

THE MASSIVE STAR NEWSLETTER

formerly known as the hot star newsletter

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No. 150

2015 November-December

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CONTENTS OF THIS NEWSLETTER:

Abstracts of 2 accepted papers

[s-process production in rotating massive stars at solar and low metallicities](#)
[Spectroscopic and Photometric Variability in the A0 Supergiant HR 1040](#)

Abstracts of 1 other publications

[IAU Commission 36 \(Theory of Stellar Atmospheres\): Hexennial Report 2009-2015](#)

Jobs

[Two PhD positions in asteroseismology of massive stars at Leuven University](#)

Meetings

[Electron Capture Supernovae & Super-AGB Star Workshop](#)
[IAUS 329: The Lives and Death-Throes of Massive Stars](#)

PAPERS

Abstracts of 2 accepted papers

***s*-process production in rotating massive stars at solar and low metallicities**

Urs Frischknecht (1,2), Raphael Hirschi (1,3,8), Marco Pignatari (4), André Maeder (5), George Meynet (5), Cristina Chiappini (6), Friedrich-Karl Thielemann (2), Thomas Rauscher (2,7,8), Cyril Georgy (1), Sylvia Ekström (5)

(1) Keele Uni, (2) Uni Basel (3) Kavli IPMU (4) Konkoly Obs (5) Geneva Obs (6) AIPotsdam (7) Uni Hertfordshire (8) BRIDGCE UK network

Rotation was shown to have a strong impact on the structure and light element nucleosynthesis in massive stars. In particular, models including rotation can reproduce the primary nitrogen observed in halo extremely metal-poor (EMP) stars. Additional exploratory models showed that rotation may enhance *s*-process production at low metallicity.

Here we present a large grid of massive star models including rotation and a full *s*-process network to study the impact of rotation on the weak *s*-process. We explore the possibility of producing significant amounts of elements beyond the strontium peak, which is where the weak *s*-process usually stops.

We used the Geneva stellar evolution code coupled to a large reaction network with 737 nuclear species up to bismuth to calculate 15-40 M_{\odot} models at four metallicities ($Z=0.014, 10^{-3}, 10^{-5},$ and 10^{-7}) from the main sequence up to the end of oxygen burning.

We confirm that rotation-induced mixing between the convective H-shell and He-core enables an important production of primary ^{14}N , ^{22}Ne and *s*-process at low metallicity. At low metallicity, even though the production is still limited by the initial number of iron seeds, rotation enhances the *s*-process production, even for isotopes heavier than strontium, by increasing the neutron to seed ratio. The increase in this ratio is a direct consequence of the primary production of ^{22}Ne . Despite nuclear uncertainties affecting the *s*-process production and stellar uncertainties affecting the rotation-induced mixing, our results show a robust production of *s* process at low metallicity when rotation is taken into account. Considering models with a distribution of initial rotation rates enables to reproduce the observed large range of the [Sr/Ba] ratios in (carbon-enhanced and normal) EMP stars.

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

Weblink: <http://adsabs.harvard.edu/abs/2015arXiv151105730F>

Comments: 26 pages, 15 figures, 8 tables

Email: r.hirschi@keele.ac.uk

[Back to contents](#)

Spectroscopic and Photometric Variability in the A0 Supergiant HR 1040

David J. Corliss (1,2), Nancy D. Morrison (2), and Saul J. Adelman (3)

1 - The University of Toledo; 2 - Wayne State University; 3 - The Citadel

A time-series analysis of spectroscopic and photometric observables of the A0 Ia supergiant HR 1040 has been performed, including equivalent widths, radial velocities, and Strömgren photometric indices. The data, obtained from 1993 through 2007, include 152 spectroscopic observations from the Ritter Observatory 1 m telescope and 269 Strömgren photometric observations from the Four College Automated Photoelectric Telescope. Typical of late B- and early A-type supergiants, HR 1040 has a highly variable H α profile. The star was found to have an intermittent active phase marked by correlation between the H α absorption equivalent width and blue-edge radial velocity and by photospheric connections observed in correlations to equivalent width, second moment and radial velocity in Si II $\lambda\lambda 6347, 6371$. High-velocity absorption (HVA) events were observed only during this active phase. HVA events in the wind were preceded by photospheric activity, including Si II radial velocity oscillations 19–42 days prior to onset of an HVA event and correlated increases in Si II W λ and second moment from 13 to 23 days before the start of the HVA event. While increases in various line equivalent widths in the wind prior to HVA events have been reported in the past in other stars, our finding of precursors in enhanced radial velocity variations in the wind and at the photosphere is a new result.

