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THE MASSIVE STAR NEWSLETTER

formerly known as the hot star newsletter

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Obituaries Paul Kunasz and David Hummer

Dear colleagues,

some of you might already have heard the sad news that David Hummer has passed away recently. I was just informed that also Paul Kunasz has died, already in August 2015. Together with Dimitri Mihalas, we thus lost, during the last year, three of the world-leading pioneers and experts on radiative transfer, stellar atmospheres and may more topics. As an example, you might remember the most influential series of papers on comoving frame transfer, published by Mihalas, Kunasz & Hummer in the 1970ies.

I am sure that everybody will miss them.

An obituary for Paul Kunasz can be found on

http://www.legacy.com/obituaries/dailycamera/obituary.aspx?pid=175559352

and an obituary for David Hummer on

http://www.dailycamera.com/features/ci_29348396/friends-peers-raise-final-pint-david-hummer-co

Those of you who are not aware of David's other 'profession', as a founder of one of the first micro-breweries in the USA, might be particularly interested in the latter article.

Jo Puls

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Fizeau exchange visitors program: call for applications (Now closed)

J. Hron & L. Misoni

European Interferometry Initiative

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), 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 March 15. Fellowships can be awarded for missions starting in May 2016.

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

The program is funded by OPTICON/FP7.

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

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

Reference: Deadline March 15
Status: Other

Weblink: www.european-interferometry.eu

Comments: Please circulate not later than March 1

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PAPERS

Abstracts of 18 accepted papers

Classical Oe Stars in the Field of the Small Magellanic Cloud

Jesse B. Golden-Marx (1), M. S. Oey (1), J. B. Lamb (2), Andrew S. Graus (3), Aaron S. White (1)

((1) University of Michigan, (2) Nassau Community College, (3) University of California, Irvine)

We present 29±1 classical Oe stars from RIOTS4, a spatially complete, spectroscopic survey of Small Magellanic Cloud (SMC) field OB stars. The two earliest are O6e stars, and four are earlier than any Milky Way (MW) Oe stars. We also find ten Ope stars, showing He~\textsc{i} infill and/or emission; five appear to be at least as hot as ∼O7.5e stars. The hottest, star 77616, shows He~\textsc{ii} disk emission, suggesting that even the hottest O stars can form decretion disks, and offers observational support for theoretical predictions that the hottest, fastest rotators can generate He+-ionizing atmospheres. Our data also demonstrate that Ope stars correspond to Oe stars earlier than O7.5e with strong disk emission. We find that in the SMC, Oe stars extend to earlier spectral types than in the MW, and our SMC Oe/O frequency, 0.26±0.04, is much greater than the MW value, 0.03±0.01. These results are consistent with angular momentum transport by stronger winds suppressing decretion disk formation at higher metallicity. In addition, our SMC field Oe star frequency is indistinguishable from that for clusters, which is consistent with the similarity between rotation rates in these environments, and contrary to the pattern for MW rotation rates. Thus, our findings strongly support the viscous decretion disk model and confirm that Oe stars are the high-mass extension of the Be phenomenon. Additionally, we find that Fe~\textsc{ii} emission occurs among Oe stars later than O7.5e with massive disks, and we revise a photometric criterion for identifying Oe stars to J−[3.6]≥0.1.

Reference: Accepted for publication in ApJ
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1601.03405

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An Apparent Precessing Helical Outflow from a Massive Evolved Star: Evidence for Binary Interaction

Ryan M. Lau^{1,2}, Matthew J. Hankins^{1}, Terry L. Herter^{1}, Mark R. Morris^{3}, Elisabeth A. C. Mills^{4}, Michael E. Ressler^{2}

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Massive, evolved stars play a crucial role in the metal-enrichment, dust budget, and energetics of the interstellar medium; however, the details of their evolution are uncertain because of their rarity and short lifetimes before exploding as supernovae. Discrepancies between theoretical predictions from single-star

evolutionary models and observations of massive stars have evoked a shifting paradigm that implicates the importance of binary interaction. We present mid- to far-infrared observations from the Stratospheric Observatory for Infrared Astronomy (SOFIA) of a conical ``helix" of warm dust (~180 K) that appears to extend from the Wolf-Rayet star WR102c. Our interpretation of the helix is a precessing, collimated outflow that emerged from WR102c during a previous evolutionary phase as a rapidly rotating luminous blue variable. We attribute the precession of WR102c to gravitational interactions with an unseen compact binary companion whose orbital period can be constrained to $800\,\mathrm{d} < P < 1400$ d from the inferred precession period, $\tau_p \sim 1.4\times 10^4$ yr, and limits imposed on the stellar and orbital parameters of the system. Our results concur with the range of orbital periods ($P\lesssim 1500$ d) where spin-up via mass exchange is expected to occur for massive binary systems.

Reference: arXiv:1512.07639
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1512.07639

Comments: Revised version to be updated Tuesday 1/19/2016

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A Comprehensive Comparative Test of Seven Widely-Used Spectral Synthesis Models Against Multi-Band Photometry of Young Massive Star Clusters

A. Wofford, S. Charlot, G. Bruzual, J. J. Eldridge, D. Calzetti, A. Adamo, M. Cignoni, S. E. de Mink, D. A. Gouliermis, K. Grasha, E. K. Grebel, J. Lee, G. Ostlin, L. J. Smith, L. Ubeda, E. Zackrisson

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We test the predictions of spectral synthesis models based on seven different massive-star prescriptions against Legacy ExtraGalactic UV Survey (LEGUS)observations of eight young massive clusters in two local galaxies, NGC 1566 and NGC 5253, chosen because predictions of all seven models are available at the published galactic metallicities. The high angular resolution, extensive cluster inventory and full near-ultraviolet to near-infrared photometric coverage make the LEGUS dataset excellent for this study. We account for both stellar and nebular emission in the models and try two different prescriptions for attenuation by dust. From Bayesian fits of model libraries to the observations, we find remarkably low dispersion in the median E(B-V) (~0.03 mag), stellar masses (~10^4 M_\odot) and ages (~1 Myr) derived for individual clusters using different models, although maximum discrepancies in these quantities can reach 0.09 mag and factors of 2.8 and 2.5, respectively. This is for ranges in median properties of 0.05-0.54 mag, 1.8-10x10^4 M_\odot and 1.6-40 Myr spanned by the clusters in our sample. In terms of best fit, the observations are slightly better reproduced by models with interacting binaries and least well reproduced by models with single rotating stars. Our study provides a first quantitative estimate of the accuracies and uncertainties of the most recent spectral synthesis models of young stellar populations, demonstrates the good progress of models in fitting high-quality observations, and highlights the needs for a larger cluster sample and more extensive tests of the model parameter space.

