

Title: Senior research associate: quantum annealing experiment; collaboration with MIT Lincoln Laboratory

Reference: 1628099

Grade: 8

Salary: £42,304 - £49,904 (inclusive of London Allowance)
An additional market supplement of up to £18,421 per year will be payable to compensate for extended off-site working at MIT Lincoln Laboratory.

Terms and Conditions: In accordance with the conditions of employment as laid down in the relevant UCL Staff policies

Accountable to: Prof Paul Warburton

Job Summary:

We seek to appoint an experienced experimentalist post-doctoral researcher to take a leadership role in the design and measurement of circuit elements of a quantum annealer based on superconducting quantum interference devices.

The work at UCL is part of the international collaborative project “FluQS” funded by the US government agency IARPA. Other team members in the collaboration include the University of Southern California, Caltech, MIT Lincoln Laboratory, MIT, Harvard University, the University of Waterloo (Canada), UC Berkeley, Tokyo Institute of Technology, the University of Saarland (Germany), Lockheed Martin Corporation and Northrop Grumman Corporation. The overall goal of this project is to demonstrate quantum speedup in a prototype quantum annealing machine. The FluQS project is initially funded for one year, with further options for an additional four years (subject to satisfactory performance).

The appointee will be based off-site at MIT Lincoln Laboratory, where the experimental facilities for the FluQS project will be located. The applicant must therefore be willing and in a position to undergo the usual security clearances for working at MIT Lincoln Laboratory.

Duties and Responsibilities:

Use off-the-shelf and tailored software tools to design and simulate novel elements for a superconducting annealer, including high-order couplers (*i.e.* cubic and quartic) and couplers which enable the encoding of non-stoquastic Hamiltonians (*e.g.* $\sigma^x \sigma^x$).

Submit circuit-layout artwork for these circuit elements to the fabrication facility at MIT Lincoln Laboratory.

Measure the electronic properties of the circuit elements at millikelvin temperatures with both annealing and r.f. spectroscopy techniques using the experimental facilities at MIT Lincoln Laboratory.

Take leadership responsibility for a small team of one postdoctoral researcher and three graduate students working on the FluQS project at UCL.

Take leadership responsibility for interactions with collaborators both at MIT Lincoln Laboratory and more widely within the FluQS team.

Prepare reporting documentation for use within the FluQS team; attend and give presentations at FluQS team progress meetings.

Prepare articles for publication and presentation of papers at conferences.

Comply with relevant College policies, including Financial Regulations, Equal Opportunities Policy, Promoting Race Equality Policy, Health and Safety Policy, Information Systems Security Policy and Intellectual Property Rights and Register of Interests Policies.

Person Specification

Essential Qualifications

A PhD in experimental physics or experimental materials science or experimental electrical engineering

Essential Experience

Hands-on experience of designing, installing and performing electrical transport measurements in a dilution refrigerator leading to publications in the international peer-reviewed literature

Hands-on experience of performing radio frequency measurements in a dilution refrigerator at frequencies above 1 GHz

Hands-on experience of designing, installing and performing measurements on Josephson junctions or superconducting quantum interference devices

A record of publication in peer-reviewed academic journals as first author

Desirable Experience

An independent research reputation, including giving invited talks at conferences

Track record of working in the field of experimental quantum computation

Experience of quantum annealing

Experience of design and simulation of superconducting circuits

Essential skills and abilities

Willingness to undergo the usual security clearances for working at MIT Lincoln Laboratory (search on-line for “mit lincoln lab security clearance quick reference” for a pdf with useful information on this)

A demonstrated ability for innovation and original research

Good organisational and multi-tasking abilities

To have a sound grasp of current health & safety regulations, practices and issues, particularly in relation to the topic being researched, and to comply with these at all times

Ability to exercise initiative and judgment in carrying out research tasks

Ability to maintain a clear and up-to-date lab notebook and prepare and present progress reports to the project team members and at seminars

Ability to write clearly and concisely to a level consistent with publication in highly regarded international journals

Ability to communicate results effectively at meetings and conferences

Ability to relate appropriately to others and to work as part of a team

London Centre for Nanotechnology

The London Centre for Nanotechnology is an interdisciplinary joint enterprise between University College London and Imperial College London. In bringing together world-class infrastructure and leading nanotechnology research activities, the Centre aims to attain the critical mass to compete with the best facilities abroad. Research programmes are aligned to three key areas, namely Planet Care, Healthcare and Information Technology and exploit core competencies in biomedical, physical and engineering sciences.