Reference: AJ, 150, 190

Status: Manuscript has been accepted

Weblink: <http://iopscience.iop.org/article/10.1088/0004-6256/150/6/190>

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[Back to contents](#)

Abstracts of 1 other publications

IAU Commission 36 (Theory of Stellar Atmospheres): Hexennial Report 2009-2015

Joachim Puls & Martin Asplund

(1) University Observatory, LMU Munich, Germany

(2) Research School of Astronomy & Astrophysics, ANU, Canberra, Australia

This hexennial report covers the activities of IAU Commission 36 -- 'Theory of Stellar Atmospheres' -- during the years 2009 to 2015, and will be the last report from this Commission, being replaced by Commission C.G5.

After outlining the composition of the Organization Committee(s), we list the scientific meetings held between 2009 and 2015 that were of relevance for our Commission members, and comment on the establishment and objectives of the new Commission C.G5 ('Stellar and Planetary Atmospheres') within the re-structuring process of the IAU.

In the main part of the report, we briefly review specific contributions and achievements within our research field during the last six years, concentrating on the theoretical aspect, and dividing between late-type and massive star atmospheres. We also provide a more general overview of primary research areas, and finish our report with a collection of useful web links.

Reference: Transactions IAU, Volume XXIXA
<http://arxiv.org/abs/1512.06972>
Status: Manuscript has been accepted

Weblink: <http://arxiv.org/abs/1512.06972>

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[Back to contents](#)

JOBS

Two PhD positions in asteroseismology of massive stars at Leuven University

Conny Aerts

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3001 Leuven
Belgium

MAMSIE is an ERC Advanced Grant in stellar physics (2016-2020) with the aim to study mixing and angular momentum transport of massive blue stars. The project consists of several work packages and relies on the bridging of stellar modelling and 3D hydrodynamics. As part of the project, two PhD students will perform seismic modelling of OB-type stars based on non-radial oscillation modes detected in space photometry and/or ground-based data.

One PhD student will focus on the development and application of new modelling tools for single OB-type gravity-mode pulsators. The other PhD student will tackle the case of massive binary pulsators by performing multicolour photometry and spectroscopic monitoring with the aim to apply iterative binary and seismic modelling. Both PhD students will interact intensively with the MAMSIE postdocs, who will focus on the bridging of asteroseismology and 3D hydrodynamics. The MAMSIE PI, Conny Aerts, will act as PhD supervisor:
fys.kuleuven.be/ster/staff/conny-aerts

Attention/Comments: More information on the institute, the requirements and the application instructions is available from <http://fys.kuleuven.be/ster/vacancies>

Weblink: <http://fys.kuleuven.be/ster/vacancies>

Email: conny.aerts@ster.kuleuven.be

Deadline: 25 February 2016

[Back to contents](#)

MEETINGS

Electron Capture Supernovae & Super-AGB Star Workshop

February 1-5, 2016

Venue: Monash University, Melbourne, Australia

We would like to announce the Joint Institute for Nuclear Astrophysics (JINA) workshop on Electron Capture Supernovae (ECSNe) & Super-AGB Stars to be held February 1-5, 2016 at Monash University, Melbourne, Australia. This workshop aims to bring together Australian and international experts from stellar evolution, supernova theory, stellar spectroscopy, hydrodynamics, and nuclear physics with expected topics including:

- * single and binary super-AGB star evolution
- * population synthesis & ECSNe rate predictions
- * convective URCA phase
- * C and O/Ne flame propagation
- * electron capture supernova models
- * s/p/r/iprocess nucleosynthesis
- * spectroscopy and GCE role of ECSNe at low metallicity
- * ECSNe from Pop III stars
- * evidence for ECSNe from a) light curves, b) SN remnants c) neutron star masses
- * massive white dwarf formation and super-AGB stars mass loss rates

The preliminary webpage for the meeting can be found at:
<http://users.monash.edu.au/~cdoherty/EC-SN-2016/>

If you are interested in participating please register as soon as possible through our website. Registration is free and we are able to offer limited financial support for students.

We hope to see you in Melbourne next February!

Yours Sincerely,

The Organising Committee

Carolyn Doherty, Alexander Heger, John Lattanzio and Bernhard Mueller

Weblink: <http://users.monash.edu.au/~cdoherty/EC-SN-2016/>

Email: alexander.heger@monash.edu

[Back to contents](#)

IAUS 329: The Lives and Death-Throes of Massive Stars

28th November to 2nd December 2016

Venue: Takapuna, Auckland, New Zealand

Dear colleagues,

This is the first announcement of the forthcoming IAU symposium to be held in Auckland, New Zealand entitled

"IAUS 329: The Lives and Death-Throes of Massive Stars".