Reference: Accepted for publication in MNRAS. Pre-print available at arxiv.
Status: Manuscript has been accepted

Weblink: http://arxiv.org/pdf/1601.03850.pdf

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Modeling X-ray emission line profiles from massive star winds – A review

Richard Ignace

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The Chandra and XMM-Newton X-ray telescopes have led to numerous advances in the study and understanding of astrophysical X-ray sources. Particularly important has been the much increased spectral resolution of modern X-ray instrumentation. Wind-broadened emission lines have been spectroscopically resolved for many massive stars. This contribution reviews approaches to the modeling of X-ray emission line profile shapes from single stars, including smooth winds, winds with clumping, optically thin versus thick lines, and the effect of a radius-dependent photoabsorption coefficient.

Reference: Advances of Space Research
Status: Manuscript has been accepted

Weblink: http://www.sciencedirect.com/science/article/pii/S0273117716000041

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Long-Wavelength, Free-Free Spectral Energy Distributions from Porous Stellar Winds

Richard Ignace

East Tennessee State University

The influence of macroclumps for free-free spectral energy distributions (SEDs) of ionized winds is considered. The goal is to emphasize distinctions between microclumping and macroclumping effects. Microclumping can alter SED slopes and flux levels if the volume filling factor of the clumps varies with radius; however, the modifications are independent of the clump geometry. To what extent does macroclumping alter SED slopes and flux levels? In addressing the question, two specific types of macroclump geometries are explored: shell fragments (``pancake"-shaped) and spherical clumps. Analytic and semi-analytic results are derived in the limiting case that clumps never obscure one another. Numerical calculations based on a porosity formalism is used when clumps do overlap. Under the assumptions of a constant expansion, isothermal, and fixed ionization wind, the fragment model leads to results that are essentially identical to the microclumping result. Mass-loss rate determinations are not affected by porosity effects for shell fragments. By contrast, spherical clumps can lead to a reduction in long-wavelength fluxes, but the reductions are only significant for extreme volume filling factors.

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Weblink: http://arxiv.org/abs/1601.06715

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The Runaways and Isolated O-Type Star Spectroscopic Survey of the SMC (RIOTS4)

J. B. Lamb (1,2), M. S. Oey (1), D. M. Segura-Cox (1,3), A. S. Graus (1,4), D. C. Kiminki (5), J. B. Golden-Marx (1), J. Wm. Parker (6)

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We present the Runaways and Isolated O-Type Star Spectroscopic Survey of the SMC (RIOTS4), a spatially complete survey of uniformly selected field OB stars that covers the entire star-forming body of the SMC. Using the IMACS multislit spectrograph and MIKE echelle spectrograph on the Magellan telescopes, we obtained spectra of 374 early-type field stars that are at least 28 pc from any other OB candidates. We also obtained spectra of an additional 23 field stars in the SMC bar identified from slightly different photometric criteria. Here, we present the observational catalog of stars in the RIOTS4 survey, including spectral classifications and radial velocities. For three multi-slit fields covering 8% of our sample, we carried out monitoring observations over 9-16 epochs to study binarity, finding a spectroscopic, massive binary frequency of at least $\sim$60% in this subsample. Classical Oe/Be stars represent a large fraction of RIOTS4 (42%), occurring at much higher frequency than in the Galaxy, consistent with expectation at low metallicity. RIOTS4 confirmed a steep upper IMF in the field, apparently caused by the inability of the most massive stars to form in the smallest clusters. Our survey also yields evidence for in-situ field OB star formation, and properties of field emission-line star populations, including sgB[e] stars and classical Oe/Be stars. We also discuss the radial velocity distribution and its relation to SMC kinematics and runaway stars. RIOTS4 presents a first quantitative characterization of field OB stars in an external galaxy, including the contributions of sparse, but normal, star formation; runaway stars; and candidate isolated star formation.

Reference: Astrophysical Journal (in press)
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1512.01233

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Eta Carinae's Thermal X-ray Tail Measured with XMM-Newton and NuSTAR

Kenji Hamaguchi(1,2), Michael F. Corcoran(1,3), Theodore R. Gull(4), Hiromitsu Takahashi(5), Brian Grefenstette(6), Takayuki Yuasa(7), Martin Stuhlinger(8), Christopher M. P. Russell(4,9), Anthony F. J. Moffat(10), Neetika Sharma(2), Thomas I. Madura(1,3), Noel D. Richardson(10), Jose Groh(11), Julian M. Pittard(12), Stan Owocki(13)

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The evolved, massive highly eccentric binary system, eta Car, underwent a periastron passage in the summer of 2014. We obtained two coordinated X-ray observations with XMM-Newton and NuSTAR during the elevated X-ray flux state and just before the X-ray minimum flux state around this passage. These NuSTAR observations clearly detected X-ray emission associated with eta Car extending up to ~50 keV for the first time. The NuSTAR spectrum above 10 keV can be fit with the bremsstrahlung tail from a kT~6 keV plasma. This temperature is Delta kT ~2 keV higher than those measured from the iron K emission line complex, if the shocked gas is in collisional ionization equilibrium. This result may suggest that the companion star's pre-shock wind velocity is underestimated. The NuSTAR observation near the X-ray minimum state showed a gradual decline in the X-ray emission by 40% at energies above 5 keV in a day, the largest rate of change of the X-ray flux yet observed in individual eta Car observations. The column density to the hardest emission component, NH~1e24 cm-2, marked one of the highest values ever observed for eta Car, strongly suggesting increased obscuration of the wind-wind colliding X-ray emission by the thick primary stellar wind prior to superior conjunction. Neither observation detected the power-law component in the extremely hard band that INTEGRAL and Suzaku observed prior to 2011. If the non-detection by INTEGRAL is caused by absorption, the power-law source must be small and located very near the WWC apex. Alternatively, it may be that the power-law source is not related to either eta Car or the GeV gamma-ray source.

