School of Physics and Astronomy News

May 2023

Welcome to our new SPA newsletter

Dear all

Welcome to the first edition of our new monthly newsletter. We hope you enjoy this opportunity to mark your calendars for the month ahead, catch up on recent news, and learn more about our vibrant community of staff and students. I wish you all a rewarding month of May!

Stefan

Upcoming Events

10 May - School Colloquium: Prof Stefan Maier, Head of School @ 2pm

10 May - The Faculty of Science Research Uplift Scheme applications due

10 May - The Faculty of Science Industry Partnership Development Scheme applications due

17 May - School Staff Council @ 2pm with a presentation by Dr Anna Phillips

19 May - Winter Vacation Research Scholarship applications due

22 May - Pint of Science Festival: Dr Evgeni Grishin, Three Body Chaos: From the Solar System to Gravitational Waves

23 May - Pint of Science Festival: Dr Taïssa Danilovich, Observing the Deaths of Stars like the Sun

24 May - School Colloquium: Dr Amelia Liu, ARC Future Fellow @ 2pm

25 May - Robert Street Doctoral Prize in Physics, presented by Prof Alison Street @ 3-5pm

31 May - PhD scholarship applications due (domestic/semester 2 start)

5 June - Encounters: Navigating indeterminacy in experimental practice, featuring Prof Michael Fuhrer and Dr Annie Hui-Hsin Hsieh (Composer, Carnegie Mellon University)

Welcome

Welcome to recent staff arrivals in Quantum Light, Information, Matter and Electronics (QLIME) - Dr Chi Li, Dr Kishan Menghrajani, Dr Qile Li, Dr Daniel Moreno Cerrada and Dr Lake Bookman.

Starting earlier this year in Monash Astrophysics, welcome to Dr Jinping Zhu, Dr Rachel Harrison and ARC DECRA Fellow Dr Taïssa Danilovich. In Particle Physics, we welcome Dr Jake Lane. Executive Assistant Karen Hewitt has also recently joined the professional staff team.

We look forward to welcoming in May new staff Dr Simon Goode in Monash Astrophysics and Dr Oliver Clark in QLIME.

Finally, a big welcome to PhD students new to the program in 2023 - Christian Adamcewicz, Shun Cheung, Taylor Christie, Lucy Costello, Michael Deimetry, John Kam, Jayan Gunasekera, Thomas Hilder, Fitz Hu, Frank Liu, Yoshiya Mori and Liam Pinchbeck.

Visitors

From 19 to 23 May, Dr Sigmund Stintzing (Vice President) and Conny Reichelt (Faculty Manager) will visit from Ludwig Maximilians University, Munich.

Open Positions

Physics of Imaging roles

Lecturer/Senior Lecturer - theoretical and/or experimental position to join Physics of Imaging. The advertisement has been distributed on physics and imaging websites. Further distribution to your networks in the imaging field is most welcome. Applications close 10 May 2023.

5 Year Research Fellowships in Advanced S/TEM (4 positions) - applications close 15 May 2023.

3 Year Research Fellowship in 4D-Scanning Transmission Electron Microscopy (4D-STEM) - applications close 15 May 2023.

News

Double-slit experiment that proved the wave nature of light explored in time

Image: Riccardo Sapienza, Imperial College London

Head of School **Professor Stefan Maier** has contributed to an international study led by Imperial College London that has recreated the famous double-slit experiment, which showed light behaving as particles and a wave, in time rather than space.

The experiment, published in Nature Physics, relies on materials that can change their optical properties in fractions of a second, which could be used in new technologies or to explore fundamental questions in physics.

The original double-slit experiment, performed in 1801 by Thomas Young at the Royal Institution, showed that light acts as a wave. Further experiments, however, showed that light actually behaves as both a wave and as particles – revealing its quantum nature. These experiments had a profound impact on quantum physics, revealing the dual particle and wave nature of not just light, but other 'particles' including electrons, neutrons, and whole atoms.

Read more

Congratulations to Dr Amelia Liu

In March, **Dr Amelia Liu**, ARC Future Fellow, was awarded the John Booker Medal of the Australian Academy of Science for her work on new methods to measure the structure of glasses at the atomic level.

Dr Liu's research addresses the mystery of how glasses can solidify and yet retain the disordered structure of the parent liquid when they solidify during fast quenching from a melt. When crystals solidify from a melt, their rigidity is linked to the symmetry of their atomic arrangements. In contrast, for a glass, the transition to a solid phase is not signaled by any obvious new order. In her most recent work, Dr Liu demonstrated that even in globally disordered glass structures, there is a strong link between local structural symmetry and rigidity. She showed that both ageing and brittle mechanical failure in glasses can be understood in terms of co-ordinated local structural transformations to lower symmetry configurations.

