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⋆

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http://www.astroscu.unam.mx/massive_stars
http://www.star.ucl.ac.uk/∼hsn/index.html
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Working Group Matters

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Accepted Papers

AG Carinae: a Luminous Blue Variable with a high rotational velocity

J. H. Groh (1,2), D. J. Hillier (2), A. Damineli (1)

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We report the detection of broad absorptions due to Si IV 4088-4116 A in the Luminous Blue Variable (LBV) AG Carinae during its last hot phase (2001-2003). Our NLTE spectral analysis, with the

radiative transfer code CMFGEN, revealed the photospheric nature of these lines predicting, however, much narrower and deeper absorption profiles than observed. Using a recently-developed code to compute synthetic spectra in 2D geometry allowing for the effects of rotation, we could match the broad absorptions with a high projected rotational velocity of 190 +/- 30 km/s on 2001 April. Analysis of spectra obtained on 2002 March and 2003 January, when the star was cooling, yielded to a projected rotational velocity of 110 +/- 10 km/s and 85 +/- 10 km/s, respectively. The derived rotational velocities are proportional to R^{-1}, as expected from angular momentum conservation. We discuss the effects of such high rotation on the spectral analysis of AG Car, and on the wind terminal velocity. Our results show direct spectroscopic evidence, for the first time, that a LBV may rotate at a significant fraction of its break-up velocity. Thus, AG Car (and possibly other LBVs) is indeed close to the Gamma-Omega limit, as predicted by theoretical studies of LBVs.

Reference: Accepted for ApJ Letters
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/astro-ph/0512372

Comments: 15 pages, 4 figures

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A Rich Population of X-ray Emitting Wolf-Rayet Stars in the Galactic Starburst Cluster Westerlund 1

S.L. Skinner [1], A.E. Simmons [1], S.A. Zhekov [2], M. Teodoro [3], A. Damineli [3] & F. Palla [4]

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Recent optical and infrared studies have revealed that the heavily-reddened starburst cluster Westerlund 1 (Wd 1) contains at least 22 Wolf-Rayet (WR) stars, comprising the richest WR population of any galactic cluster. We present results of a sensitive Chandra X-ray observation of Wd 1 which detected 12 of the 22 known WR stars and the mysterious emission-line star W9. The fraction of detected WN stars is nearly identical to that of WC stars. The WN stars WR-A and WR-B as well as W9 are exceptionally luminous in X-rays and have similar hard heavily-absorbed X-ray spectra with strong Si XIII and S XV emission lines. The luminous high-temperature X-ray emission of these three stars is characteristic of colliding wind binary systems but their binary status remains to be determined.

Reference: ApJL, in press
Status: Manuscript has been accepted

Weblink: astro-ph/0601550

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A Survey of Local Group Galaxies Currently Forming Stars. I. UBVRI Photometry of Stars in M31 and M33

Philip Massey, K. A. G. Olsen, Paul W. Hodge, Shay B. Strong, George H. Jacoby, Wayne Schlingman, and R. C. Smith

Massey: Lowell Observatory; Olsen and Smith: CTIO/NOAO; Hodge: Univ. of Washington; Strong: Univ of Texas; Jacoby: WIYN Obs; Schlingman: Univ of Arizona

We present UBVRI photometry obtained from Mosaic images of M31 and M33 using the KPNO 4-m telescope. We describe our data reduction and automated photometry techniques in some detail, as we will shortly perform a similar analysis of other Local Group galaxies. The present study covered 2.2 square degrees along the major axis of M31, and 0.8 square degrees on M33, chosen so as to include all of the regions currently active in forming massive stars. We calibrated our data using data obtained on the Lowell 1.1-m telescope, and this external method resulted in millimag differences in the photometry of overlapping fields, providing some assurance that our photometry is reliable. The final catalog contains 371,781 and 146,622 stars in M31 and M33, respectively, where every star has a counterpart in (at least) the B, V and R passbands. Our survey goes deep enough to achieve 1-2% photometry at 21st magnitude (corresponding to stars more massive than 20Mo) and achieves <10% errors at U B V R I 23rd mag. Although our typical seeing was only modest (0.8-1.4", median 1.0") by some standards, we find excellent correspondence between our catalog sources and those we see in our HST ACS data for OB48, a crowded region in M31. We compare our final photometry with those of others, and find good agreement with the CCD catalog of M31 stars by Magnier et al., although our study covers twice the area and goes about 2 mags deeper. The photographic studies of others fare less well, particularly at the faint end in V, where accurate background subtraction is needed for good photometry. We provide cross references to the stars confirmed as members by spectroscopy, and compare the location of these to the complete set in color-magnitude diagrams. While follow up spectroscopy is needed for many projects, we demonstrate the success of our photometry in being able to distinguish M31/M33 members from foreground Galactic stars. Finally, we present the results of a single night of spectroscopy on the WIYN 3.5-m telescope examining the brightest likely members of M31. The spectra identify 34 newly confirmed members, including B-A supergiants, the earliest O star known in M31, and two new Luminous Blue Variable candidates whose spectra are similar to that of P Cygni.