Reference: ApJ, 817, 23 (2016)
Status: Manuscript has been accepted

Weblink: http://iopscience.iop.org/article/10.3847/0004-637X/817/1/23/meta;jsessionid=76A9B4FEB605C936E1B0430C36DEDDAD.c3.iopscience.cld.iop.org

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Stellar modelling of Spica, a high-mass spectroscopic binary with a beta Cep variable primary component

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Binary stars provide a valuable test of stellar structure and evolution, because the masses of the individual stellar components can be derived with high accuracy and in a model-independent way. In this work, we study Spica, an eccentric double-lined spectroscopic binary system with a beta Cep type variable primary component. We use state-of-the-art modelling tools to determine accurate orbital elements of the binary system and atmospheric parameters of both stellar components. We interpret the short-period variability intrinsic to the primary component, detected on top of the orbital motion both in the photometric and spectroscopic data. The non-LTE based spectrum analysis reveals two stars of similar atmospheric chemical composition consistent with the present day cosmic abundance standard defined by Nieva&Przybilla (2012). The masses and radii of the stars are found to be 11.43+/-1.15 M_sun and 7.21+/-0.75 M_sun, and 7.47+/-0.54 R_sun and 3.74+/-0.53 R_sun for the primary and secondary, respectively. We find the primary component to pulsate in three independent modes, of which one is identified as a radial mode, while the two others are found to be non-radial, low degree l modes. The frequency of one of these modes is an exact multiple of the orbital frequency, and the l=m=2 mode identification suggests a tidal nature for this particular mode. We find a very good agreement between the derived dynamical and evolutionary masses for the Spica system to within the observational errors of the measured masses. The age of the system is estimated to be 12.5+/-1 Myr.

Reference: main journal of MNRAS
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1601.08069

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Observational signatures of past mass-exchange episodes in massive binaries: The case of HD149404

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Mass and momentum exchanges in close massive binaries play an important role in their evolution, and produce several observational signatures such as asynchronous rotation and altered chemical compositions, that remain after the stars detach again. We investigated these effects for the detached massive O-star binary HD149404 (O7.5If + ON9.7I, P = 9.81 days), which is thought to have experienced a past episode of case A Roche-lobe overflow (RLOF). Using phase-resolved spectroscopy, we performed

the disentangling of the optical spectra of the two stars. The reconstructed primary and secondary spectra were then analysed with the CMFGEN model atmosphere code to determine stellar parameters, such as the effective temperatures and surface gravities, and to constrain the chemical composition of the components. We complemented the optical study with the study of IUE spectra, which we compare to the synthetic binary spectra. The properties of the stars were compared to evolutionary models. We confirmed a strong overabundance in nitrogen ([N/C]$\sim$150[N/C]$_{\odot}$) for the secondary and a slight nitrogen overabundance ([N/C]$\sim$5[N/C]$_{\odot}$) for the primary star. Comparing the two stars, we found evidence for asynchronous rotation, with a rotational period ratio of 0.50$\pm$0.11. The hypothesis of a past case A RLOF interaction in HD149404 is most plausible to explain its chemical abundances and rotational asynchronicity. Some of the observed properties, such as the abundance pattern, are clearly a challenge for current case A binary evolution models, however.

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Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1601.08083

Comments:

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The Galactic O-Star Spectroscopic Survey (GOSSS). III. 142 additional O-type systems

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This is the third installment of GOSSS, a massive spectroscopic survey of Galactic O stars, based on new homogeneous, high signal-to-noise ratio, R~2500 digital observations selected from the Galactic O-Star Catalog (GOSC). In this paper we present 142 additional stellar systems with O stars from both hemispheres, bringing the total of O-type systems published within the project to 590. Among the new objects there are 20 new O stars. We also identify 11 new double-lined spectroscopic binaries (SB2s), of which 6 are of O+O type and 5 of O+B type, and an additional new tripled-lined spectroscopic binary (SB3) of O+O+B type. We also revise some of the previous GOSSS classifications, present some egregious examples of stars erroneously classified as O-type in the past, introduce the use of luminosity class IV at spectral types O4-O5.5, and adapt the classification scheme to the work of Arias et al. (2016).

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Weblink: http://arxiv.org/abs/1602.01336

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Probing the Dragonfish star-forming complex: the ionizing population of the young massive cluster Mercer 30

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The Dragonfish Nebula has been recently claimed to be powered by a superluminous but elusive OB association. Instead, systematic searches in near-infrared photometric surveys have found many other cluster candidates on this sky region. Among these, the first confirmed young massive cluster was Mercer 30, where Wolf-Rayet stars were found. We perform a new characterization of Mercer 30 with unprecedented accuracy, combining NICMOS/HST and VVV photometric data with multi-epoch ISAAC/VLT H- and K-band spectra. Stellar parameters for most of spectroscopically observed cluster members are found through precise non-LTE atmosphere modeling with the CMFGEN code. Our spectrophotometric study for this cluster yields a new, revised distance of d = (12.4 +- 1.7) kpc and a total of Q = 6.70 x 10^50 Lyman ionizing photons. A cluster age of (4.0 +- 0.8) Myr is found through isochrone fitting, and a total mass of (1.6 +- 0.6) x 10^4 Msol is estimated thanks to our extensive knowledge of the post-main-sequence population. As a consequence, membership of Mercer 30 to the Dragonfish star-forming complex is confirmed, allowing us to use this cluster as a probe for the whole complex, which turns out to be extremely large (400 pc across) and located at the outer edge of the Sagittarius-Carina spiral arm (11 kpc from the Galactic Center). The Dragonfish complex hosts 19 young clusters or cluster candidates (including Mercer 30 and a new candidate presented in this work) and an estimated minimum of 9 field Wolf-Rayet stars. The sum of all these contributions accounts for, at least, 73% of the Dragonfish Nebula ionization and leaves little or no room for the alleged superluminous OB association; alternative explanations are discussed.

