resolving individual rotational components of the bands, we derive the kinematical characteristics of the gas, finding that the emission is centered at the stellar radial velocity and its intrinsic width is 13.5 km s^{-1} (full width at half maximum). It is the narrowest emission among all (thermal) features observed in VY CMa so far. The temperature and line widths suggest that the emission arises in gas located within ~ 20 stellar radii, where the outflow is still being accelerated. This result contradicts equilibrium-chemistry models which predict substantial AlO abundances only to within a few stellar radii. We argue that non-equilibrium models involving propagation of shocks are needed to explain the observations.

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Full SED fitting with the KOSMA–τ PDR code

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We revised the treatment of interstellar dust in the KOSMA–τ PDR (photo-dissociation region) model code to achieve a consistent description of the dust-related physics in the code. The detailed knowledge of the dust properties is then used to compute the dust continuum emission together with the line emission of chemical species.
We coupled the KOSMA–τ PDR code with the MCDRT (multi component dust radiative transfer) code to to solve the frequency-dependent radiative transfer equations and the thermal balance equation in a dusty clump under the assumption of spherical symmetry, assuming thermal equilibrium in calculating the dust temperatures, neglecting non-equilibrium effects. We updated the calculation of the photoelectric heating and extended the parametrization range for the photoelectric heating toward high densities and UV fields. We revised the computation of the H_2 formation on grain surfaces to include the Eley–Rideal effect, thus allowing for high-temperature H_2 formation.
We demonstrate how the different optical properties, temperatures, and heating and cooling capabilities of the grains influence the physical and chemical structure of a model cloud. The most influential modification is the treatment of H_2 formation on grain surfaces that allows for chemisorption. This increases the total H_2 formation significantly and the connected H_2 formation heating provides a profound heating contribution in the outer layers of the model clumps. The contribution of polycyclic aromatic hydrocarbons (PAH) surfaces to the photoelectric heating and H_2 formation provides a boost to the temperature of outer cloud layers, which is clearly traced by high-J CO lines. Increasing the fraction of small grains in the dust size distribution results in hotter gas in the outer cloud layers caused by more efficient heating and cooler cloud centers, which is in turn caused by the more efficient FUV extinction.

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A comparison of approaches in fitting continuum SEDs

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We present a detailed comparison of two approaches, the use of a pre-calculated database and simulated annealing (SA), for fitting the continuum spectral energy distribution (SED) of astrophysical objects whose appearance is dominated by surrounding dust. While pre-calculated databases are commonly used to model SED data, only few studies to date employed SA due to its unclear accuracy and convergence time for this specific problem. From a methodological point of view, different approaches lead to different fitting quality, demand on computational resources and calculation

time. We compare the fitting quality and computational costs of these two approaches for the task of SED fitting to provide a guide to the practitioner to find a compromise between desired accuracy and available resources. To reduce uncertainties inherent to real datasets, we introduce a reference model resembling a typical circumstellar system with 10 free parameters. We derive the SED of the reference model with our code MC3D at 78 logarithmically distributed wavelengths in the range 0.3 μm–1.3 mm and use this setup to simulate SEDs for the database and SA. Our result shows directly the applicability of SA in the field of SED modeling, since the algorithm regularly finds better solutions to the optimization problem than a pre-calculated database. As both methods have advantages and shortcomings, a hybrid approach is preferable. While the database provides an approximate fit and overall probability distributions for all parameters deduced using Bayesian analysis, SA can be used to improve upon the results returned by the model grid.

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Are there any stars lacking neutron-capture elements? Evidence from strontium and barium

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The cosmic dispersion in the abundances of the heavy elements strontium and barium in halo stars is well known. Strontium and barium are detected in most cool, metal-poor giants, but are these elements always detectable? To identify stars that could be considered probable candidates for lacking these elements, I examine the stellar abundance data available in the literature for 1148 field stars and 226 stars in dwarf galaxies, 776 of which have metallicities lower than [Fe/H] < -2.0. Strontium or barium have been detected in all field, globular cluster, and dwarf galaxy environments studied. All upper limits are consistent with the lowest detected ratios of [Sr/H] and [Ba/H]. The frequent appearance of these elements raises the intriguing prospect that at least one kind of neutron-capture reaction operates as often as the nucleosynthesis mechanisms that produce lighter elements, like magnesium, calcium, or iron, although the yields of heavy elements may be more variable.

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Multipolar planetary nebulæ: not as geometrically diversified as thought

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Planetary nebulæ (PNe) have diverse morphological shapes, including point-symmetric and multipolar structures. Many PNe also have complicated internal structures such as tori, lobes, knots, and ansæ. A complete accounting of all the morphological structures through physical models is difficult. A first step toward such an understanding is to derive the true three-dimensional structure of the nebulae. In this paper, we show that a multipolar nebula with three pairs of lobes can explain many such features, if orientation and sensitivity effects are taken into account. Using only six parameters – the inclination and position angles of each pair – we are able to simulate the observed images of 20 PNe with complex structures. We suggest that multipolar structure is an intrinsic structure of PNe and the statistics of multipolar PNe have been severely underestimated in the past.