Reference: Astronomical Journal, in press
Status: Manuscript has been accepted

Weblink: http://www.lowell.edu/users/massey/M3133.pdf.gz

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Discovery of an Extraordinarily Massive Cluster of Red Supergiants

Donald F. Figer, John MacKenty, Massimo Robberto, Kester Smith, Francisco Najarro, Rolf P. Kudritzki, and Artemio Herrero

RIT, STScI, STScI, STScI, CSIC, UH, IAC

We report the discovery of an extraordinarily massive young cluster of stars in the Galaxy, having an inferred total initial cluster mass comparable to the most massive young clusters in the Galaxy.

Using *IRMOS*, *2MASS*, and *Spitzer* observations, we conclude that there are 14 red supergiants in the cluster, compared with five, in what was previously thought to be the richest Galactic cluster of such stars. We infer spectral types from near-infrared spectra that reveal deep CO bandhead absorption that can only be fit by red supergiants. We identify a gap of $\Delta K_s \sim 4$ magnitudes between the stars and the bulk of the other stars in the region that can only be fit by models if the brightest stars in the cluster are red supergiants. We estimate a distance of 5.8 kpc to the cluster by associating an OH maser with the envelope of one of the stars. We also identify a "yellow" supergiant of G6 I type in the cluster. Assuming a Salpeter IMF, we infer an initial cluster mass of 20,000 to 40,000 $M_{\odot}$ for cluster ages of 7-12 Myr. Continuing with these assumptions, we find 80% of the intial mass and 99% of the number of stars remain at the present time. We associate the cluster with an x-ray source (detected by *ASCA* and *Einstein*), a recently discovered very high energy γ-ray source (detected by *INTEGRAL* and *HESS*), and several non-thermal radio sources, finding that these objects are likely related to recent supernovae in the cluster. In particular, we claim that the cluster has produced at least one recent supernova remnant with properties similar to the Crab nebula. It is not unlikely to find such a source in this cluster, given our estimated supernova rate of one per 40,000 to 80,000 *yr*.

Reference: ApJ
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/astro-ph/0602146

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Confidence limits of evolutionary synthesis models IV. Moving forward to a probabilistic formulation.

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Context: Synthesis models predict the integrated properties of stellar populations. Several problems exist in this field, mostly related to the fact that integrated properties are distributed. To date, this aspect has been either ignored (as in standard synthesis models, which are inherently deterministic) or interpreted phenomenologically (as in Monte Carlo simulations, which describe distributed properties rather than explain them).

Aims: This paper presents a method of population synthesis that accounts for the distributed nature of stellar properties.

Methods: We approach population synthesis as a problem in probability theory, in which stellar luminosities are random variables extracted from the stellar luminosity distribution function (sLDF).

Results: With standard distribution theory, we derive the population LDF (pLDF) for clusters of any size from the sLDF, obtaining the scale relations that link the sLDF to the pLDF. We recover the predictions of standard synthesis models, which are shown to compute the mean of the luminosity function. We provide diagnostic diagrams and a simplified recipe for testing the statistical richness of observed clusters, thereby assessing whether standard synthesis models can be safely used or a statistical treatment is mandatory. We also recover the predictions of Monte Carlo simulations, with the additional bonus of being able to interpret them in mathematical and physical terms. We give examples of problems that can be addressed through our probabilistic formalism: calibrating the SBF

method, determining the luminosity function of globular clusters, comparing different isochrone sets, tracing the sLDF by means of resolved data, including fuzzy stellar properties in population synthesis, among others. Additionally, the algorithmic nature of our method makes it suitable for developing analysis tools for the Virtual Observatory.