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Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1602.02503

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Short-term variability and mass loss in Be stars I. BRITE satellite photometry of eta and mu Centauri

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Context. Empirical evidence for the involvement of nonradial pulsations (NRP's) in the mass loss from Be stars ranges from (i) a singular case (μ Cen) of repetitive mass ejections triggered by multi-mode beating to (ii) several photometric reports about enormous numbers of pulsation modes popping up during outbursts and on to (iii) effective ingle-mode pulsators.
Aims. Develop a more detailed empirical description of the star-to-disk mass transfer. Check the hypothesis that spates of transient nonradial pulsation modes accompany and even drive mass-loss episodes.
Methods. The BRITE Constellation of nanosatellites was used to obtain mmag photometry of the Be stars η and μ Cen.
Results. In the low-inclination star μ Cen, light pollution by variable amounts of near-stellar matter prevented any new insights into the variability and other properties of the central star. In the equator-on star η Cen, BRITE photometry and Heros echelle spectroscopy from the 1990s reveal an intricate clockwork of star-disk interactions. The mass transfer is modulated with the frequency difference of two NRP modes and an amplitude three times as large as the amplitude sum of the two NRP modes. This process feeds a highamplitude circumstellar activity running with the incoherent and slightly lower so-called Štefl frequency. The mass loss-modulation cycles are tightly coupled to variations in the value of the Štefl frequency and in its amplitude, albeit with strongly drifting phase differences.
Conclusions. The observations are well described by the decomposition of the mass loss into a pulsation-related engine in the star and a viscosity-dominated engine in the circumstellar disk. Arguments are developed that large-scale gas-circulation flows occur at the interface. The propagation rates of these eddies manifest themselves as Štefl frequencies. Bursts in power spectra during mass-loss events can be understood as the noise inherent to these gas flows.

Reference: Astronomy & Astrophysics
Status: Manuscript has been accepted

Weblink: http://esoads.eso.org/abs/2016arXiv160201744B

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Luminous blue variables: An imaging perspective on their binarity and near environment

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Context: Luminous blue variables (LBVs) are rare massive stars with very high luminosity. They are characterized by strong photometric and spectroscopic variability related to transient eruptions. The mechanisms at the origin of these eruptions is not well known. In addition, their formation is still problematic and the presence of a companion could help to explain how they form.
Aims: This article presents a study of seven LBVs (about 20\% of the known Galactic population), some Wolf-Rayet stars, and massive binaries. We probe the environments that surround these massive stars with near-, mid-, and far-infrared images, investigating potential nebula/shells and the companion stars.
Methods: To investigate large spatial scales, we used seeing-limited and near diffraction-limited adaptive optics images to obtain a differential diagnostic on the presence of circumstellar matter and to determine their extent. From those images, we also looked for the presence of binary companions on a wide orbit. Once a companion was detected, its gravitational binding to the central star was tested. Tests include the chance projection probability, the proper motion estimates with multi-epoch observations, flux ratio, and star separations.
Results: We find that two out of seven of LBVs may have a wide orbit companion. Most of the LBVs display a large circumstellar envelope or several shells. In particular, HD168625, known for its rings, possesses several shells with possibly a large cold shell at the edge of which the rings are formed. For the first time, we have directly imaged the companion of LBV stars.

Reference: Astronomy & Astrophysics
Status: Manuscript has been accepted

Weblink: http://adsabs.harvard.edu/abs/2016arXiv160103542M

Comments:

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OB stars at the lowest Local Group metallicity. GTC-OSIRIS observations of Sextans A

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Context: Massive stars play an important role in the chemical and dynamical evolution of the Universe. The first metal-poor stars may have started the reionization of the Universe. To understand these early epochs it is necessary to know the behavior and the physical properties of massive stars in very metal-poor environments. We focus on the massive stellar content of the metal-poor irregular galaxy Sextans A.

Aims: Our aim is to find and classify OB stars in Sextans A, so as to later determine accurate stellar parameters of these blue massive stars in this low-metallicity region (Z $\sim$ 0.1 Zsun).

Methods: Using UBV photometry, the reddening-free index Q and GALEX imaging, we built a list of blue massive star candidates in Sextans A. We obtained low-resolution (R $\sim$ 1000) GTC-OSIRIS spectra for a fraction of them and carried out spectral classification. For the confirmed O-stars, we derived preliminary stellar parameters.

Results: The target selection criteria and observations were successful and have produced the first spectroscopic atlas of OB-type stars in Sextans A. From the whole sample of 18 observed stars, 12 were classified as early OB-types, including 5 O-stars. The radial velocities of all target stars are in agreement with their Sextans A membership, although three of them show significant deviations. We determined the stellar parameters of the O-type stars using the stellar atmosphere code FASTWIND and revisited the sub-SMC temperature scale. Two of the O-stars are consistent with relatively strong winds and enhanced helium abundances, although results are not conclusive. We discuss the position of the OB stars in the HRD. Initial stellar masses run from slightly below 20 up to 40 solar masses.

Conclusions: The target selection method worked well for Sextans A. The stellar temperatures are consistent with findings in other galaxies. Some of the targets deserve follow-up spectroscopy because of indications of a runaway nature, an enhanced helium abundance, or a relatively strong wind. We observe a correlation between HI and OB associations similar to the irregular galaxy IC 1613, confirming the previous result that the most recent star formation of Sextans A is currently ongoing near the rim of the HI cavity.

Reference: A&A
Status: Manuscript has been accepted

Weblink: http://www.aanda.org/articles/aa/abs/2016/01/aa25533-14/aa25533-14.html
http://arxiv.org/abs/1510.05408

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Herschel observations of the nebula M1-67 around the Wolf-Rayet star WR 124

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Infrared Herschel imaging and spectroscopic observations of the nebula M1-67 around the Wolf-Rayet star WR 124 have been obtained along with optical imaging observations. The infrared images reveal a clumpy dusty nebula that extends up to 1 pc. The comparison with the optical images shows that the ionized gas nebula coincides with the dust nebula, the dust and the gas being mixed together. A photodissociation region is revealed from the infrared spectroscopic analysis. The analysis of the infrared spectrum of the nebula, where forbidden emission lines of ionized elements were detected, showed that the nebula consists of mildly processed material with the calculated abundance number ratios being N/O = 1.0 +/- 0.5 and C/O = 0.46 +/- 0.27. Based on a radiative transfer model, the dust mass of the nebula was estimated to be 0.22 Msun with a population of large grains being necessary to reproduce the observations. The comparison of the mass-loss rate and the abundance ratios to theoretical models of stellar evolution led to the conclusion that the nebular ejection took place during a RSG/YSG evolutionary phase of a central star with an initial mass of 32 Msun.

