1. Welcome and ANITA status report [Darren Croton]

2. Theory meetings to watch [Daniel Price]

3. gSTAR is coming! [Jarrod Hurley]


5. Discussion: 2012-2015 strategic plan for theoretical astrophysics
Why ANITA exists:

1. Support the professional development of the theoretical astrophysics community within Australia

2. Promote the discipline of theoretical astrophysics

3. Linkage with the national and international astronomical community

4. Education
The new steering committee, as of 1st April 2011, is:

**Chair (2010-2012):** Darren Croton (Swinburne)

**Two year terms (2010-2012):** Tamara Davis (Queensland), Alan Duffy (ICRAR), Jarrod Hurley (Swinburne)

**Two year terms (2011-2013):** Gregory Poole (Swinburne), David Parkinson (Queensland), Daniel Price (Monash)

**Student representative:** Simon Mutch (Swinburne)

**Immediate past convenor:** John Lattanzio (Monash)
Thanks to our outgoing Steering Committee members:

Geoff Bicknell (ANU), Loren Bruns (Melbourne), Andrew Melatos (Melbourne), and Stuart Wyithe (Melbourne)
The ANITA Newsletter

Regular newsletter items:

1. Latest news and upcoming events
2. Feature article
3. Research round-up
4. The ANITA crossword
From the Steering Committee

On behalf of the ANITA steering committee, and especially our editors Richard Stancliffe and Alan Duffy, welcome to the first ANITA newsletter! This newsletter has three simple goals: to inform, to promote, and to unify our small yet active theory community. We will publish each newsletter quarterly with a common format, covering news, reviews and research relevant to Australian theory of all areas.

In this inaugural edition we report on the ASA/ANITA Summer School on Nucleosynthesis held at Monash University in January, and the Fourth ANITA & companion gSTAR Workshop held at Swinburne University in March. We also give a round up of recent news relevant to the Australian theoretical community, as well as recently submitted/published theoretical papers. Starting next newsletter, in a regular series we’ll showcase a different Australian theory group and their research highlights (suggestions welcome). Each newsletter will be rounded out with a list of recent publications from the Australian theoretical community (please submit your abstracts for us to publish).

Our most recent exciting announcement is the new ANITA website: http://anita.edu.au/. Check there for all the latest ANITA news and information, and more general national and international news related to astro theory. We’ve also set-up an easy to use registration page. Those interested in joining ANITA should find this a quick and efficient way to do so.

Importantly, this newsletter belongs to the community. We would love to hear from you! If you have anything you would like to see in the newsletter; advertisements of jobs, upcoming conferences, etc., please get in touch with us.

July 5, 2010
The ANITA Charter:
1. Support the professional development of the theoretical astrophysics community within Australia
2. Promote the discipline of theoretical astrophysics
3. Linkage with the national and international astronomical community
4. Education

ANITA membership is open to all ASA members and is free to join.

Q4 2010

From the ANITA Steering Committee

On behalf of ANITA, we welcome the reader to our second ANITA newsletter. As ever, the goals of this newsletter are threefold: to inform, to promote, and to unify the dispersed astronomy theory community of Australia. In supporting these aims this newsletter covers the latest news and research relevant to those interested in Australian-led theory.

In this issue, and as the first article in a regular series showcasing particular projects or research groups within Australia, we cover the theoretical developments within the CSIRO built ASKAP facility. We also showcase a number of important news items related to our community, including the announcement of the next ANITA workshop, which will be held at ICRAR in Perth in February 2011.

We are keen to hear your news stories and research developments. This especially includes abstracts for newly accepted publications. Please don’t hesitate to contact us! As always, contact and all other ANITA information can be found at our website: http://anita.edu.au/. This includes the online ANITA membership registration form, and we encourage those who are interested (both observers and theorists) to become members if you are not already.

Finally, you may have noticed the revamped style of the newsletter. We’d love to hear your thoughts and suggestions!

Alan Duffy (editor), Darren Croton, Greg Poole.

This issue

Theoretical news in Australia 2
Theorists behind ASKAP 3
Research roundup 4
ANITA meeting, Perth 2011 5

The new Australian Square Kilometer Array Pathfinder currently under construction at the Murchison Radio Observatory. This next generation facility will challenge Australia’s theorists to develop new analysis software and perform simulations of increasingly advanced complexity. (Image credit Prof Martin Meyer, ICRAR)
This quarter... cosmo-crossword, MWA, 2011 ANITA Workshop

From the ANITA Steering Committee

Welcome to our third ANITA Newsletter! We hope everyone had a relaxing and safe Christmas and new year. ANITA has some exciting plans this year, and we hope that we can continue to serve the community through regular outreach and support. This newsletter aims to cover the latest news and research relevant to Australian-led theory.