Conclusions: Though still under development, ours is a powerful approach to population synthesis. In an era of resolved observations and pipelined analyses of large surveys, this paper is offered as a signpost in the field of stellar populations.

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

Weblink: http://arxiv.org/abs/astro-ph/0504483

Comments: Substantially modified with respect to the original version.

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The Discovery of a P Cygni Analog in M31

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We present spectroscopy and discuss the photometric history of a previously obscure star in M31. The spectrum of the star is an extremely close match to that of P Cygni, one of the archetypes of Luminous Blue Variables (LBVs). The star has not shown much variability over the past 40 years (<0.2 mag), although small-scale (0.05 mag) variations over a year appear to be real. Nevertheless, the presence of a sub-arcsecond extension around the star is indicative of a past outburst, and from the nebula's size (0.5 pc diameter) we estimate the outburst took place roughly 2000 yrs ago. P Cygni itself exhibits a similar photometric behavior, and has a similar nebula (0.2 pc diameter). We argue that this may be more typical behavior for LBVs than commonly assumed. The star's location in the HR diagram offers substantial support for stellar evolutionary models that include the effects of rotation, as the star is just at a juncture in the evolutionary track of a 85Mo star. The star is likely in a transition from an O star to a late-type WN Wolf-Rayet.

Reference: ApJ (Letters), in press
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/astro-ph/0601102

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On the reliability of CIV 1549 as an abundance indicator for high redshift star-forming galaxies

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We reconsider the use of the equivalent width of CIV 1549, EW(CIV), as an indicator of the oxygen abundance in star-forming galaxies, as proposed by Heckman et al. for nearby starbursts. We refine the local calibration of EW(CIV) vs. log (O/H) by using a restricted wavelength window which minimises

blending with interstellar absorption lines. When applied to the stellar component only of the complex CIV 1549 features in two high redshift galaxies with good quality spectra, MS1512-cB58 (z = 2.7268) and Q1307-BM1163 (z = 1.4105), the local calibration gives values of the oxygen abundance which are in good agreement with other metallicity determinations based on nebular emission and interstellar absorption lines. Our main conclusion is that for this method to give reliable results at high redshifts, it should only be used on data of sufficiently high spectral resolution (R > 1000) for stellar and interstellar CIV components to be clearly separated. Oxygen abundances will be systematically overestimated if the local calibration is applied to spectra of high-z galaxies obtained with the low resolving powers (R 200-300) of many current wide field surveys. It will also be necessary to understand better the causes of the scatter in the local relation, before we can be confident of inferences from it at high z.

Reference: MNRAS in press
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/astro-ph/0602188

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How extreme are the Wolf-Rayet clusters in NGC3125?

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We reinvestigate the massive stellar content of NGC3125 (Tol3) using VLT/FORS1 imaging & spectroscopy, plus archival VLT/ISAAC, HST/FOC and HST/STIS datasets. Narrow-band imaging confirms that A and B knots represent the primary sites of Wolf-Rayet (WR) stars, whilst HST imaging reveals that both regions host multiple clusters. Clusters A1 + A2 within region A host WR stars. altough is not clear which cluster within region B hosts WR stars. Nebular properties infer an LMC-like metallicity. LMC template WN5-6 & WC4 spectra are matched to the observed optical WR bumps of A1 and B, permitting the contribution of WC stars to the blue bump to be quantified. We obtain N(WN5-6:WC4)=105:20, 55:0, 40:20 for clusters A1, A2 and B1+B2, a factor of 3 lower than optical studies, as a result of a lower E(B-V). Using Starburst99 models to estimate O star populations for individual clusters, we find N(WR)/N(O)=0.2 for A1 and 0.1 for A2 and B1+B2. From Halpha imaging, the O star content of the Giant HII regions A and B is found to be a factor of 5-10 times higher than that derived spectroscopically for the UV/optically bright clusters, suggesting that NGC3125 hosts optically obscured young massive clusters, further supported by VLT/ISAAC K band imaging. Archival HST/STIS UV spectroscopy confirms the low E(B-V) towards A1, for which we have determined an SMC extinction law, in preference to an LMC or starburst law. We obtain N(WN5-6)=110 from the slit-loss corrected HeII 1640 line flux, in excellent agreement with optical result. However, this is a factor of 35 times lower than that inferred from the same dataset by Chandar et al. due to their use of a starburst extinction law. Highly discrepant stellar populations may result in spatially resolved star forming regions from UV and optical studies through use of different extinction laws.