Read more

Confirmation of a new forming planet

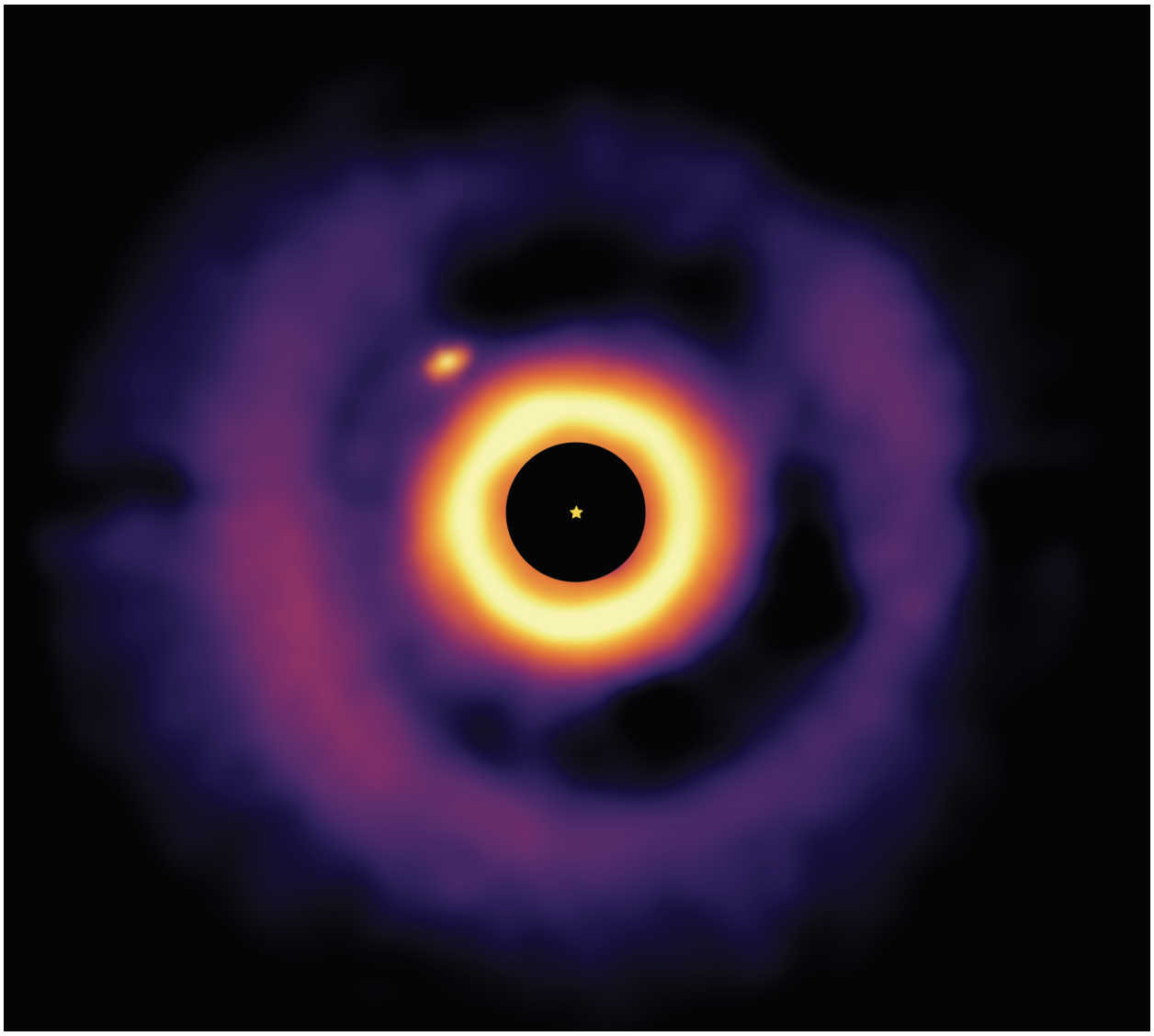

Image: Iain Hammond using data from ESO VLT/SPHERE. Figure made using SPLASH (Daniel Price)

A recent publication in *Monthly Notices of the Royal Astronomical Society* has confirmed the formation of a protoplanet using near-infrared images. Researchers in Monash Astrophysics used data from the European Southern Observatory's Very Large Telescope (VLT) in Chile of a young star, called HD 169142, over 350 light years away. The images captured with the SPHERE instrument at the VLT reveal the formation of a protoplanet moving in orbit over four years.

Researchers also found the planet had carved a gap in the disc as it attracted material from the disc itself. From PhD student **Iain Hammond**:

“In the near-infrared we can see a spiral arm being excited in the disc by the planet, which strongly suggests other protoplanetary discs that contain similar spirals could host yet-undiscovered planets.”

For his work as lead study author, Iain was the recipient of a Poster Award Talk at the April Protostars and Planets VII conference held in Kyoto, Japan. This detection is only the third of its kind and has proven it is possible to directly image forming planets even when still completely buried in dust.

Congratulations to Iain and the entire team!