Reference: A&A in press
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/1602.03422

Comments: -

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The Massive Stellar Population of W49: A Spectroscopic Survey

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Massive stars form on different scales ranging from large, dispersed OB associations to compact, dense starburst clusters. The complex structure of regions of massive star formation, and the involved short

timescales provide a challenge for our understanding of their birth and early evolution. As one of the most massive and luminous star-forming region in our Galaxy, W49 is the ideal place to study the formation of the most massive stars. By classifying the massive young stars deeply embedded into the molecular cloud of W49, we aim to investigate and trace the star formation history of this region. We analyse near-infrared K-band spectroscopic observations of W49 from LBT/LUCI combined with JHK images obtained with NTT/SOFI and LBT/LUCI. Based on JHK-band photometry and K-band spectroscopy the massive stars are placed in a Hertzsprung Russell diagram. By comparison with evolutionary models, their age and hence the star formation history of W49 can be investigated. Fourteen O type stars as well as two young stellar objects (YSOs) are identified by our spectroscopic survey. Eleven O-stars are main sequence stars with subtypes ranging from O3 to O9.5, with masses ranging from ~ 20 $M_{\odot}$ to ~ 120 $M_{\odot}$. Three of the O-stars show strong wind features, and are considered to be Of-type supergiants with masses beyond 100 $M_{\odot}$. The two YSOs show CO emission, indicative for the presence of circumstellar disks in the central region of the massive cluster. The age of the cluster is estimated as ~1.5 Myr, with star formation still ongoing in different parts of the region. The ionising photons from the central massive stars have not yet cleared the molecular cocoon surrounding the cluster. W49 is comparable to extragalactic star-forming regions and provides us with an unique possibility to study a starburst in detail.

Reference: article to be published in A&A
Status: Manuscript has been accepted

Weblink: http://arxiv.org/pdf/1602.05190v1.pdf

Comments: 16 pages, 8 figures, 5 tables

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Line-driven ablation of circumstellar disks: I. Optically thin decretion disks of classical Oe/Be stars

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The extreme luminosities of hot, massive stars drive strong stellar winds through UV line-scattering. For OB stars with an orbiting circumstellar disk, we explore the effect of such line-scattering in ablating disk material, initially focusing on the marginally optically thin decretion disks of classical Oe and Be stars. For this we apply a multi-dimensional radiation-hydrodynamics code, assuming optically thin ray tracing for the stellar continuum and a multi-ray Sobolev treatment of the line transfer. This accounts for desaturation of line-absorption by Keplerian shear in the disk, and associated driving by non-radial photons. Results show dense, intermediate-speed surface ablation, consistent with the strong, blue-shifted absorption seen in UV wind lines of Be shell stars. The asymptotic ablation rate is typically an order-unity factor times the stellar wind mass loss rate, leading to disk destruction times of order months to years for Be disks, consistent with observations. The much stronger radiative forces of O stars reduce this time to order days, making sustaining a disk difficult, and so providing a natural explanation for the rarity of Galactic Oe stars. Additionally, the weakened line-driving at lower metallicity implies both a reduction in the winds that help spin-down stars from near-critical rotation, and in the ablation of decretion disks, thus providing a natural explanation for the higher fraction of Classical Be stars, and the presence of Oe stars,

in the Magellanic Clouds. We conclude with a discussion of future extensions to study line-driven ablation of denser, optically thick, accretion disks around pre-main-sequence massive stars.

Reference: Article to be Published in MNRAS
Status: Manuscript has been accepted

Weblink: http://arxiv.org/pdf/1602.07874v1.pdf

Comments: 14 pages, 20 figures, 7 tables

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Analysis of the WN star WR 102c, its WR nebula, and the associated cluster of massive stars in the Sickle Nebula

The massive Wolf-Rayet type star WR 102c is located near the Quintuplet Cluster - one of the three massive star clusters in the Galactic Center region. Previous studies indicated that WR 102c may have a dusty circumstellar nebula and is among the main ionizing sources of the Sickle Nebula associated with the Quintuplet cluster. We obtained observations with the ESO's VLT integral field spectrograph SINFONI in the K-band, extracted the stellar spectra, and analyzed them by means of stellar atmosphere models. Our new analysis supersedes the results reported for WR 102c previously. We significantly revise down its bolometric luminosity and hydrogen content. We detect four early OB type stars close to WR 102c. These stars have radial velocities similar to that of WR 102c. We suggest that together with WR 102c these stars belong to a distinct star cluster with a total mass of about 1000 M_sun. We identify a new WR nebula around WR 102c in the SINFONI map of the diffuse Brγ emission and in the HST's Paα images. The Brγ line at different locations is not significantly broadened and similar to the width of nebular emission elsewhere in the H II region around WR 102c. The massive star WR 102c located in the Galactic Center region resides in a star cluster containing further early type stars. The stellar parameters of WR 102c are typical for hydrogen-free WN6 stars. We newly identify a nebula surrounding WR 102c that has a morphology similar to other nebulae around hydrogen-free WR stars, and propose that the formation of this nebula is linked to interaction of the fast stellar wind with the matter ejected at previous evolutionary stage of WR 102c.

Weblink: http://arxiv.org/abs/1601.03395

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JOBS

Two Faculty Positions in Astrophysics at Instituto de Astrofisica de Atacama, Copiapo (Chile)

Mauro Barbieri

Universidad de Atacama
Copayapu 485, Copiapo, Chile
http://www.uda.cl

The Instituto de Astrofisica de Atacama (IAA) at the Universidad De Atacama (UDA) in Copiapo (Chile) invites applications for two faculty positions to join the IAA team.
The successful candidates will join a group of five faculty working on a broad range of research topics and will have access to the Chilean Time in a broad array of facilities, including ALMA, VLT, Gemini, Magellan, LSST, GMT and the E-ELT.

