POSITION DESCRIPTION

Position Title: Postdoctoral Research Fellow
Organisation Unit: School of Mathematics and Physics
Position Number: 3025798
Type of Employment: Full-time, fixed term for up to 2 years
Classification: Academic Level A (Research Focussed)

THE UNIVERSITY OF QUEENSLAND

The University of Queensland (UQ) contributes positively to society by engaging in the creation, preservation, transfer and application of knowledge. UQ helps shape the future by bringing together and developing leaders in their fields to inspire the next generation and to advance ideas that benefit the world. UQ strives for the personal and professional success of its students, staff and alumni. For more than a century, we have educated and worked with outstanding people to deliver knowledge leadership for a better world.

UQ ranks in the world’s top universities, as measured by several key independent ranking, including the CWTS Leiden Ranking (32), the Performance Ranking of Scientific Papers for World Universities (43), the US News Best Global Universities Rankings (42), QS World University Rankings (48), Academic Ranking of World Universities (55), and the Times Higher Education World University Rankings (69). Excluding the award component, UQ is now ranked 45th in the world in the ARWU, and is one of the only two Australian universities to be included in the global top 50.

UQ has an outstanding reputation for the quality of its teachers, its educational programs and employment outcomes for its students. Our students remain at the heart of what we do. The UQ experience – the UQ Advantage – is distinguished by a research enriched curriculum, international collaborations, industry engagement and opportunities that nurture and develop future leaders. UQ has a strong focus on teaching excellence, winning more national teaching excellence awards than any other in the country and attracting the majority of Queensland’s highest academic achievers, as well as top interstate and overseas students.

UQ is one of Australia’s Group of Eight, a charter member of edX and a founding member of Universitas 21, an international consortium of leading research-intensive universities.

Our 52,000-plus strong student community includes more than 16,400 postgraduate scholars and more than 15,400 international students from 135 countries, adding to its proud 250,000-plus alumni. The University has more than 6,600 academic and professional staff (full-time equivalent) and a $1.75 billion annual operating budget. Its major campuses are at St Lucia, Gatton and Herston, in addition to teaching and research sites around Queensland and Brisbane city. The University has six Faculties and four University-level Institutes. The Institutes, funded by government and industry grants, philanthropy and commercialisation activities, have built scale and focus in research areas in neuroscience, biomolecular and
biomedical sciences, sustainable minerals, bioengineering and nanotechnology, as well as social science research.

UQ has an outstanding track-record in commercialisation of our innovation with major technologies employed across the globe and integral to gross product sales of $11billion+ (see http://uniquest.com.au/our-track-record).

UQ has a rapidly growing record of attracting philanthropic support for its activities and this will be a strategic focus going forward.

Organisational Environment

UQ Physics is located in the School of Mathematics and Physics in the Faculty of Science. The Discipline is internationally recognised for its research excellence, and hosts a number of world-class research centres. In the recent Excellence in Research for Australia 2015 assessment, the University of Queensland was rated “well-above world standard” in Physical Sciences and Quantum Physics. Details of the research interests of academic staff may be accessed on the School’s web site at http://www.smp.uq.edu.au/

The University of Queensland and the School of Mathematics and Physics is proud to support a major research effort in quantum physics. It leads the ARC Centre of Excellence (CoE) for Engineered Quantum Systems (led by Prof. Andrew White) and hosts nodes of the ARC CoE for Future Low-Energy Electronics Technologies and ARC CoE for Quantum Computing and Communication Technology.

The advertised position is in the theoretical group for Quantum Many-Body Dynamics (QMBD) led by Prof. Karen Kheruntsyan and Dr. Ian McCulloch. The QMBD group is a recent offshoot of the quantum gases, condensed matter, and AMO physics research efforts that have been a core research strength in Quantum Science in the SMP for more than two decades. Other quantum gases, condensed matter, and AMO theorists that we closely interact with include Dr. Michael Bromley, Dr. Joel Corney, Prof. Matthew Davis, Dr. Jacinda Gringes, Prof. Ross McKenzie, Prof. Ben Powel, and Prof. Tom Stace. We also closely interact with the UQ Bose-Einstein Condensation laboratory (led by Prof. Halina Rubinsztein-Dunlop with Dr. Tyler Neely and Dr. Mark Baker) and with the Quantum Optics laboratory of Prof. Warwick Bowen.