It’s been an exciting start to the year. In February we held our annual ANITA workshop, coupled with the 2011 Astronomastics school, both at ICRAR in Perth. In the news section we give a report on both and showcase a number of other news items from the last 4 months. This includes an announcement of results from the recent ANITA steering committee elections. On page X we feature our special report on Australian efforts to understand the new frontier of high redshift astronomy - the Epoch of Reionisation. We also introduce a new item to the newsletter, the official ANITA crossword puzzle. Feel free to challenge yourself!

We’re keen to hear your news stories and research developments. In particular, this includes abstracts for newly accepted publications and announcements for conferences or workshops you may be organising. Please don’t hesitate to contact us! As always, contact us at info@anitas.org.au, which includes the online ANITA membership form. We encourage those who are interested (both observers and theorists) to become members if you’re not already.

Alan Duffy (editor) and Darren Croton (chair)

This issue

Theoretical news in Australia 2
Special article: The MWA 3
Research roundup 5
Cosmo Crossword... 6

The ANITA Charter:
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This quarter ... WiggleZ and GiggleZ

From the ANITA Steering Committee

Welcome to our fifth ANITA Newsletter! As we pass the midpoint of 2011, we hope the year so far has been a happy one for all. A perusal of the ANITA research roundup on p.6 shows that it certainly been a productive one.

This is an exciting time for ANITA members. The midterm review has been completed and should be available as you read this, and the qSTAR GPU supercomputer is nearing commission at Swinburne. Perhaps now, as many of us meet together at the ASA general meeting in Adelaide, is a good time to take stock and consider our place within the broader community of Australian astronomy.

As a case study, we offer an article this quarter presenting the latest results from the WiggleZ survey, a newly completed 276-night redshift survey conducted with the AAT, designed for dark energy and cosmology studies. Large supercomputer simulations have been essential throughout the science phase of the survey, spawning the Gigaparsec WiggleZ (GiggleZ) Simulation project. More details can be found on p.4.

As always, we’re keen to hear your thoughts and share your stories. Several members of the ANITA steering committee will be present at the ASA this year. Our names are listed at the end of this newsletter. Please don’t hesitate to stop one of us as we walk by! As always, contact details and all other ANITA information can be found at our website: http://anita.edu.au, which includes the online ANITA membership registration form. We encourage those who are interested (both observers and theorists) to become members if you’re not already.

Greg Poole (editor) & Darren Croton (chair)
<table>
<thead>
<tr>
<th></th>
<th>All members</th>
<th>Male</th>
<th>Female</th>
<th>All student</th>
<th>Male student</th>
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<td>0</td>
<td>0 (50%)</td>
<td>0 (50%)</td>
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<td>15 (24%)</td>
<td>9 (15%)</td>
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<tr>
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<td>23 (26%)</td>
<td>37 (43%)</td>
<td>24 (28%)</td>
<td>13 (15%)</td>
</tr>
</tbody>
</table>
ANITA Membership Statistics:

>12k members by 2250!
About

Welcome to the Australian National Institute for Theoretical Astrophysics (ANITA), a Chapter of the Astronomical Society of Australia. ANITA is a virtual national institute which aims to ensure that the needs of Australian theoretical astrophysics are represented at a national and international level.

The goals of ANITA are to raise the profile of Australian theoretical astrophysics, encourage national collaboration, foster international links, facilitate theoretical astrophysics meetings, and provide input into national policy.

http://anita.edu.au/
Registration

There are two classes of ANITA membership: full membership and student membership.

Full membership to ANITA is open to all Ph.D. graduates (or equivalent) in astronomy, or others who have contributed to the advancement of astronomy through research or education, who are broadly committed to the development of theoretical astrophysics in Australia and ANITA's specific goals. Student membership is open to undergraduate or Graduate students working towards a degree in astronomy or a related subject.

Current membership in the ANITA is required to join.

To apply for ANITA membership, please fill out and submit the following form. An ANITA steering committee member will review your application and contact you via the supplied email address when your registration is confirmed.

When registered your Title, First/Last Name, and Institution will be displayed on the ANITA membership listing here, while all other fields will be kept private.

Please provide your details for registration:

Title: 

First Name:
Theory Meetings
ANITA 2011 Workshop
14-15 February @ ICRAR, Perth

38 registered participants, with 18 talks (4 student talks).

Talk topics covered a broad range of astrophysical problems: semi-analytic and hydrodynamic supercomputer simulations of galaxies and gas, statistical methods for galaxy models and cosmology, star clusters, planetary nebula and supernova, supersonic turbulence and colliding stellar winds, black holes and their feedback, magnetic fields in magnetars, chemical enrichment in Lyman alpha systems, constraining neutrino masses using galaxy surveys.