Dates: 28th November to 2nd December 2016

Location: Auckland, New Zealand

Venue: The Spencer on Byron Hotel, Takapuna

Abstract Submission and registration to open: 30th March 2016

Abstract Submission closes: 30th May 2016

Early-bird registration closes: 30th August 2016

IAU Grant submission deadline: 30th May 2016

Conference website: <http://nzstars2016.nz>

Contact for questions about the meeting scientific program: nztars2016@auckland.ac.nz

The meeting will summarize recent progress and establish stronger links between the massive star community and closely-linked fields, particularly those studying end stages of massive star evolution and massive star cosmic implications. We will announce the invited speakers and a more detailed schedule before registration opens but wanted to provide useful information on the conference while it is only one year away.

Topics to be covered:

well established facts and open problems in our knowledge of massive stars, particularly in the so-called well understood phases

challenges to present theoretical models of interior and atmospheres; connecting interior and atmospheres; wind structure; episodic mass-loss mechanisms; binaries in interaction; X-ray and gamma-ray production

short-lived phases of massive stars (LBVs, WRs and RSGs) and their characteristics as supernova progenitors

new results from large-scale surveys, observational techniques and instrumentation for massive stars and supernovae

the link between massive stars and their deaths

constraints on the nucleosynthesis production in supernovae and the production of dust

explosion mechanisms of supernovae and the parameters required for a successful explosion

massive stars as astrophysical tools: tracing galaxies' structure; tracers of star formation; feedback from massive stars; population synthesis; limits to our interpretation of the high-z Universe; cosmic reionization; first stars and galaxies.

Travel, accommodation and support

New Zealand is a significant distance to travel, particularly due to the location of the international date line causing many attendees to "lose-a-day" when travelling to the conference. We advise our most distant attendees to arrive two days early, if possible, but at least 1 day before the Monday morning, so they are able to enjoy the first full day of the conference.

We are finalizing the accommodation for the conference but have ensured that people can share rooms to reduce. Rooms in the conference venue come with kitchenette facilities. Rooms are NZ\$178.25 inclusive of GST per night including wifi we will provide details of how to book a room in the second announcement. The conference registration fee is yet to be finalized but including GST it will be around NZ\$575.

We have limited funds from the IAU to provide support for attendees that have limited travel funding. Further details of how to apply for this funding will be provided shortly.

Please contact the organizers if child care is required. We are currently in discussion with local providers.

If you require a letter of invitation to visit New Zealand, you must first register for and pay all applicable registration fees. Full details of how to apply for this letter and a list of visa-free countries are listed on the conference website.

Nationwide public symposium

In the weekend following the conference, Dec 3rd, we are planning to run a large one day public symposium with as many speakers as possible talking about their latest research. We also hope to have these talks streamed live onto the internet and recorded so there is a lasting impact of the meeting in New Zealand. If you would like to be involved, or perhaps to travel to a city within New Zealand to give a talk please email j.eldridge@auckland.ac.nz and outline your previous outreach experience.

Splinter Meetings:

It may be possible to run a few splinter meetings during the conference in the evenings, or during the weekend after the main conference. If you would like to run a splinter meeting please email j.eldridge@auckland.ac.nz with a short outline of the topic, an estimated number of participants, and the names of organizers before the 30th March 2016.

Conference Excursions:

We currently aim to provide a choice for where to go in the conference excursions on Wednesday afternoon. We hope to have a trip to a nearby Auckland vineyard, a trip to the Auckland Domain Museum and possibly a beach Olympics.

Social Media:

The hashtag for the meeting is #NZstars2016. We have also setup a Facebook group for the meeting which can be found at: <https://www.facebook.com/groups/1015095635200645/>

Conference Equity and Anti-Harassment Statement:

#NZstars2016 is dedicated to providing an equitable and harassment-free conference experience for everyone regardless of gender, gender identity and expression, sexual orientation, disability, physical appearance, body size, race, age or religion. We do not tolerate harassment of conference participants in any form. Conference participants violating these rules may be sanctioned at the discretion of the conference organizers and the conference equity committee.

Weblink: <http://nzstars2016.nz>

Email: nzstars2016@auckland.ac.nz

[Back to contents](#)