



RESEARCH FELLOW IN THE ELECTRONIC PROPERTIES OF TWISTED 2D SEMICONDUCTORS

| | |
|------------------|---------------------------------|
| DEPARTMENT/UNIT | School of Physics and Astronomy |
| FACULTY/DIVISION | Faculty of Science |
| CLASSIFICATION | Level A |
| WORK LOCATION | Clayton Campus |

ORGANISATIONAL CONTEXT

Everyone needs a platform to launch a satisfying career. At Monash, we give you the space and support to take your career in all kinds of exciting new directions. You'll have access to quality research, infrastructure and learning facilities, opportunities to collaborate internationally, as well as the grants you'll need to publish your work. We're a university full of energetic and enthusiastic minds, driven to challenge what's expected, expand what we know, and learn from other inspiring, empowering thinkers. Discover more at www.monash.edu.

Everyone needs a platform to launch a satisfying career. At Monash, we give you the space and support to take your career in all kinds of exciting new directions. You'll have access to quality research, infrastructure and learning facilities, opportunities to collaborate internationally, as well as the grants you'll need to publish your work. We're a university full of energetic and enthusiastic minds, driven to challenge what's expected, expand what we know, and learn from other inspiring, empowering thinkers. Discover more at www.monash.edu

The Faculty of Science contributes to the university's goals via research, teaching and partnerships with industry, government and individual supporters. Our five Schools cover a large and diverse range of disciplines in undergraduate and postgraduate courses. Ten Schools from other university faculties contribute to science teaching at all levels, allowing students to choose their studies from physical, biological, biomedical, behavioural, environmental, mathematical and computer sciences. The research in the Faculty of Science is carried out by world-class researchers. Their work spans the theoretical to the applied, contributes to new knowledge and technologies, and challenges how we interact with the world. To learn more about the Faculty of Science, please visit our website: www.monash.edu/science/.

The School of Physics and Astronomy is a School located within the Faculty of Science. It aims to position itself as one of the top physics and astronomy research and teaching departments in Australia. The School is committed to teaching and research of the highest quality in astronomy, astrophysics, experimental physics, and theoretical

physics. We are strongly committed to improving the diversity of our staff and students, and promoting a culture of equality, fairness, respect and openness. In 2015, the School received a Bronze Pleiades Award - Recognising Commitment to Advancing Women in Astronomy. This is an important first step in affirming women within the School, one that we can build upon. Please visit <https://www.monash.edu/science/schools/physics>.

Currently the School has 30 tenured academic staff, 36 research-only staff and 12 adjunct staff, supported by 14 professional staff. In 2018, the School's total recurrent income was approximately \$20M, with research income in the past four years totaling >\$40M. It is actively involved in six research centres:

- The ARC Centre of Excellence for Future Low Energy Electronics Technologies (FLEET) - <https://www.fleet.org.au/>
- The ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav) - www.ozgrav.org
- The Monash Centre for Electron Microscopy (MCEM) - <http://mcem.monash.edu.au>

Prof. Michael Fuhrer is a Professor and former ARC Laureate Fellow in the School of Physics and Astronomy. Fuhrer runs a vigorous experimental research program on graphene, atomically thin semiconductors, and topological materials. Fuhrer's laboratory in the New Horizons Centre is equipped with two low-temperature (4.5 K) ultra-high vacuum scanning tunneling microscopes, low-temperature electronic measurement facilities (<100 mK, 14 T), van der Waals fabrication facilities (ambient and Ar glove box), as well as facilities for materials synthesis and spectroscopic characterisation. Fuhrer founded the Monash Centre for Atomically Thin Materials (MCATM; <https://www.monash.edu/atomically-thin-materials>) which also includes researchers in Chemistry, Materials Engineering, and Mechanical Engineering with interests in graphene and other atomically thin materials. Fuhrer directs the ARC Centre of Excellence in Future Low-Energy Electronics Technologies, with six Chief Investigators at Monash (Profs. Fuhrer and Helmerson, A/Prof. Parish and Dr Schiffrin, in the School of Physics & Astronomy, and A/Profs. Medhekar and Bao in the Department of Materials Science and Engineering). <https://research.monash.edu/en/persons/michael-fuhrer>.