Reference: 12 pages, MNRAS in press
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/astro-ph/0602591

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Wind signatures in the x-ray emission line profiles of the late O supergiant zeta Orionis

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X-ray line profile analysis has proved to be the most direct diagnostic of the kinematics and spatial distribution of the very hot plasma around O stars. In this paper we apply several analysis techniques to the emission lines in the Chandra HETGS spectrum of the late-O supergiant zeta Ori (O9.7 Ib), including the fitting of a simple line-profile model. We show that there is distinct evidence for blue shifts and profile asymmetry, as well as broadening in the X-ray emission lines of zeta Ori. These are the observational hallmarks of a wind-shock X-ray source, and the results for zeta Ori are very similar to those for the earlier O star, zeta Pup, which we have previously shown to be well-fit by the same wind-shock line-profile model. The more subtle effects on the line-profile morphologies in zeta Ori, as compared to zeta Pup, are consistent with the somewhat lower density wind in this later O supergiant. In both stars, the wind optical depths required to explain the mildly asymmetric X-ray line profiles imply reductions in the effective opacity of nearly an order of magnitude, which may be explained by some combination of mass-loss rate reduction and large-scale clumping, with its associated porosity-based effects on radiation transfer. In the context of the recent reanalysis of the helium-like line intensity ratios in both zeta Ori and zeta Pup, and also in light of recent work questioning the published mass-loss rates in OB stars, these new results indicate that the X-ray emission from zeta Ori can be understood within the framework of the standard wind-shock scenario for hot stars.

Reference: to appear in MNRAS
Status: Manuscript has been accepted

Weblink: http://astro.swarthmore.edu/∼cohen/Papers/cohen_zori_lprofiles_mnras_2006.pdf

Comments: 16 pages, including 4 tables and 6 figures

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C II abundances in early-type stars: solution to a notorious non-LTE problem

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We address a long-standing discrepancy between non-LTE analyses of the prominent C II 4267 and 6578/82 A multiplets in early-type stars. A comprehensive non-LTE model atom of C II is constructed based on critically selected atomic data. This model atom is used for an abundance study of six apparently slow-rotating main-sequence and giant early B-type stars. High-resolution and high-S/N spectra allow us to derive highly consistent abundances not only from the classical features but also from up to 18 further C II lines in the visual - including two so far unreported emission features equally well reproduced in non-LTE. These results require the stellar atmospheric parameters to be

determined with care. A homogeneous (slightly) sub-solar present-day carbon abundance from young stars in the solar vicinity (in associations and in the field) of log C/H +12= 8.29+/-0.03 is indicated.

Reference: 2006,ApJ, 639, L39
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/astro-ph/0602342

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Submitted Papers

Centrifugal Breakout of Magnetically Confined Line-Driven Stellar Winds

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We present 2D MHD simulations of the radiatively driven outflow from a rotating hot star with a dipole magnetic field aligned with the star's rotation axis. We focus primarily on a model with moderately rapid rotation (half the critical value), and also a large magnetic confinement parameter, $\eta_* \equiv B_*^2 R_*^2/\dot{M}V_\infty = 600$. The magnetic field channels and torques the wind outflow into an equatorial, rigidly rotating disk extending from near the Kepler corotation radius outwards. Even with fine-tuning at lower magnetic confinement, none of the MHD models produce a stable Keplerian disk. Instead, material below the Kepler radius falls back on to the stellar surface, while the strong centrifugal force on material beyond the corotation escape radius stretches the magnetic loops outwards, leading to episodic breakout of mass when the field reconnects. The associated dissipation of magnetic energy heats material to temperatures of nearly 10^8K, high enough to emit hard (several keV) X-rays. Such *centrifugal mass ejection* represents a novel mechanism for driving magnetic reconnection, and seems a very promising basis for modeling X-ray flares recently observed in rotating magnetic Bp stars like σ Ori E.

Reference: ApJL
Status: Manuscript has been submitted

Weblink: http://www.star.ucl.ac.uk/∼rhdt/publications/

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Excitation of g modes in Wolf-Rayet stars by a deep opacity bump

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We examine the stability of l=1 and l=2 g modes in a pair of nitrogen-rich Wolf-Rayet stellar models characterized by differing hydrogen abundances. We find that modes with intermediate radial orders are destabilized by a kappa mechanism operating on an opacity bump at an envelope temperature log T $\sim$ 6.25. This 'deep opacity bump' is due primarily to L-shell bound-free transitions of iron. Periods

of the unstable modes span $\sim$ 11-21 hr in the model containing some hydrogen, and $\sim$ 3-12 hr in the hydrogen-depleted model. Based on the latter finding, we suggest that self-excited g modes may be the source of the 9.8 hr-periodic variation of WR 123 recently reported by Lefevre et al. (2005).