Congratulations to Simon Mutch from Swinburne University for winning this year's ANITA student prize for his talk on "MCMC Methods and their Application to Galaxy Formation Models".

ANITA 2012 Workshop
13-14 February @ Monash, Melbourne

Details TBD

2012 Nuclei in the Cosmos - International Symposium on Nuclear Astrophysics

05-10 August 2012

Serious Business in Australia’s Most Stunning Location
XII International Symposium on Nuclei in the Cosmos

Cairns Convention Centre
Queensland, Australia
5th - 10th August 2012
WWW.NIC2012.ORG

Local Organising Committee
Maria Lugaro (Monash University)
John Lattanzio (Monash University)
Chiaki Kobayashi (Australian National University)
Amanda Karakas (Australian National University)
Marie Newington (Monash University)
Peter Cottrell (University of Canterbury, New Zealand)
Darren Cróton (Swinburne University)
Gayandhi De Silva (Australian Astronomical Observatory, AAO)
George Dracoulis (Australian National University)
Ken Freeman (Australian National University)
Duncan Galloway (Monash University)
Karl Glazebrook (Swinburne University)
Trevor Ireland (Australian National University)
Stefan Keller (Australian National University)
Tibor Kibedi (Australian National University)
Gray Lane (Australian National University)
Libby Mauder (Australian National University)
Andrew Melatos (University of Melbourne)
Anthony Thomas (University of Adelaide)
Anton Wallner (Australian Nuclear Science and Technology Organisation, ANSTO)
Sessions on
- **Nuclear reaction rates and stellar modelling**
- The s-process
- Nuclear properties for astrophysics
- Explosive scenarios
- Novae and X-ray bursts
- SNIa and the p-process
- High density matter
- Core collapse SN, mergers, and the r process
- The early Universe
- Radioactivity
- Meteorites
XII International Symposium on Nuclei in the Cosmos

Cairns Convention Centre
Queensland
Australia 5th-10th August, 2012
www.nic2012.org

MONASH University

ANU
THE AUSTRALIAN NATIONAL UNIVERSITY

MoCA
Monash Centre for Astrophysics

Swinburne University of Technology

Australian Government
Department of Innovation, Industry, Science and Research
$gSTAR: \text{the GPU supercomputer for Theoretical Astrophysics Research}$

- $1.04m$ from EIF via AAL
- national GPU-based facility for astronomers
- hosted at Swinburne
- part of overall Swinburne HPC upgrade in 2011
**gSTAR:**

Minimum Specifications:

- 160 GPUs
  (1 Tflop/s, 1 GB each)
- 500 CPU cores
- 2000 GB CPU RAM
- 170 Tflop/s (sgl)
- 40 Gb/s interconnect
- 200 TB disk
gSTAR:

50 GPU nodes
   2 x C2070 (1.03 Tflop/s, 6 GB each)
   12 Westmere cores (X5650)
   48 GB RAM

3 high-density GPU nodes
   7 x M2090 (1.33 Tflop/s, 6 GB)

QDR infiniband
   40 Gb/s, non-blocking

200 TB disk

Minimum Specifications:

- 160 GPUs (1 Tflop/s, 1 GB each)
- 500 CPU cores
- 2000 GB CPU RAM
- 170 Tflop/s (sgl)
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- 160 GPUs (1 Tflop/s, 1 GB each)
- 500 CPU cores
- 2000 GB CPU RAM
- 170 Tflop/s (sgl)
- 40 Gb/s interconnect
- 200 TB disk

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- to be supplied by SGI
- available ~Sep 2011
- 40+ GPUs in 2\(^{nd}\) phase (late 2011)
gSTAR: the GPU supercomputer for Theoretical Astrophysics Research

• 75% for national astronomy access

• any astronomer at a public-funded institution

• 50% of time for merit-allocation

• remainder for general access (job queue)

• 1m CPU-hours available on Swinburne system
Melbourne HPC GPU Workshop


July 13-14, Monash University

• introduction to MASSIVE

• presentations from NVIDIA

• GPU programming examples and tutorials
National supercomputer access and support
National High Performance Computing Access for Astronomy

All astronomers in Australia have access to dedicated high-performance computing facilities. These facilities, located at ANU and Swinburne University of Technology, each have 1 million CPU-hours per year available for research projects in the next two years, and each has a dedicated support person to help users. A new national facility, Graphics Processing Unit (GPU)-based cluster for astronomical research, gSTAR, is also coming online in 2011.

NCI: National Facility

NCI is Australia’s high-end research computing service. The NCI National Facility, hosted by the Australian National University (ANU), delivers a world-class high-end computing service supporting many major research areas, including astronomy. In 2012 NCI will install a petascale system designed to dramatically enhance the modelling capabilities for many fields of high impact research.