Dr Mark Edmonds is a Lecturer in the School of Physics & Astronomy at Monash University and a former ARC DECRA fellow. He is an associate investigator in the ARC Centre of Excellence in Future Low-Energy Electronics Technologies (FLEET) and investigator in the Monash Centre for Atomically Thin Materials (MCATM). He leads a laboratory and research group into the growth via molecular beam epitaxy of novel electronic materials such as topological Dirac semimetals and topological insulators and their electronic properties. The laboratory includes state-of-the-art facilities for growth via molecular beam epitaxy and in-situ diffraction characterisation in ultra-high vacuum, with a glove box attached to the load lock. An ultra-high vacuum suitcase allows transfer of samples to the Toroidal Analyser at the Australian Synchrotron for angle-resolved photoelectron spectroscopy measurements. High magnetic field cryostats are also available for sample characterisation. Further information on Dr Edmonds research programme is available at: <http://research.monash.edu/en/persons/mark-edmonds>.

POSITION PURPOSE

A Level A research-only academic is expected to contribute towards the research effort of the university and to develop their research expertise through the pursuit of defined projects relevant to the particular field of research.

The role is responsible for conducting research in experimental condensed matter physics and surface science. The Fellow will fabricate van der Waals heterostructures of 2D semiconductors with controlled twist angle, and study their electronic properties using low-temperature magnetotransport. The Research Fellow will also work closely with a team to study the electronic structure of twisted 2D semiconductor heterostructures using scanning tunneling microscopy and angle-resolved photoelectron spectroscopy. The Research Fellow is expected to publish papers in high-impact journals, present results at major conferences and workshops, and to assist in the supervision of PhD and honours students.

Reporting Line: The position reports to a professor in the School of Physics and Astronomy

Supervisory Responsibilities: Not applicable

Financial Delegation: Not applicable

Budgetary Responsibilities: Not applicable

KEY RESPONSIBILITIES

Specific duties required of a Level A research-only academic may include:

1. The conduct of research under limited supervision either as a member of a team or, where appropriate, independently and the production or contribution to the production of conference and seminar papers and publications from that research
2. Establishing a programme of high-quality research in experimental condensed matter physics into the electronic properties of twisted 2D semiconductor
3. Supervising the operation of (1) a van der Waals heterostructure apparatus inside a glove box and (2) a low-temperature high-magnetic-field cryostat
4. Disseminating the result of the research in high-quality publications and as well as presentations at conferences and seminars
5. Involvement in professional activities including, subject to availability of funds, attendance at conferences and seminars in the field of expertise
6. Limited administrative functions primarily connected with the area of research of the academic
7. Co-supervision of PhD students

KEY SELECTION CRITERIA

Education/Qualifications

1. The appointee will have:
 - A doctoral qualification in experimental condensed matter physics or a relevant discipline or a closely related field

Knowledge and Skills

2. Research experience in van der Waals heterostructure fabrication using 2D materials, and device fabrication/cleanroom techniques
3. A strong background and expertise in experimental condensed matter physics, particularly in electronic measurements
4. A demonstrable record of high-impact, peer-reviewed publications in experimental physics, surface science and/or materials growth
5. Excellent written communication and verbal communication skills with proven ability to produce clear, succinct reports and documents
6. Ability to solve complex problems by using discretion, innovation and the exercise diagnostic skills and/or expertise
7. Other experience in techniques of electronic materials research including materials synthesis, spectroscopic characterisation, scanned probe techniques (STM, AFM) will be advantageous

OTHER JOB RELATED INFORMATION

- Travel to other campuses of the University may be required
- There may be a requirement to work additional hours from time to time

- There may be peak periods of work during which taking of leave may be restricted
- A current satisfactory Working With Children Check is required

GOVERNANCE

Monash University expects staff to appropriately balance risk and reward in a manner that is sustainable to its long-term future, contribute to a culture of honesty and integrity, and provide an environment that is safe, secure and inclusive. Ensure you are aware of and adhere to University policies relevant to the duties undertaken and the values of the University. This is a standard which the University sees as the benchmark for all of its activities in Australia and internationally.