Read more

Giulia Cinquegrana awarded CSIRO scholarship

Congratulations to PhD student **Giulia Cinquegrana** who was recently awarded the 2023 CSIRO Alumni Scholarship in Physics. Giulia gave a talk on her theoretical astrophysics research at a ceremony held in March at the CSIRO Lindfield facility in NSW. The scholarship is built on the legacy of Drs. John Dunlop, Tony Farmer, Gerry Haddad and Don Price and their contributions to Australian physics. The award will fund Giulia's PhD travel to Germany and Budapest in August of this year.

Read more about Giulia Cinquegrana's research

Pint of Science

by **Errol Hunt**

Join us supporting two astrophysicists courageously explaining their science over a pint this month, as part of Pint of Science. **Dr Taïssa Danilovich** will explain the science of dying stars at The Retreat, Abbotsford on May 23rd while **Dr Evgeni Grishin** will be giving a talk on black holes, gravitational waves, and three-body chaos at The Notting Hill Hotel May 22nd. Let's help make astrophysics accessible and fun! Book tickets below and share with your networks.

School Centres of Excellence

by **Errol Hunt**

Read about research, personal achievements, translation and outreach over the last year at the **ARC Centre for Gravitational Wave Discovery (OzGrav)**, one of two Australian Research Council Centres of Excellence at Monash Physics and Astronomy.

https://www.ozgrav.org/annual-reports.html

And, read about the last year at **ARC Centre for Future Low-Energy Electronics Technologies (FLEET)**, with 2022 seeing FLEET turn its focus onto ensuring a lasting legacy beyond the life of the Centre, a process that began with 2021's mid-term review.

https://www.fleet.org.au/annual-reports/

Research lab tour

by **Errol Hunt**

Monash Physics and Astronomy recently hosted a tour by UK consulate science advisor Geoff Pinfield, with a view to encouraging future Aus-UK photonics and quantum technology collaborations. Thanks to Gary Beane, Mitko Oldfield, Amelia Dominguez and Kris Helmerson for showing Geoff around the labs.

Occupational Health and Safety

Flu vaccinations

A reminder that FREE flu vaccinations are available for eligible Monash staff and students until 22 June.

Book your flu shot here

Risk Assessments

All students working in a laboratory are required to complete the following self-paced online course, which will take approximately one hour:

'OHS Risk Assessment for Student Projects - Basic Principles' course in myDevelopment.

We will schedule a follow-up workshop tailored to the projects/activities relevant to the School. The online course is a prerequisite for the workshop.

Students can use the following deep link to access this course - "OHS Risk Assessment for Student Projects - Basic Principles" (please note this course in myDevelopment is only visible to student accounts). This information will also be emailed to students soon.

Get to Know

Riley Henderson, PhD student in Particle Physics

My name is Riley Henderson, 3rd year PhD student in the Monash Warwick Alliance in particle physics. I have been a long-time student of Monash University, having completed my bachelor's degree in science and computer science, followed by an honours year and now a PhD in the School of Physics and Astronomy. However, for the past eight months I have in fact been living abroad, completing a year of my PhD on the opposite side of the world in the United Kingdom, hosted by the University of Warwick. Now, notwithstanding the vibrant Clayton campus

atmosphere, you might say I was due for a change of scenery. And indeed, the opportunity to do this was a big part of my decision to apply for the joint Monash-Warwick PhD position; to travel and see the world, all the while undertaking frontier research in particle physics and building my career — that was too good to pass up.

Evidently, the first 18 months of my PhD flew by and all of a sudden it was time to pack my suitcase and head off overseas to a temporary new home and a new university. Thankfully, everything went smoothly; I found myself a flat with some other university students who have been great fun and made me feel right at home from the start. The University of Warwick Elementary Particle Physics group were also excited to welcome me and I quickly settled into my new office surrounded by like-minded young physicists.

From then on, day to day life at the university and at home has not been dramatically different, perhaps with one exception: within the first month, I was already taking full advantage of my new convenient location and made my first trip to Geneva to visit CERN, the home of the Large Hadron Collider (LHC) and the experiment to which I have dedicated most of my productive hours for the past 3 years — the LHCb experiment. This was a surreal experience and something I had wanted to tick off the bucket list for quite some time. I have since made a number of other short Euro-trips for various reasons — conferences and workshops, vacations, etc. — with nothing but a carry bag in hand. This, of course, is not so easy from my usual home in Australia and has certainly composed many of the highlights of my experience thus far. I believe the connections I have made whilst abroad, both professionally and personally, will be invaluable and cherished for many years to come.

Now on YouTube

Leonardo de S. Menezes

Metasurfaces: a nanophotonic platform for full control of light in space and time

Anais Möller

Time-domain science in the Rubin era

Philipp Podsiadlowski

How stars end their lives

To suggest a story or other content please email karen.hewitt@monash.edu. Submissions are due by the last Monday of each month.