



## POSITION DESCRIPTION

School of Physics  
Faculty of Science

# Postdoctoral Fellowship in Gravitational Wave Astrophysics

**POSITION NO** 0064103

**CLASSIFICATION** Level A

**SALARY** \$83,468 - \$113,262 p.a.  
(\*PhD entry level \$105,518 p.a.)

**SUPERANNUATION** Employer contribution of 17%

**WORKING HOURS** Full-Time (1.0 FTE)

**BASIS OF EMPLOYMENT** Fixed-Term for three years

### **FLEXIBLE EMPLOYMENT**

The University of Melbourne is strongly committed to supporting diversity and flexibility in the workplace. Applications for part-time or other flexible working arrangements will be welcomed and will be fully considered subject to meeting the inherent requirements of the position.

**OTHER BENEFITS** <http://about.unimelb.edu.au/careers/working/benefits>

**HOW TO APPLY** Online applications are preferred. Go to <http://about.unimelb.edu.au/careers>, select the relevant option ('Current Staff' or 'Prospective Staff'), then find the position by title or number.

**CONTACT FOR ENQUIRIES ONLY** Professor Andrew Melatos  
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Email [amelatos@unimelb.edu.au](mailto:amelatos@unimelb.edu.au)

*Please do not send your application to this contact*

For information about working for the University of Melbourne, visit our website:  
[about.unimelb.edu.au/careers](http://about.unimelb.edu.au/careers)

## Acknowledgement of Country

The University of Melbourne acknowledges the Traditional Owners of country throughout Australia. The University recognises the unique place held by Aboriginal and Torres Strait Islander peoples as the original custodians of country and their continued connection to the land, waterways, songlines and culture. The University respects all Aboriginal and Torres Strait Islander People and warmly embrace those students, staff, Elders and collaborators who identify as First Nations.

## *Position Summary*

The Australian Research Council (ARC) Centre of Excellence for Gravitational Wave Discovery (OzGrav) was established in 2017 to use the historic first detections of gravitational waves to understand the extreme physics of black holes and warped space time. These discoveries will inspire the next generation of scientists and engineers to make use of this new window on the universe.

The University of Melbourne is one of eight universities collaborating through OzGrav, along with Swinburne University of Technology (headquarters), The Australian National University, Monash University, The University of Western Australia, The University of Adelaide, The University of Sydney, and The University of Queensland. OzGrav was recently awarded \$35M from the ARC to renew Centre operations for another seven years, through to 2031. As well as fundamental research, OzGrav pursues a vigorous outreach agenda that includes working with students from low socio-economic areas and encouraging the participation of minorities in science at all levels. OzGrav pursues research translation and commercialisation opportunities, offering opportunities for staff to experience secondments to industry during their postdoctoral terms.

This position focuses on two OzGrav Research Programs: Detection (gravitational wave data analysis and pulsar timing) and Extreme Matter (physics of bulk matter at nuclear density). The successful candidate will join the OzGrav team at the University of Melbourne, led by A/Prof. Katie Auchettl and Prof. Andrew Melatos, and will collaborate closely with other OzGrav nodes. The candidate will be encouraged to develop their own, innovative, independent research program as well as contribute to existing research. Examples of existing activities include:

- Observational searches for continuous gravitational waves in the audio band using advanced signal processing techniques such as hidden Markov models (Program: Detection).
- Radio and X-ray pulsar timing studies to probe the physics of neutron star interiors and compact object accretion, as well as detect nanohertz gravitational waves (Programs: Detection, Extreme Matter).
- First-principles theoretical modelling of the superfluid and superconducting interiors of neutron stars, and the origin and evolution of their magnetic fields, to make fundamental discoveries about bulk matter at nuclear density, including the nuclear equation of state (Program: Extreme Matter).

We encourage applicants from under-represented groups, including Aboriginal and Torres Strait Islander people. To allow us to consider performance relative to opportunity, we also invite applicants to provide a brief statement (up to 1 page) that describes circumstances that may have affected their career development or progression, including career interruptions or delays, periods of part time work, or forms of bias they have experienced.

## 1. Key Responsibilities

As with all positions, career achievements will be interpreted relative to opportunity, including career disruptions due to caring responsibilities, time in industry, illness etc.

The position description should be read alongside [Academic Career Benchmarks and Indicators](#). A level A academic is acquiring skills and building academic achievements (oriented towards the benchmarks).