Swinburne Green & gSTAR

The Green Machine was installed at Swinburne in May 2007. During 2011 Swinburne is undertaking a multi-million dollar upgrade to Green which will make it a leading facility for the Australian research community. Part of the upgrade is the creation of gSTAR – a GPU intensive supercomputer suitable for massively parallel computations.

One million hours

As part of Astronomy Australia Ltd (AAL)’s support for High Performance Computing (HPC) access for the astronomy community, under NCI’s Specialised Support Program, one million CPU hours on the NCI peak system, and the same amount on the upgraded Swinburne system, have been dedicated to highly scalable flagship quality astrophysics research problems. Access to these CPU-hours will be through a dedicated Metrics Allocation Committee. This coordinated approach will allow the committee to assign access requests to the most suitable machine for the task.

NCI: National Facility

The present peak system is an Oracle/Sun Constellation providing an internationally significant peak performance of 140 TFlops. The Cluster has 1492 nodes, each containing two quad-core 2.8 GHz Intel Nehalem CPUs. The system has a total of 37TB of RAM on compute nodes and approximately 800 TB/ytes of usable global storage.

Swinburne Green & gSTAR

Green is so named because of its use of Cloverton processors giving improved performance per watt compared to previous processors. Green comprises 145 Dell PowerEdge 1950 nodes each with 2 quad-core Cloverton processors at 2.33 GHz; 16 GB RAM; and two 500 GB drives. The nodes are controlled by a head node which distributes jobs to the cluster via a queue system. The Centre for Astrophysics and Supercomputing (CAS) at Swinburne has over 100 TB of RAID5 disks and 77 TB of magnetic tape available for long-term data storage.

The design minimum of gSTAR will have 180 GPUs, plus 200 TB of dedicated storage, gSTAR will also include 500 CPU cores and 2000 GB CPU RAM, giving a combined CPU/GPU performance of 170 TFlops.

Science

Using the NCI National Facility peak system, Dr Chiaki Kobayashi of the ANU’s Research School of Astronomy and Astrophysics is simulating the formation and chromodynamical evolution of the Milky Way galaxy at the highest resolution ever attempted. The simulation output includes positions, velocities, some physical quantities, and about 70 elemental abundances for 60,000,000 particles. Dr Kobayashi’s simulations will use highly-efficient, massively parallel codes and will consume approximately 100,000 CPU hours per quarter on the NCI National Facility peak system during 2011.

At Swinburne the GigaZ and the Giga-parsec WiggleZ simulation suite project is a series of dark matter cosmological simulations designed to supply the theoretical needs of the WiggleZ Dark Energy survey team. The suite consists of control-volume simulations with high snapshot temporal resolution spanning a factor of 512 in mass resolution and a main-volume run consisting of over 10 billion particles. The simulations were run by Dr Gregory Pokorak from CAS, Swinburne, on Green and together comprised the largest single astronomical simulation ever conducted in Australia, using approximately one million CPU hours.

Funding

NCI, an initiative of the Australian Government, is hosted by The Australian National University and is jointly funded by the Department of Innovation, Industry, Science and Research under its NCIIS program, CSIRO and ANU. The Green machine is fully funded by Swinburne University of Technology. Swinburne is funding the upgrade of Green and AAL has contributed $1 million from its EIF grant to Swinburne to create gSTAR.

AAL worked with NCI to enable the two support personnel to be dedicated to this astronomy community, and the allocation of one million CPU-hours per year at each of the NCI National Facility and Swinburne.

Key Contacts

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Jon Smailie
National Computational Infrastructure, Canberra, Australia
E: jsmailie@nci.org.au | T: +61 2 6125 1430
Astronomy Australia Limited
Melbourne, Australia
E: info@astronomyaustralia.org.au
P: +61 3 9214 8096
Project suggestions
Fill in the form at http://goo.gl/NS15R

Support

Two support personnel are available to assist the Australian astronomical community by providing high-performance computing technical expertise and provide training and information in order to enhance the uptake of available new hardware rapidly across the community.

Luke Hodkinson is based at Swinburne University of Technology and Jon Smailie is based at NCI.
Discussion:
The future of theoretical astrophysics in Australia
Mid-Term Review recommendation:

"Over the period 2012–2015, under the coordination of ANITA, a strategic plan for theoretical astrophysics should be developed."

- What will theory look like in 2015?
- What will theory look like in 2025?
- What opportunities would we like to have?
- How do we integrate/distinguish ourselves? What is our niche?
A path forward?

• Strategic plan in the form of a document
• Submitted to the Australian Academy of Science(?)
• Consultation with both theorists and observers
• Prepared by the ANITA steering committee
• With input from a (small?) advisory committee
• For both the next 3 years and to position theory for the 2015-2025 Decadal Plan
• Submission date 1st March 2012(?)