Information for Prospective Staff

Information about life at UQ including staff benefits, relocation and UQ campuses is available at - http://www.uq.edu.au/current-staff/working-at-uq

The University of Queensland Enterprise Agreement outlines the position classification standards for Levels A to E.

DUTY STATEMENT

Primary Purpose of Position

To carry out research aligned with the Australian Research Council Discovery Project grant “Quantum thermodynamics of ultracold atoms” awarded to Prof. Karen Kheruntsyan and Dr. Ian McCulloch. This will involve the development of theoretical and computational many-body methods for characterizing and simulating the nonequilibrium dynamics of ultracold quantum gases in a variety of thermodynamic scenarios. Applications of these methods will
be made to fundamental and applied problems, including modeling and development of proposals for specific ultracold atom experiments in collaboration with international partners.

**Duties**

Duties and responsibilities include, but are not limited to:

**Research**
- Conduct research and develop research program in quantum thermodynamics of ultracold atomic gases
- Develop quantum many-body methods and computer codes and apply them to characterize finite-temperature equilibrium and nonequilibrium behavior of interacting many-body systems
- Publish the results of their research in leading international peer-reviewed journals
- Present the results of their research at international and national conferences
- Participate in the academic life of the School of Mathematics and Physics, including giving talks at seminars and regular group meetings
- Collaborate with colleagues and postgraduates in the development and execution of joint research projects

**Teaching and Learning**
- Assist in the supervision of postgraduate and undergraduate students

**Service and Engagement**
- Perform a range of standard administrative functions in the School of Mathematics and Physics
- Contribute to the processes that enable the academic team to manage the work of the School, including participate in School decision-making and serve on School committees
- Foster the School's relations with industry, government departments, professional bodies and the wider community.
- Any other duties as reasonably directed by your supervisor

**Other**

Ensure you are aware of and comply with legislation and University policy relevant to the duties undertaken, including but not exclusive to:
- the [University's Code of Conduct](#)
- requirements of the Queensland occupational health and safety (OH&S) legislation and related [OH&S responsibilities and procedures](#) developed by the University or Institute/School
- the adoption of sustainable practices in all work activities and compliance with associated legislation and related University [sustainability responsibilities and procedures](#)
• requirements of the Education Services for Overseas Students Act 2000, the National Code 2007 and associated legislation, and related responsibilities and procedures developed by the University

Organisational Relationships

The position reports to Prof. Karen Kheruntsyan, School of Mathematics and Physics Head of School, and is supervised jointly with Dr. Ian McCulloch.

SELECTION CRITERIA

• Applicants will have (or be in the process of obtaining) a PhD in theoretical physics in the area ultracold atoms or condensed matter physics with expertise in computational many-body dynamics
• Strong background and demonstrated capacity to carry out research in AMO, Condensed Matter and/or Computational Physics, with high level analytical and computational skills
• Expertise in numerical methods for quantum many-body dynamics, such t-DMRG, Matrix Product States and finite temperature c-field techniques
• Knowledge of quantum field theory and many-body methods, such as Quantum Lattice Models, DMRG and t-DMRG, Matrix Product States, Luttinger Liquid, Low Dimensional Systems, Integrable Systems, Bethe Ansatz, and Keldysh Formalism
• Demonstrated research quality evidenced by highly-cited publications (relative to publication year) in leading international peer-reviewed journals
• Demonstrated ability to conduct research independently and collaboratively, evidenced by first-authored publications
• High-level of verbal and written communication skills
• Ability to interact well with colleagues, staff, and students

Qualification Verification

An appointment to this position is subject to the verification of the highest academic qualification from the conferring institution.

The University of Queensland values diversity and inclusion and actively encourages applications from those who bring diversity to the University. Please refer to the University’s Diversity and Inclusion webpage (http://www.uq.edu.au/equity) for further information and points of contact if you require additional support.

Accessibility requirements and/or adjustments can be directed to Carley Meehan at recruitment@uq.edu.au.