Reference: MNRAS
Status: Manuscript has been submitted

Weblink: http://www.star.ucl.ac.uk/$\sim$rhdt/publications/

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The Effect of Porosity on X-ray Emission Line Profiles from Hot-Star Winds

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We investigate the degree to which the nearly symmetric form of X-ray emission lines seen in Chandra spectra of early-type supergiant stars could be explained by a possibly porous nature of their spatially structured stellar winds. Such porosity could effectively reduce the bound-free absorption of X-rays emitted by embedded wind shocks, and thus allow a more similar transmission of red- vs. blue-shifted emission from the back vs. front hemispheres. For a medium consisting of clumps of size l and volume filling factor f, in which the 'porosity length' h=l/f increases with local radius as h = h' r, we find that a substantial reduction in wind absorption requires a quite large porosity scale factor h' > 1, implying large porosity lengths h > r. The associated wind structure must thus have either a relatively large scale l r, or a small volume filling factor f l/r << 1, or some combination of these. The relatively small-scale, moderate compressions generated by intrinsic instabilities in line-driving seem unlikely to give such large porosity lengths, leaving again the prospect of instead having to invoke a substantial (ca. factor 5) downward revision in assumed mass-loss rates to explain the near symmetry of X-ray line profiles.

Reference: ApJ, submitted
Status: Manuscript has been submitted

Weblink: http://www.bartol.udel.edu/$\sim$owocki/preprints/xporosity.pdf

Comments: also available as astro-ph/0602054

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In Proceedings

Rotating massive stars @ very low Z: high C and N production

Raphael Hirschi

University of Basel

Two series of models and their yields are presented in this paper. The first series consists of 20 Mo models with varying initial metallicity (solar down to $Z = 10^{-8}$) and rotation (Vini=0-600 km/s).

The second one consists of models with an initial metallicity of $Z = 10^{-8}$, masses between 20 and 85 Mo and average rotation velocities at these metallicities (Vini=600-800 km/s). The most interesting models are the models with $Z = 10^{-8}$ ([Fe/H]= -6.6). In the course of helium burning, carbon and oxygen are mixed into the hydrogen burning shell. This boosts the importance of the shell and causes a reduction of the size of the CO core. Later in the evolution, the hydrogen shell deepens and produces large amount of primary nitrogen. For the most massive models (M> 60 Mo), significant mass loss occurs during the red supergiant stage. This mass loss is due to the surface enrichment in CNO elements via rotational and convective mixing. The yields of the fast rotating 20 Mo models can best reproduce (within our study) the observed abundances at the surface of extremely metal poor (EMP) stars. The wind of the massive models can reproduce the CNO abundances of the carbon–rich UMPs, in particular for the most metal poor star known to date, HE1327-2326.

Reference: astro-ph/0601498
Status: Conference proceedings

Weblink: http://arxiv.org/abs/astro-ph/0601498

Comments: 6 pages, 3 figures, Proceedings of "Origin of Matter and Evolution of Galaxies (OMEG05): New Horizon of Nuclear Astrophysics and Cosmology". Nov 8-11-2005, Tokyo, Japan, AIP conf. series, Ed. S. Kubono

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Stellar evolution of massive stars at very low metallicities

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Recently, measurements of abundances in extremely metal poor (EMP) stars have brought new constraints on stellar evolution models. In an attempt to explain the origin of the abundances observed, we computed pre–supernova evolution models, explosion models and the related nucleosynthesis. In this paper, we start by presenting the pre-SN models of rotating single stars with metallicities ranging from solar metallicity down to almost metal free. We then review key processes in core-collapse and bounce, before we integrate them in a simplistic parameterization for 3D MHD models, which are well underway and allow one to follow the evolution of the magnetic fields during collapse and bounce. Finally, we present explosive nucleosynthesis results including neutrino interactions with matter, which are calculated using the outputs of the explosion models. The main results of the pre-SN models are the following. First, primary nitrogen is produced in large amount in models with an initial metallicity $Z = 10^{-8}$. Second, at the same metallicity of $Z = 10^{-8}$ and for models with an initial mass larger than about 60 Mo, rotating models may experience heavy mass loss (up to more than half of the initial mass of the star). The chemical composition of these winds can qualitatively reproduce the abundance patterns observed at the surface of carbon-rich EMP stars. Explosive nucleosynthesis including neutrino-matter interactions produce improved abundances for iron group elements, in particular for scandium and zinc. It also opens the way to a new neutrino and proton rich process (νp-process) able to contribute to the nucleosynthesis of elements with A > 64.