### 1.1 RESEARCH AND RESEARCH TRAINING

The appointee will be expected to:

- ▶ Significantly contribute towards the research effort of the team and develop research expertise with an increasing degree of autonomy.
- ▶ Undertake original, rigorous, scholarly research in gravitational wave discovery and astrophysics, with an emphasis on OzGrav's Detection and Extreme Matter research programs
- ▶ Collaborate on this research with members of OzGrav and, where appropriate, members of the LIGO-Virgo-KAGRA Scientific Collaboration
- ▶ Contribute to and publish academic papers and other scholarly outputs to a high academic standard in accordance with the research expectations of the University of Melbourne
- ▶ Actively participate in research seminars and conferences to disseminate research findings as opportunities arise.
- ▶ Develop existing and new links with researchers from disciplines outside physics, e.g., electrical engineering, where appropriate to further the goals of OzGrav's research program
- ▶ Contribute to the preparation of, or prepare individually where appropriate, research proposal submissions to internal or external funding bodies as relevant
- ▶ Contribute to and assist in the co-supervision and training of research students
- ▶ Undertake administrative functions and obligations primarily connected with the staff member's area of research.
- ▶ Engage with relevant professional and industry bodies and stakeholders to foster collaborative partnerships.

## 1.2 EDUCATION AND LEARNING

The appointee will be expected to:

- ▶ Contribute to teaching, training, scientific mentoring and supervision of students.
- ▶ Contribute to the effective supervision of junior research staff in the appointee's area of expertise.

## 1.3 LEADERSHIP AND SERVICE

The appointee will be expected to:

- ▶ Participate as an active member of OzGrav, including taking leadership positions
- ▶ Actively participate at School meetings and with guidance, contribute to planning activities or committee work to support capacity building in the School/discipline.
- ▶ Actively participate in activities within the School and Faculty to support Diversity and Inclusion.
- ▶ Contribute to, or present research to the public to elevate public awareness of educational and scientific developments and promote critical enquiry and public debate within the community where appropriate.
- ▶ Effectively demonstrate and promote University values including diversity and inclusion and high standards of ethics and integrity.
- ▶ Actively contribute to School activities such as Open day to promote student engagement.

## 1.4 OTHER DUTIES

The appointee will be expected to:

- ▶ Undertake administration primarily relating to the activities of the role and research area
- ▶ Perform other tasks as requested by the supervisor or the Head of School
- ▶ Actively participate in the University Professional Development Framework
- ▶ Ensure an up-to-date record of University compliance courses, such as, but not limited to, Appropriate Workplace Behaviour, PDF for Staff and Supervisors, OH &S training courses.
- ▶ Occupational Health and Safety (OH&S) and Environmental Health and Safety (EH&S) responsibilities as outlined in section 4.

## **2. Selection Criteria**

### **2.1 ESSENTIAL**

- ▶ Completion (or near completion) of a PhD or equivalent in physics, mathematics, electrical engineering, or a related discipline
- ▶ A demonstrated aptitude for research, with a sound publication record in relevant areas, commensurate with experience and opportunities.
- ▶ Demonstrated ability to prepare research reports and manuscripts for publication.
- ▶ Strong evidence of ability and desire to build an academic research career trajectory.
- ▶ Demonstrated ability to engage with relevant professional and industry bodies and stakeholders to foster collaborative partnerships.
- ▶ Excellent interpersonal and both written and oral communication skills in English.
- ▶ Excellent ability to work co-operatively and positively in a multi-disciplinary research-based team environment and liaise with people from diverse backgrounds.
- ▶ Demonstrated excellent organisational skills to meet deadlines and bring projects to a timely completion.
- ▶ Demonstrated ability to develop, administer and see through to completion appropriately designed research projects with limited supervision.

### **2.2 DESIRABLE**

- ▶ Experience in
  - Observational or theoretical gravitational wave astrophysics, and/or
  - Observational or theoretical neutron star astrophysics, and/or
  - Advanced signal processing
- ▶ The ability to attract external funding through grant applications and/or support in funded joint projects with others internal or external to the university.
- ▶ Experience in assisting with supervision of students undertaking undergraduate or higher degree research projects.

### **2.3 OTHER JOB-RELATED INFORMATION**

- This position requires the incumbent to hold a current and valid Working with Children Check.
- The position involves occasional work out of ordinary hours (e.g., to participate in tele-conferences in other time zones) and occasional domestic and international travel (e.g., to attend conferences in person).

### ***3. Equal Opportunity, Diversity and Inclusion***

The University is an equal opportunity employer and is committed to providing a workplace free from all forms of unlawful discrimination, harassment, bullying, vilification and victimisation. The University makes decisions on employment, promotion, and reward on the basis of merit.

The University is committed to all aspects of equal opportunity, diversity and inclusion in the workplace and to providing all staff, students, contractors, honorary appointees, volunteers and visitors with a safe, respectful and rewarding environment free from all forms of unlawful discrimination, harassment, vilification and victimisation. This commitment is set out in the Advancing Melbourne strategy that addresses diversity and inclusion, equal employment opportunity, discrimination, sexual harassment, bullying and appropriate workplace behaviour. All staff are required to comply with all University policies.