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A detailed morpho-kinematic model of the Eskimo, NGC 2392. A unifying view with the Cat's Eye and Saturn planetary nebulæ

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The 3-D and kinematic structure of the Eskimo nebula, NGC 2392, has been notoriously difficult to interpret in detail given its complex morphology, multiple kinematic components and its nearly pole-on orientation along the line of sight. We present a comprehensive, spatially resolved, high resolution, long-slit spectroscopic mapping of the Eskimo planetary nebula. The data consist of 21 spatially resolved, long-slit echelle spectra tightly spaced over the Eskimo and along its bipolar jets. This data set allows us to construct a velocity-resolved [N II] channel map of the nebula with a resolution of 10 km s^{-1} that disentangles the different kinematic components of the nebula. The spectroscopic information is combined with HST images to construct a detailed three dimensional morpho-kinematic model of the Eskimo using the code SHAPE. With this model we demonstrate that the Eskimo is a close analog to the Saturn and the Cat's Eye nebulae, but rotated 90° to the line of sight. Furthermore, we show that the main characteristics of our model apply to the general properties of the group of elliptical planetary nebulæ with ansæ or FLIERS, once the orientation is considered. We conclude that these kind of nebulæ belong to a class with a complex common evolutionary sequence of events.

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No surviving evolved companions of the progenitor of SN 1006

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Type Ia supernovae are thought to occur when a white dwarf made of carbon and oxygen accretes sufficient mass to trigger a thermonuclear explosion. The accretion could be slow, from an unevolved (main-sequence) or evolved (subgiant or giant) star (the single-degenerate channel), or rapid, as the primary star breaks up a smaller orbiting white dwarf (the double-degenerate channel). A companion star will survive the explosion only in the single-degenerate channel. Both channels might contribute to the production of Type Ia supernovæ, but the relative proportions of their contributions remain a fundamental puzzle in astronomy. Previous searches for remnant companions have revealed one possible case for SN 1572, although that has been questioned. More recently, observations have restricted surviving companions to be small, main-sequence stars, ruling out giant companions but still allowing the single-degenerate channel. Here we report the results of a search for surviving companions of the progenitor of SN 1006. None of the stars within $4'$ of the apparent site of the explosion is associated with the supernova remnant, and we can firmly exclude all giant and subgiant stars from being companions of the progenitor. In combination with previous results, our findings indicate that fewer than 20% of Type Ia supernovæ occur through the single-degenerate channel.

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Review Paper

Selected topics in the evolution of low-mass stars

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Low-mass stars play a key role in many different areas of astrophysics. In this article, I provide a brief overview of the evolution of low-mass stars, and discuss some of the uncertainties and problems currently affecting low-mass stellar models. Emphasis is placed on the following topics: the solar abundance problem, mass loss on the red giant branch, and the level of helium enrichment associated to the multiple populations that are present in globular clusters.

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Thesis

Atomic and molecular aspects of astronomical spectra

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In the first section we present the atomic part where a C_2^+ atomic target was prepared and used to generate theoretical data to investigate recombination lines arising from electron–ion collisions in thin plasma. R-matrix method was used to describe the C_2^+ plus electron system. Theoretical data concerning bound and autoionizing states were generated in the intermediate-coupling approximation. The data were used to generate dielectronic recombination data for C^+ which include transition lines, oscillator strengths, radiative transition probabilities, emissivities and dielectronic recombination coefficients. The data were cast in a line list containing 6187 optically-allowed transitions which include many C II lines observed in astronomical spectra. This line list was used to analyze the spectra from a number of astronomical objects, mainly planetary nebulae, and identify their electron temperature. The electron temperature investigation was also extended to include free electron energy analysis to investigate the long-standing problem of discrepancy between the results of recombination and forbidden lines analysis and its possible connection to the electron distribution. In the second section we present the results of our molecular investigation; the generation of a comprehensive, calculated line list of frequencies and transition probabilities for H_2D^+. The line list contains over 22 million rotational-vibrational transitions occurring between more than 33 thousand energy levels and covers frequencies up to 18500 cm^{-1}. About 15% of these levels are fully assigned with approximate rotational and vibrational quantum numbers. A temperature-dependent partition function and cooling function are presented. Temperature-dependent synthetic spectra for the temperatures $T = 100$, 500, 1000 and 2000 K in the frequency range 0–10000 cm^{-1} were also generated and presented graphically.

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Announcements

Workshop on: Symbiotic stars, binary post-AGB and related objects

Dear colleagues,

We are pleased to announce the workshop on "Symbiotic stars, binary post-AGB and related objects" to be held in Wierzba (Mazury Lakes), Poland on 18–23 August, 2013. The program is aimed at the most important discoveries and future prospects resulting from the ground based projects and recent space missions as well as theoretical modelling related to these binaries. In particular, the topics we would like to discuss are:

- link between symbiotic and binary post-AGB stars;
- mass transfer and activity;
- synchronization & circularization;
- circumstellar environment;
- extragalactic systems;
- evolution and chemistry;
- relation with SNIa.

The program is still open and will be established by the SOC after receiving titles and short abstracts from the participants. For more details and the registration form see the workshop www page.

Please note that conference has to be limited to about 50 participants due to limited number of hotel rooms, so please register as soon as possible.

Joanna Mikołajewska and Ryszard Szczerba

See also http://users.camk.edu.pl/magdaot/wierzba2013/

AAS Conference, "Giants of Eclipse" Monterey, CA (USA), 2013 July 29 to August 2

We are pleased to announce an AAS Conference, **GIANTS OF ECLIPSE**. The objectives are twofold:

- To tease out the unique science which can be accessed by observing certain cool stars during chromospheric eclipses, and thereby to enrich our general knowledge about cool giants;
- To collate and examine the major accumulations of new data on ϵ Aurigæ acquired during its recent eclipse, in order to try to gain some better understanding of this bright but highly enigmatic system.

A (very) preliminary programme can be perused on our website, and a list of confirmed speakers will be placed there soon.

Please visit our website and pre-register for the conference, so that we can estimate the likely attendance.

We hope to see you in Monterey!

Elizabeth Griffin and Robert Stencel

See also http://aas.org/meetings/aastcs3