We are particularly interested in candidates with strong experience in one or more of these fields:

-Origin, structure and evolution of planets, satellites, and minor bodies in the Solar System;
-Extrasolar Planets;
-Formation, structure and evolution of stars;
-Milky Way: stellar populations, star clusters, variable stars, galactic structure;
-Terrestrial Mars analogs;
-Astrobiology.

The positions carry teaching duties in astronomy at the undergraduate level, with a load of 6h per week. The working language is English. While knowledge of Spanish is not required (teaching can be done in English), the successful candidates are expected to teach in Spanish within two years.
The appointment at UDA will be for three years, with a first probation year, and the position is further extendable subject to performance.

Applicants should have a PhD in astronomy or physics or related sciences completed at least 3 years prior to the starting day of the contract.

To receive full consideration, applications must be sent by Friday 18 of March 2016, although the positions will remain open until filled. Start date is expected to be October 2016.

Applications must be submitted by e-mail to Mauro Barbieri (mauro.barbieri @ uda.cl), and they should include:
1) Cover letter,
2) Curriculum Vitae,
3) List of publications,
4) Statement of recent research achievements (max. 2 pages),
5) An outline of future research (min. 2 pages, max. 10 pages),
6) The contact details of three referees (one needs to be the last employer, the others needs to be aware of the recent work of the candidate).

Questions may be addressed to the previous e-mail address.

Relevant links:

Universidad de Atacama
http://www.uda.cl

Instituto de Astrofisica de Atacama
https://sites.google.com/site/grupoastrouda

Convocatoria Programa de Insercion de Investigadores en la UDA
http://www.vrip.uda.cl/frontend/noticia_completa/104

Weblink: http://eas.unige.ch/jobs.jsp?id=671

Email: mauro.barbieri@uda.cl

Deadline: 18 March 2016 (positions will remain open until filled)

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11 postdoc positions at Instituto de Astrofisica de Canarias

Dr. Enric Palle, IAC Research Head

Instituto de Astrofisica de Canarias
C/ Via Lactea s/n
E-38205 La Laguna, Tenerife
Spain

The IAC offers 11 postdoc positions in the frame of the Severo Ochoa program for excellence research centers in Spain.
Some of the positions are for five years (so-called Severo Ochoa Advanced Fellowships).
The positions cover many different fields in Astrophysics.

Attention/Comments: see the link below for details of each position

Weblink: http://www.iac.es/info.php?op1=26&lang=en

Email: corinv@iac.es

Deadline: may 31, 2016 or july 31, 2016

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Postdoctoral position on Gaia and massive stars

Dr. Eric Gosset and Prof. Gregor Rauw

Institute of Astrophysics and Geophysics
Quartier Agora, Batiment B5c
Allee du 6 Aout, 19c
4000 Liege
Belgium

The High-Energy Astrophysics Group (http://www.gaphe.ulg.ac.be/index_e.html) of the Department of Astrophysics, Geophysics and Oceanography (http://www.ago.ulg.ac.be/index_e.php) of the University of Liege (Belgium) is offering a postdoctoral position to participate in the development of projects related to massive stars and the ESA cornerstone mission Gaia. The position is funded by Concerted Research Actions (ARC) programme.

The High-Energy Astrophysics Group (GAPHE) carries out a variety of research projects aiming at studying single and binary massive stars (OB, Wolf-Rayet, Luminous Blue Variables, ...) and the interactions with their environment based on data obtained with world-class, space-borne (XMM, Chandra, ...) or ground-based (ESO, ...) facilities.

The Gaia satellite is currently performing an all-sky survey providing astrometry and photometry for about one billion stars, and spectroscopy for a subsample. The first data are due to be released to the whole community in summer 2016. This release will include parallaxes and proper motions of unprecedented accuracy for about 2.5 million bright sources (see http://www.cosmos.esa.int/web/gaia/release), among which a large number of massive stars. On the other hand, members of the GAPHE are involved in the Gaia-ESO survey (https://www.gaia-eso.eu/), whose main goal is to complement the Gaia data by providing precise chemical abundances. As part of this survey, spectroscopic data are being collected for numerous hot stars in young open clusters (Carina Nebula, ...).

The successful candidate will develop projects making use of the data for hot stars from the first (2016) and second (2017) Gaia data releases. In parallel, he/she is expected to analyse the data for OB stars obtained by the Gaia-ESO survey, with a particular emphasis on the determination of the atmospheric parameters, chemical composition and wind properties.

Applicants with interest and previous experience in massive star research are invited to apply. Expertise in the determination of fundamental parameters and abundances of massive stars, analysis of spectroscopic data, knowledge of model atmosphere codes for hot stars (CMFGEN, TLUSTY, ...) and astronomical softwares (IRAF, MIDAS, ...) are an advantage but are not mandatory.

Applicants should have a record of publications in peer-reviewed journals, demonstrated creativity, independence, high motivation, good communication skills, and the ability to work independently as well as in collaboration with other members of our research group.

The appointment is initially for one year with a possible extension for a second year subject to funding and performance. The starting date is negotiable but preferably before June 1st, 2016. To be eligible, the applicant should not have lived or worked in the 'Federation Wallonie-Bruxelles' for more than 24 months over the last three years. The salary is on the official Belgian public employee pay scale for a young Post-Doc. Funding for travel and research equipment is available.

Interested persons should send their application material including a curriculum vitae, a summary (one page at most) of past and current research activities, a letter of interest, a full publication list and a list of three reference persons by e-mail to: Eric Gosset/Gregor Rauw, Institute of Astrophysics and Geophysics, Quartier Agora, Batiment B5c, Allee du 6 Aout, 19c, 4000 Liege, Belgium (e-mail: gosset@astro.ulg.ac.be, rauw@astro.ulg.ac.be). The application deadline is May 1st, 2016. For any further inquiry, please e-mail: gosset@astro.ulg.ac.be.

Weblink:http://www.ago.ulg.ac.be/Edu/Jobs/Job_54.pdf

Email:gosset@astro.ulg.ac.be

Deadline: May 1st, 2016

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MEETINGS

Bridging the gap: from massive stars to supernovae

1-2 June 2016

Venue: Kavli Royal Society Centre, Chicheley Hall, England

Synopsis: The few seconds it takes to explode a massive star separate millions of years of stellar evolution from thousands of years of supernova evolution. In this meeting, we will discuss massive stars both before and after the explosion, from theoretical and observational perspectives, addressing how the pre-collapse life affects the explosion mechanism and supernova display.