Reference: astro-ph/0601502
Status: Conference proceedings

Weblink: http://arxiv.org/abs/astro-ph/0601502

Comments: 29 pages, 10 figures, Reviews of Modern Astronomy 19, proceedings for 79th Annual Scientific Meeting of the Deutsche Astronomische Gesellschaft 2005

Revisiting and assessing uncertainties in stellar populations synthesis

M. Cerviño and V. Luridiana

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In this review we address the uncertainties implicit in evolutionary synthesis model computations. After describing the general structure of synthesis codes, we discuss several source of uncertainties that may affect their results.

In particular, we discuss the uncertainties arising in the computation of isochrones from evolutionary tracks; those related to atmosphere models; those that are a consequence of the incompleteness of the input ingredients; and those associated with the computational aspect used in synthesis codes.

We also discuss the issue of the inclusion of distributed properties in synthesis models, an issue that will become relevant in the next future; as a paradigm of this case, we illustrate the difficulties implied by the inclusion of tracks with rotation in synthesis models. Finally, we describe several examples of the statistical approach to population synthesis.

We report on the insuccess of the fuel consumption theorem (FCT) and the isochrone synthesis code to produce mutually consistent results. However, we argue that FCT and isochrone synthesis results are reliable for application to real systems in the wavelength range where they coincide.

On the constructive side, we derive several useful survival strategies to bypass uncertainties. We show that single stellar populations at the turn-off ages of the tabulated tracks can be safely compared, as they are scarcely affected by the interpolation scheme used to compute isochrones. Finally, we suggest to use derivative quantities, such as the SN-rate, as bug detectors.

On the recommendation side, we advocate for greater transparency and more documentation in synthesis modeling. We also ask stellar model makers to think of us and include more mass values in the tracks, please.

Reference: To be published in: "Resolved Stellar Populations" D. Valls-Gabaud & M. Chavez (eds.), ASP Conf. Ser. (ASP: San Francisco)
Status: Conference proceedings

Weblink: http://arxiv.org/abs/astro-ph/0510411

Comments: invited review

Email: mcs@iaa.es

Jobs

Postdoctoral Research Associate in Hot, Luminous Stars

Paul Crowther

Department of Physics & Astronomy University of Sheffield

Applications are invited for a PPARC funded PDRA to work with Dr Paul Crowther on programmes involved with hot, luminous stars, which include (i) analysis of mid-IR Spitzer spectroscopic observation of Wolf-Rayet stars involving the use of stellar atmosphere codes; (ii) ground and space based ultraviolet, optical and infrared studies of the stellar content of young, massive clusters within the Milky Way and external galaxies.

A PhD or equivalent in astrophysics or a related discipline is essential. Candidates should have interests of relevance to the research programme, for which experience with the analysis of spectroscopic observations of hot, luminous stars is highly desirable.

The position is tenable from 1 May 2006, or as soon as possible thereafter, for a period of up to 35 months at a salary from 23,457 per annum, depending upon age and experience.

Attention/Comments: Applications may be made online at www.shef.ac.uk/jobs, quoting reference PR2335, or by sending a full CV, together with a covering letter to arrive no later than 1 April 2006 to: Staff Recruitment Service, Human Resources, University of Sheffield, Firth Court, Sheffield, S10 2TN, UK (two copies of each), plus the names of two referees. Please also send a copy of your CV directly to Paul Crowther (Paul.Crowther@shef.ac.uk), to whom informal enquiries may be made.

Weblink: http://www.shef.ac.uk/physics/people/pacrowther

Email: Paul.Crowther@sheffield.ac.uk

Deadline: 1 April 06

JETSET - Radiative hydrodynamics experiments on large scale lasers in astrophysical context .