The University values diversity because we recognise that the differences in our people's age, race, ethnicity, culture, gender, nationality, sexual orientation, physical ability and background bring richness to our work environment. Consequently, the People Strategy sets out the strategic aim to drive diversity and inclusion across the University to create an environment where the compounding benefits of a diverse workforce are recognised as vital in our continuous desire to strive for excellence and reach the targets of Advancing Melbourne.

### ***4. Occupational Health and Safety (OHS)***

All staff are required to take reasonable care for their own health and safety and that of other personnel who may be affected by their conduct.

OHS responsibilities applicable to positions are published at:

<http://safety.unimelb.edu.au/topics/responsibilities/>

These include general staff responsibilities and those additional responsibilities that apply for Managers and Supervisors and other Personnel.

### ***5. Other Information***

#### **5.1 RESEARCH CONTEXT: OZGRAV**

[www.ozgrav.org](http://www.ozgrav.org) - OzGrav's postdoctoral and technical positions are funded by the Centre and hosted by the eight partner nodes:

- ▶ Australian National University
- ▶ Monash University
- ▶ Swinburne University of Technology (headquarters)
- ▶ University of Adelaide
- ▶ University of Melbourne
- ▶ University of Queensland
- ▶ University of Sydney
- ▶ University of Western Australia

Research fellows will be encouraged to spend time visiting other nodes as members of a dynamic and flexible team, which works collaboratively across the gravitational-wave spectrum, from nanohertz to kilohertz frequencies, on a range of problems in gravitational-wave astrophysics. Each postdoc has a generous travel budget and access to generous resources and technologies to facilitate OzGrav-wide large-scale projects. OzGrav is also home to the new \$5.2M OzSTAR supercomputer, Ngarrgu Tindebeek, custom designed to support gravitational-wave astrophysics. OzGrav members have the opportunity to become active participants in the LIGO-Virgo-Kagra Scientific Collaboration and participate in nanohertz-frequency gravitational wave astronomy through the MeerKAT Pulsar Timing Array, Parkes Pulsar Timing Array, and International Pulsar Timing Array projects.

OzGrav is dedicated to creating a balanced workforce, by providing family-friendly policies and work practices, and working to solve “two-body” problems where possible. It will run dedicated Career Development, Gender Equity, Outreach and Research Translation programmes.

The successful applicant will be part of a team of OzGrav research fellows at the University of Melbourne working in the areas of LIGO data analysis, pulsar timing, gravitational wave and high-energy astrophysics, theory of extreme matter, theory of neutron star interiors and magnetic fields, advanced signal processing, and high-performance computing. As well as conducting their own independent research, research fellows have the opportunity to participate in a range of collaborative projects inside and outside OzGrav. The position offers the opportunity to work with some of Australia’s top physics postgraduate students. Current activities at U. Melbourne include:

- leadership of LIGO continuous-wave (hidden Markov model) searches
- analysis of radio pulsar timing data, with an emphasis on novel tracking methods for timing noise and glitches and nanohertz gravitational wave detection with pulsar timing arrays
- multi-messenger astrophysical studies of neutron stars, including simulations of magnetic fields and quantum fluids in neutron star interiors and the nuclear equation of state
- cross-disciplinary studies at the interface of LIGO detector characterization, signal processing, and computing, including noise suppression
- industry translation opportunities
- a rich public outreach effort.

The University of Melbourne is a full member of the LIGO-Virgo-KAGRA Scientific Collaboration.

## 5.2 SCHOOL OF PHYSICS

[www.physics.unimelb.edu.au/](http://www.physics.unimelb.edu.au/)

The University of Melbourne's School of Physics is one of Australia's leading Physics Schools. It has achieved this status through the high quality of its research and teaching programs. The School offers a wide range of physics subjects to undergraduate and postgraduate students, and performs research in the following areas: Astrophysics, Atomic, Molecular and Optical Physics, Experimental Condensed Matter Physics, Experimental Particle Physics, Materials Science, Physical Biosciences, Theoretical Condensed Matter Physics and Theoretical Particle Physics.

The School of Physics hosts the following ARC Centre of Excellence groups:

- ▶ ARC Centre of Excellence for Transformative Meta-Optical Systems (TMOS)
- ▶ ARC Centre of Excellence for Dark Matter Particle Physics
- ▶ ARC Centre of Excellence for Gravitational Wave Discovery
- ▶ ARC Centre of Excellence for All Sky Astrophysics in 3D
- ▶ ARC Centre of Excellence for Quantum Computation and Communication Technology (CQC<sup>2</sup>T)

The School also plays a major role in the Australian Synchrotron research program, and in the development of the Stawell Underground Physics Laboratory.

