Macquarie’s physics and astronomy research is world leading. In the most recent Excellence in Research for Australia (ERA) evaluation, our physical sciences research received a rating of 5 out of 5 – ‘outstanding performance well above world standard’, as did our research in the sub-disciplines of astronomical and space sciences, and quantum physics.

Our scientists enjoy outstanding international collaborative links, and publish their research in high-impact journals.

As an HDR candidate you will work alongside outstanding researchers on fundamental and applied physics in optics, photonics and lasers; astronomy and astrophysics; or quantum information science. A range of cutting-edge projects are available, involving work in areas such as:

- building powerful new lasers with pure diamond crystals
- constructing 3D quantum logic circuits using high-intensity femtosecond lasers
- designing new sensors based on levitated quantum mechanical systems
- finding cell populations with enhanced therapeutic value using advanced imaging
- harnessing the angular momentum of light at the quantum level
- studying collisions between planets and dying stars
- using nanoparticles to identify diseases.

Macquarie physicists have partnered in successful commercial ventures leading to spinoff companies such as semiconductor producer BluGlass Ltd, and Laser Micromachining Solutions, which provides micro-fabrication services to companies and universities across Australia.

Graduates from Macquarie have obtained academic, post-doctoral research, industry and government positions, making successful careers in Australia and internationally. Additionally, our HDR students have been very successful obtaining national and international awards including the Jak Kelly Award, Royal Society Scholarships; travel grants from OSA, ISAC, and other organisations; and best poster and best presentation awards at major conferences.

### Areas of Specialisation
- Astronomy, astrophysics and astrophotonics
- Biophotonics
- Lasers and light sources, photonic structures and devices
- Molecular physics
- Nanotechnology
- Quantum information science and technology
- Semiconductors and materials

### Facilities
- Access to onshore and offshore 2 – 8 metre telescopes
- Laser micromachining, nano-characterisation and diamond growth facility
- More than 30 well-equipped laboratories and clean rooms
- Optical and photonic micro-characterisation and microscopy facilities
- Thin film deposition and crystal growth systems

### Research Hubs
- MQ Biofocus Research Centre
- MQ Photonics Research Centre
- Macquarie University Research Centre for Astronomy, Astrophysics and Astrophotonics
- Research Centre in Quantum Science and Technology
Large federally-funded centres

- The Department of Physics and Astronomy is home to major nodes in the ARC Centres of Excellence for Engineered Quantum Systems, Nanoscale BioPhotonics and Ultrahigh-bandwidth Devices for Optical Systems, as well as the OptoFab Node of the Australian National Fabrication Facility

Support

We give HDR candidates strong academic and administrative support. This includes:

- commencement and completion programs
- discipline-specific research training units, including workshops in research communication, presentation skills, academic writing skills, thesis planning and poster preparation
- experienced supervisors and department-based higher degree research directors
- financial support for eligible candidates for a range of research-related activity
- regular progress reports and interviews, and/or work-in-progress presentations in which research candidates receive feedback on their work from a panel of academics in their field.

Research leaders

- Macquarie is home to many internationally renowned researchers, including three Fellows of The Optical Society and a Chair of the International Astronomical Union. The department is home to six ARC Future Fellows, and a Gutenberg Chair in Physics and Astronomy. We have strong collaborations and joint staff appointments with the Australian Astronomy Observatory (AAO) and CSIRO Astronomy and Space Science.

- Our research leadership is recognised internationally, with high-profile research published in prestigious journals including Nature Physics, Nature Photonics, Nature Nanotechnology and Science.

- Our national and international network of collaborators allows our students to participate in industrial projects and in international research programs, supporting them to develop successful careers beyond their degrees.