Chantal Stehle

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A one year postdoctoral position has been opened in Paris Observatory (www.obspm.fr) to work on the modelling of radiative hydrodynamics high energy laser experiments of astrophysical interest , in the context of the European network Marie Curie RTN-JETSET (www.jetsets.org). The candidate should have experience in numerical modelisation and if possible expertise in multidimensional numerical simulation. Expertise in hydrodynamics, radiative transfert, plasma physics, astrophysics will be appreciated.

Interested people can read the dedicated CNRS web page :
http://www.sg.cnrs.fr/drhchercheurs/Post_doc_2006/default.htm (click on "liste des offres", then SDU and SDU7) or directly at
http://www.k-projects.com/cnrs_postdocs/public/departement_details.php?
IdDpt=9&Dep=SDU&NumOffre=7

where they can also find the application form (click on "dossier de candidature") .

Contacts: sylvie.cabrit@obspm.fr or chantal.stehle@obspm.fr

Weblink: http://www.sg.cnrs.fr/drhchercheurs/Post_doc_2006/default.htm

Email: chantal.stehle@obspm.fr

Deadline: June 30, 2006.

Postdoctoral Research Associate in Massive stars

Dr. Jorick Vink

Keele University, Keele, Staffordshire, ST5 5BG, United Kingdom

Applications are invited for a PPARC-funded PDRA to work with Dr Jorick Vink on a programme of massive star research.

The applicant should have or expect to obtain a PhD; a track record in the area of massive stars is desirable, though applicants from other fields with a strong numerical emphasis, e.g. in radiative transfer or hydrodynamics, are encouraged to apply.

The Keele Astrophysics group consists of 7 staff members, with research interests including star formation and stellar clusters, late stellar evolution, the interstellar medium, binary stars, and the detection of extra-solar planets.

The position is tenable from 1 May 2006, or as soon as possible thereafter, for a period of 3 years. The salary, on the RA1A scale, will be in the range 20,044 to 30,002, depending upon experience.

The project is also part of a larger project on the evolutionary properties of massive stars and gamma-ray burst progenitors, in collaboration with Dr. A. de Koter (University of Amsterdam) and Prof. N. Langer (Utrecht University).

For informal enquiries please contact Jorick Vink (jsv@astro.keele.ac.uk); please also copy any application to Dr Vink.

Full job packs are available from Human Resources Department, Keele University, Keele, Staffordshire, ST5 5BG, U.K., email vacancies@keele.ac.uk or www.keele.ac.uk/depts/uso/hr/cwisvacs.htm

Please quote post reference: RE06/05

AN EQUAL OPPORTUNITIES EMPLOYER

Weblink: http://www.astro.keele.ac.uk/∼jsv/

Email: jsv@astro.keele.ac.uk

Deadline: 1 April 2006

Meetings

IAU General Assembly 2006, Joint Discussion 05: "Calibrating the Top of the Stellar Mass-Luminosity Relation"

16 August 2006

Venue: Praha

Weblink: http://www.stsci.edu/science/starburst/Prague/

The goal of this Joint Discussion is to bring together theorists and observers from the stellar and extragalactic communities to discuss the properties of the most massive stars and the implications for cosmological studies. The meeting will focus on a set of themes that follow from fundamental stellar astronomy, such as mass determinations in binary stars, to recent modeling of atmospheres and evolution, to the significance of massive stars for the ecology of the host galaxy, and finally to a critical assessment of the properties of the first generation of stars in the universe.

Major topics:
⋆ empirical mass determinations of the most massive single stars
⋆ models for massive stars on and off the main sequence
⋆ stability near the Eddington limit with and without rotation
⋆ comparisons of atmospheric and evolutionary masses
⋆ observational efforts to detect, monitor, and analyze massive binaries
⋆ mass and energy return to the interstellar medium from massive stars
⋆ extrapolations to the first generation of stars with ultra-high masses
⋆ the role of hot massive stars during the epoch of reionization in the early universe

Email: leitherer@stsci.edu

IAU General Assembly 2006, IAU Symposium 240: "Binary Stars as Critical Tools & Tests in Contemporary Astrophysics"

22-25 August 2006

Venue: Prague, Czech Republic

Weblink: http://ad.usno.navy.mil/iaus240/

Sponsoring Commissions: 26 and 42

Topics to be included range from common proper motion pairs and other "fragile" binaries to contact binaries and star/brown-dwarf/planet systems, with the aim of exploring interests common to all binary star researchers. It is fitting that such a meeting be held in the Czech Republic, since much of the pioneering work on binary and variable stars has been carried out in Central and Eastern Europe for over a century. Our proposal narrative provides a fuller account of the reasons behind this symposium.