The Centre occupies a purpose-built eight storey facility in Gordon Street, Bloomsbury, as well as extensive facilities within different departments at South Kensington. LCN researchers have access to state-of-the-art clean-room, characterisation, fabrication, manipulation and design laboratories. This experimental research is complemented by leading edge modelling, visualisation and theory.

LCN has strong relationships with the broader nanotechnology and commercial communities, and is involved in much major collaboration. As the world's only such facility to be located in the heart of a metropolis, LCN has superb access to corporate, investment and industrial partners. LCN is at the forefront of training in nanotechnology, and has a strong media presence aimed at educating the public and bringing transparency to this emerging science.

About UCL

UCL is one of the world's top universities. Based in the heart of London, it is a modern, outward-looking institution. At its establishment in 1826, UCL was radical and responsive to the needs of society, and this ethos – that excellence should go hand-in-hand with enriching society – continues today.

UCL's excellence extends across all academic disciplines; from one of Europe's largest and most productive hubs for biomedical science interacting with several leading London hospitals, to world-renowned centres for architecture (UCL Bartlett) and fine art (UCL Slade School).

UCL is in practice a university in its own right, although constitutionally a college within the federal University of London. With an annual turnover exceeding £1 billion, it is financially and managerially independent of the University of London.

The UCL community

UCL's staff and former students have included 29 Nobel prizewinners. It is a truly international community: more than one-third of our student body – more than 35,000 strong – come from 150 countries and nearly one-third of staff are from outside the UK.

UCL offers postgraduate research opportunities in all of its subjects, and provides more than 200 undergraduate programmes and more than 400 taught postgraduate programmes. Approximately 54% of the student community is engaged in graduate studies, with about 29% of these graduate students pursuing research degrees.

Quality of UCL's teaching and research

UCL is independently ranked as the most productive research university in Europe (SIR). It has 983 professors – the highest number of any university in the UK – and the best academic to student ratio of any UK university (*The Times*, 2014), enabling small class sizes and outstanding individual support.

In Research Excellence Framework 2014 (REF2014), UCL was rated the top university in the UK for 'research power' (the overall quality of its submission multiplied by the number of FTE researchers submitted). It was rated top not only in the overall results, but in each of the assessed components: publications and other research outputs; research environment; and research impact. REF2014 confirmed UCL's multidisciplinary research strength, with many leading performances across subject areas ranging from biomedicine, science and engineering and the built environment to laws, social sciences and arts and humanities.

Equality

UCL is proud of its longstanding commitment to equality and to providing a learning, working and social environment in which the rights and dignity of its diverse members are respected.

Some highlights below:

- **Race Charter Mark** - UCL holds a Bronze Race Equality Charter Mark award, recognising UCL's commitment to improving the representation, progression and success of minority ethnic staff and students.
- **Athena SWAN** - UCL holds an institutional Silver **Athena SWAN** award – this recognises our commitment to and impact in addressing gender equality. Departments at UCL are also engaged in the Athena SWAN charter, with 29 departments holding an award; 16 Silver and 13 Bronze.

- **Staff networks** - We have a number of staff networks that run a range of social and development activities, for example [Out@UCL](#), [PACT](#), [Enable@UCL](#), [the race equality staff network](#), [Astrea](#) and [UCL Women](#).
- **B-MEntor** – [B-MEntor](#) is a mentoring scheme for black and minority ethnic staff. The mentoring scheme is a collaborative initiative with a number of London-based universities.
- **Sabbatical Leave following maternity** – UCL provides one term of sabbatical leave without teaching commitments for research-active academics returning from maternity, additional paternity, adoption or long-term carer's leave. This support for returners enables staff to more quickly re-establish their research activity.

Please see our [Equalities and Diversity Strategy 2015-2020](#) for information on our current priorities.

Location and working environment

Based in Bloomsbury, UCL is a welcoming, inclusive university situated at the heart of one of the world's greatest cities.

UCL's central campus is within easy reach of Euston, Kings Cross and Marylebone mainline stations, the new Eurostar terminal at St. Pancras and the following Underground stations - Euston Square, Warren Street, Goodge Street and Russell Square. Road connections to the M1 and M40 motorways give easy access to the north and west road networks. There are also good public transport links to Heathrow airport.

Application procedure

Further details about the post and the application procedure are available at www.london-nano.com. If you are unable to apply online please contact Marta Dul at the London Centre for Nanotechnology, m.dul@ucl.ac.uk or 17-19 Gordon Street, London WC1H 0AH, for advice.