Invited Speakers:
Selma De Mink, Raphael Hirschi, Philipp Podsiadlowski, Jose Groh, Phillip Massey, Nathan Smith, Jorick Vink, Ben Davies, Sean Couch, Luc Dessart, Dan Kasen, Claes Fransson, Avishay Gal-Yam, Maryam Modjaz, Ferdinando Patat

Organisers:
Justyn Maund, Paul Crowther, Hans-Thomas Janka and Norbert Langer

Attending this event:
Interested participants should request an invitation to attend by Monday 29 February 2016. All requests will be reviewed by the scientific organisers and attendance is at their discretion. Successful applicants will be sent a link to register for the meeting.

Call for contributions (oral/posters) – deadline Monday 29 February 2016: Participants are invited to submit an abstract for consideration for either a 15 minute contributory talk (12 mins presentation + 3 mins for questions), or a poster. To apply to make a contribution to the programme, please email a title and short abstract (200-250 words), and specify if you would like your submission to be considered for a contributory talk or poster. If submitting an abstract for a poster, please include the proposed presenter and list of authors. This must be received by Monday 29 February 2016.

This is a residential conference, which allows for increased discussion and networking. It is free to attend, however, participants need to cover travel, accommodation and catering costs.

Weblink: https://royalsociety.org/events/2016/06/massive-stars/

Email: kavli.events@royalsociety.org

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Frontiers of massive-star evolution and core-collapse supernovae

6-8 July, 2016

Venue: European Week of Astronomy and Space Sciences (EWASS), Athens, Greece

Dear colleagues,

We are pleased to announce the symposium (S16) “Frontiers of massive-star evolution and core-collapse supernovae”, that will be held at the European Week of Astronomy and Space Science (EWASS) in Athens, Greece, between 4-8 July 2016. This will be a three-day symposium (6-8 July) focusing on both massive star evolution and core-collapse SNe.

We aim to bring together observers and theoreticians whose diverse interests are related to how massive stars evolve and die as core-collapse supernovae. We particularly hope to foster collaboration between observers and theoriticians by having a programme that is balanced between observational and theoretical work. Recent surveys such as Pan-STARRS, the Palomar Transient Factory, and PESSTO have led to a revolution in the number and types of supernovae detected, a trend that will accelerate in future large surveys such as Euclid and LSST. Better observational data has led to equally strong progress in theoretical stellar evolution, and modelling of stellar winds and supernovae. (see the poster attached)

Our goal is to discuss recent developments and the most pressing challenges in massive star evolution and SNe. We also intend to identify future avenues to explore in an open discussion session led by the organizers. Topics that will be discussed in this symposium include:

- Latest observational constraints on mass loss in massive stars
- Massive star evolution and mass loss
- Effects of binarity and multiplicity in massive star evolution
- Supernova progenitors, interacting supernovae and impostors
- Theoretical modelling of supernova light curves and spectra
- Superluminous supernovae and other peculiar explosions

Invited Speakers:
Selma de Mink (Amsterdam)
Miriam Garcia (Madrid)
Raphael Hirschi (Keele)
Raffaella Margutti (NYU)
Sergei Blinnikov (Moscow)
Andrea Pastorello (Padua)

We welcome applications for contributed talks and posters. The deadline for abstract submission is March 15. You can submit your abstract at http://eas.unige.ch/EWASS2016/abstract_submission.jsp. Information about the registration and fees is at http://eas.unige.ch/EWASS2016/registration.jsp

Please take notice of the rich scientific program of the EWASS 2016 at http://eas.unige.ch/EWASS2016/program.jsp In particular, we highlight that science related to massive stars and supernovae will also be discussed at S14: New Classes and Unique Events in Time Domain Astronomy.

Please forward this email to interested colleagues.

Useful links:
EWASS webpage, including general information on venue, etc:
http://eas.unige.ch/EWASS2016/index.jsp
Symposium webpage: http://eas.unige.ch/EWASS2016/session.jsp?id=S16

Scientific Organisers:
Morgan Fraser (University of Cambridge)
Jose Groh (Trinity College Dublin)
Cosimo Inserra (Queen's University Belfast)
Anders Jerkstrand (Queen's University Belfast)

Jorick Vink (Armagh Observatory)

We apologise if you receive this email more than once.

We are looking forward to see you in Athens!

Weblink: http://eas.unige.ch/EWASS2016/session.jsp?id=S16

Email: jose.groh@unige.ch

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Supernova Remnants: An Odyssey In Space After Stellar Death

June 6-11, 2016

Venue: Chania, Crete, Greece

3rd Announcement of the Conference

Registration is open and the deadline for abstract submission is March 4, 2016. To register, please follow the "Register" button on the website: http://snr2016.astro.noa.gr

We encourage delegates to:
(a) book accommodation well in advance as hotels impose strict release dates for reservations and there is a limited number of rooms available. After these dates no guarantee can be made that rooms will be available.
(b) book their flight-tickets to Chania well in advance since it is a very touristic destination and the cost becomes very high within the last 2 months.

For both (a) and (b) you can find more information below.

Background and Scientific Rationale

The meeting “Supernova Remnants: An Odyssey in Space after Stellar death” will explore the exciting recent observational and theoretical progress in the structure, evolution and physics of SNRs. The Institute for Astronomy, Astrophysics, Space Applications & Remote Sensing of the National Observatory of Athens, invites you to the beautiful island of Crete, the home of many well known myths, i.e. of Deadalus and Icarus, Theseus and the Minotaur, the birth of Zeus.

The conference will build upon spectral and imaging observations from radio to gamma-ray wavelengths of SNR blast waves, pulsar wind nebulae and SN ejecta and their interpretation through models and numerical simulations. The goals of the meeting are understanding the evolution of SNRs and their interaction with interstellar gas, elucidating the physical processes that govern shock waves and relativistic plasmas, and inferring characteristics of supernova explosions from SNR observations.