Currently some 30 academics, 51 research-only staff, more than 95 postgraduate students and 72 associates supported by 23 professional staff make up the School of Physics. The School typically hosts several ARC Laureate Fellows, Future Fellows, and Discovery Early Career Researchers. Skilled technical staff operate, maintain and develop complex instrumentation and equipment to support the teaching and research activities of the School. The School is located in the David Caro building on the Swanston Street boundary of the University campus. The Head of School and majority of the Professional staff are housed on the ground floor of the building to act as the first point of contact for students, staff and visitors.

## 5.3 FACULTY OF SCIENCE

<http://www.science.unimelb.edu.au>

Science at Melbourne is a global leader across fundamental and impactful scientific research and education. Science begins with curiosity, and we are dedicated to understanding the universe from the level of sub-atomic particles to the solar system. We aim to be leaders who positively impact the community locally and globally, addressing major societal issues from climate change to disease. Our discoveries help build an understanding of the world around us.

Our strength is our breadth of expertise. We are the second largest faculty in the University comprising seven schools: Agriculture, Food & Ecosystem Sciences, BioSciences, Chemistry, Geography, Earth & Atmospheric Sciences, Mathematics & Statistics, Physics and Veterinary Science.

This depth of knowledge positions the faculty to better understand, explore and impact our world and humanity, within a truly comprehensive Faculty of Science.

We have more than 150 years of experience in pioneering scientific thinking and analysis, leading to outstanding teaching and learning and offer a curriculum based on highly



relevant research. We aim to train students with the knowledge and intellectual flexibility to drive the industries of tomorrow and lead across all levels of society.

We offer a range of undergraduate, honours, graduate and research degrees, enrolling more than 11,500 undergraduate and 3,750 graduate students.

We are dedicated to delivering leading transformative educational outcomes, underpinned by research, and an inclusive and inspiring student experience.

Excellence comes in many forms and diversity of thought, perspective and disciplines is essential to deliver globally leading science. At the core of our success is our focus on an inclusive environment for all in our community. Our Faculty's focus on equity, inclusion and belonging is grounded in our endeavour to ensure we are best placed to advance research, teaching and serve diverse national and global communities.

As a Science community we sit across five of the University's campuses – Parkville, Dookie, Burnley, Creswick and Werribee. This reach provides us with a unique perspective that is beneficial to our teaching and research. It also means we can offer our students a greater variety of learning experiences and internships to engage with industry partners to solve real-world issues.

The Faculty is custodian of the Bio21 Molecular Science and Biotechnology Institute, Melbourne Energy Institute, Melbourne Biodiversity Institute, Oceania Institute, Office for Environmental Programs, Australian Mathematical Sciences Institute (AMSI) and the Indigenous Knowledge Institute and home to numerous Centres.

#### 5.4 THE UNIVERSITY OF MELBOURNE

Established in 1853, the University of Melbourne is a leading international university with a tradition of excellence in teaching and research. The main campus in Parkville is recognised as the hub of Australia's premier knowledge precinct comprising eight hospitals, many leading research institutes and a wide-range of knowledge-based industries. With outstanding performance in international rankings, the University is at the forefront of higher education in the Asia-Pacific region and the world.

The University employs people of outstanding calibre and offers a unique environment where staff are valued and rewarded.

Further information about working at The University of Melbourne is available at <http://about.unimelb.edu.au/careers>.

#### 5.5 ADVANCING MELBOURNE

The University's strategic direction is grounded in its purpose. While its expression may change, our purpose is enduring: to benefit society through the transformative impact of education and research. Together, the vision and purpose inform the focus and scale of our aspirations for the coming decade.

Advancing Melbourne reflects the University's commitment to its people, its place, and its partners. Our aspiration for 2030 is to be known as a world-leading and globally connected Australian university, with our students at the heart of everything we do.

- We will offer students a distinctive and outstanding education and experience, preparing them for success as leaders, change agents and global citizens.
- We will be recognised locally and globally for our leadership on matters of national and global importance, through outstanding research and scholarship and a commitment to collaboration.

- We will be empowered by our sense of place and connections with communities. We will take opportunities to advance both the University and the City of Melbourne in close collaboration and synergy.
- We will deliver this through building a brilliant, diverse and vibrant University community, with strong connections to those we serve.

The means for achieving these goals include the development of the University of Melbourne's academic and professional staff and the capabilities needed to support a modern, world-class university. Those means require a commitment to ongoing financial sustainability and an ambitious infrastructure program which will reshape the campus and our contribution to the communities we engage with. This strategy, and the priorities proposed, is centred around five intersecting themes: place, community, education, discovery and global.

## 5.6 GOVERNANCE

The Vice Chancellor is the Chief Executive Officer of the University and responsible to Council for the good management of the University.

Comprehensive information about the University of Melbourne and its governance structure is available at <http://www.unimelb.edu.au/governance>