The preliminary program for the meeting is available on the meeting website.

This program will evolve somewhat as more invited speakers are lined up and schedules adjusted. To complement the invited talks, participants are of course welcome to contribute posters describing their research. Time as been alloted during each session for summary talks on posters appropriate to that session's topics; these summary talks will be given by either the poster presenters themselves or by an expert in the field (such decisions must wait until we find out how many posters will be presented during each session). In an effort to encourage younger researchers, some poster presenters may be invited to give more substantial talks on their research. More details will be posted here as they become available. For further information or to note errors or problems with the website, please contact William Hartkopf at wih(at)usno.navy.mil .

Email: wih(at)usno.navy.mil

Massive Stars: Fundamental Parameters and Circumstellar Interactions

Venue: Hotel Marcin, Carilo, Argentina

December 11 - 14, 2006

Weblink: http://lilen.fcaglp.unlp.edu.ar/mstars2006

Facultad de Ciencias Astronomicas y Geofisicas, La Plata, Argentina

Massive stars, though relatively few in number and short-lived, outshine all of their numerous less massive neighbors and rule their environments, from the onset of their strong stellar winds to their deaths in core-collapse supernova explosions. Massive stars dissociate, ionize, photoevaporate, and mechanically transform their parental molecular clouds and generate circumstellar bubbles. Massive stars also produce many of heavy metals and are thus an essential source of the chemical enrichment observed in our solar system. The binary or multiple nature of most of these objects adds further dimensions to their phenomenology and evolution, such as stellar-wind interactions and mass transfer. While the basic features of the evolution of both single and binary massive stars are understood, many challenges remain to a full understanding of their pre- through post-main-sequence stages, including internal mixing and mass loss as functions of mass, metallicity, rotation, and magnetic fields. The zoo of peculiar evolved objects and the specific progenitor configurations of the various types of core-collapse supernovae remain research frontiers.

Virpi Niemela has been an active and prolific researcher on massive stars for about four decades and the La Plata Massive Stars Research Group would like to celebrate her 70th birthday by hosting a scientific meeting focused on her field of endeavor.

In this conference, we aim to review and discuss all present knowledge about massive stars, with a view toward the coordination of efforts to advance our understanding of this important subject.

Venue: Hotel Marcin, Carilo, Argentina

http://www.hotelmarcin.com.ar/home.htm

Comments: In order to compile a list of researchers interested in attending the meeting, please send an email to mstars2006@fcaglp.unlp.edu.ar before March 31st stating:
⋆ Name:
⋆ Contact email:
⋆ Institution:

⋆ Likeliness of attendance: definitely/high/medium/low
⋆ I do (not) plan to submit a contribution [if you do, please send a title or state topic of interest]

Email: mstars2006@fcaglp.unlp.edu.ar

Planned IAU Symposium: "Massive Stars as Cosmic Engines"

10-14 December 2007

Venue: not yet available

Weblink: not yet available

The theme of the conference, provisionally entitled "Massive Stars as Cosmic Engines" and developed by the IAU Working Group for Massive Stars, will be how massive stars shape the Universe from the nearby universe to high redshift galaxies. They form in starbursts, pollute the ISM, inject energy via their stellar winds and core-collapse SN, drive the ISM out of galaxies, polluting the IGM. The major observational constraints at high redshift Lyman break and DLA systems are direct detection of massive stars via their UV continua and stellar winds and indirectly via the ionized ISM. The symposium to-be-proposed will be multi-disciplinary.

Topics:
⋆ New observational studies of massive stars (e.g. Spitzer, HST, FUSE, Chandra, ground-based 8m telescopes);
⋆ New theoretical atmospheric developments including clumping, porosity and magnetic fields;
⋆ Massive star evolution of single and binary stars in different environments including rotation and magnetic fields;
⋆ Colliding wind effects in massive binaries, such as dust formation;
⋆ Massive star interactions with the interstellar medium;
⋆ End states of massive stars: Core-collapse Supernovae and Gamma Ray Bursts;
⋆ Massive stellar populations in nearby galaxies;
⋆ Super Star Clusters and Starbursts;
⋆ Role of massive stars in Chemical Evolution of galaxies;
⋆ Formation of first generation (Population III) stars, re-ionization and early enrichment;
⋆ Lyman break, and damped Lyman alpha systems;

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