We will focus on narrowing the gap between observations and theories with the help of powerful new instrumentation such as hard X-ray and gamma-ray satellites, large optical telescopes, and sub-mm and low-frequency radio arrays on the one hand, and increasingly detailed and realistic numerical simulations on the other. New understanding of the nature of supernova remnants and processes that occur there offers new insights into the role of SNRs in the structure and evolution of galaxies and the nature of supernova explosions.

Looking forward to seeing you in Crete!

Scientific Topics & Session Chairs

* Radiation studies from gamma-rays to radio in Galactic and Extragalactic SNRs (D. Green)
* The search for the binary companions of SN progenitors in SNRs (W. Blair)
* Pulsar winds nebulae (including Crab flares) (P. Slane)
* Magnetic fields in SNRs and PWNe (R. Kothes)
* Collisionless shock waves in SNRs (A. Decourcelle)
* Jets and Asymmetries in SNe and their Remnants (R. Fesen)
* SNRs as probes and drivers of galaxy structure (A. Rest)
* SNe and SNRs cosmic ray acceleration (T. Bell)
* SN ejecta – abundances, clumpiness (K. Borkowski)
* SNe and SNRs with circumstellar interactions (J. Raymond)

Invited Speakers (confirmed)

R. Chevalier (USA - Opening plenary talk), J. Vink (Netherlands – Summary plenary talk), E. Amato (Italy), C. Badenes (USA), G. Dubner (Argentina), P. Ghavamian (USA), W. Kerzendorf (Canada), S-H. Lee (Japan), M. Lemoine-Goumard (France), I. Leonidaki (Greece), L. Lopez (USA), R. McCray (USA), D. Milisavljevic (USA), D. Patnaude (USA), W. Reich (Germany), S. Reynolds (USA), S. Safi-Harb (Canada), N. Soker (Israel), A. Spitkovsky (USA), T. Temim (USA), S. Van Dyk (USA), B. Williams (USA)

Important Dates:

2016 March 04 Deadline for abstract submission for contributed talks
2016 April 01 Notification on selected abstracts for oral presentations
2016 April 08 Deadline for early registration and payment (€350)
2016 April 08 Deadline for abstract submission for posters
2016 May 03 Deadline for hotel reservation with guaranteed special meeting prices
2016 May 13 Deadline for late registration and payment (€400)
2016 June 05 On-site registration opens (€450 – payment in cash only)
2016 June 06 The conference starts

Registration

Online registration by all participants, including invited speakers, SOC and LOC members is mandatory. Participants need to complete (or update if already registered) the registration form to submit poster or contributed talk abstracts.

The meeting registration fee will be € 350 and includes the welcome reception, 4 lunches and coffee breaks, providing the payment is received by April 08th, 2016. Beyond this date a late registration fee of € 400 will be charged.

We are planning the following social events-excursions:

(a) a welcome reception (Sunday, June 5th)
(b) an afternoon excursion to the Town of Chania (Wednesday, June 8th)
(c) a conference banquet (Thursday, June 9th)
(d) a full day Boat Excursion to Gramvousa and Balos (Saturday, June 11th)

More information on these events can be found on the conference website. Please note that the cost of the conference banquet and excursions are not covered by the registration fee.

Participants are expected to arrive in Chania by Sunday, June 5th and to depart from Chania not earlier

than Saturday, June 11th.

Venue & Accommodation

The meeting will take place at the luxury 5* beachside hotel Minoa Palace Luxury Resort & Spa, situated in the cosmopolitan area of Platanias, 12 km west of the picturesque town of Chania and only a 30 min drive from Chania International Airport. Instructions for reaching the hotel can be found here.

The Local Organizing Committee has secured rooms at special rates for our meeting attendees at a number of hotels apart the main conference hotel. All reservations must be made directly with the hotels through their special link.

We invite interested participants to visit the conference website for more information:
http://snr2016.astro.noa.gr

Scientific Organizing Committee

P. Boumis (co-chair), J. Raymond (co-chair), T. Bell, W. Blair, K. Borkowski, A. Decourchelle, R. Fesen, D. Green, R. Kothes, A. Rest, P. Slane

Local Organizing Committee

P. Boumis (co-chair), A. Bonanos (co-chair), D. Abartzi, S. Akras, A. Chiotellis, M. Kopsacheili, M. Kourniotis, I. Leonidaki, A. Manousakis, M. Pliatsika, Z.T. Spetsieri, S. Williams

Weblink: http://snr2016.astro.noa.gr/

Email: bonanos@noa.gr

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Potsdam Astrophysical Summer School "Quantitative Spectroscopy in Astrophysics"

20th - 24th June 2016

Venue: Leibniz Institute for Astrophysics Potsdam (AIP), Potsdam, Germany

Spectroscopy is a universal tool used in modern Astrophysics, from solar physics to the high-redshift Universe. Essential for the study of most astrophysical phenomena, uses of spectroscopy are manifold:

- Solar physics: probing solar activity
- Stellar physics: characterizing stellar parameters, the ambient medium, stellar activity and evolution
- Interstellar and intergalactic medium: understanding the composition by emission and absorption processes
- Galaxies and their kinematics: studying the evolution of the Milky Way and the Universe on cosmological scales
- Exoplanets: unveiling their atmospheres

... and many more

The Leibniz Graduate School for Quantitative Spectroscopy in Astrophysics will host the Potsdam Astrophysical Summer School at the Leibniz Institute for Astrophysics Potsdam (AIP) from June 20th to

24th, 2016.

Invited are interested graduate students in Physics or Astrophysics to join a week of lectures and hands-on exercises given by experienced scientists in their fields from the AIP and the University of Potsdam.

Participants will get an insight into state-of-the-art research via the recent progress in quantitative spectroscopy both in theoretical methods and observational techniques. No matter which field you are interested in, learning the techniques to extract information from spectra and couple this information with dedicated models to gain quantitative insights is vital to start a scientific career in modern Astrophysics.

For more information please see the website: https://meetings.aip.de/pass/

Registration is open now till March 31st, 2016.

For inquiries please send an email to pass2016@aip.de .

The Leibniz Graduate School for Quantitative Spectroscopy in Astrophysics is a collaborative project of the Leibniz Institute for Astrophysics Potsdam (AIP) and the Institute of Physics and Astronomy of the University of Potsdam (UP).

Weblink: https://meetings.aip.de/pass/

Email: pass2016@aip.de

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