



Job Description

Research Fellow in Non-Reciprocal Photonic Integrated Circuits

Reference: B04-05489

Department: Electronic & Electrical Engineering

Salary: Grade 7.30 - 37 (£43,124 - £51,610 per annum, inclusive of London Allowance).

Location: UCL, London

Reports to

Prof. Michael Wale

Context

The Photonics Group of the UCL Department of Electronic and Electrical Engineering wishes to appoint a Research Fellow to work in the field of non-reciprocal integrated photonic devices and circuits as part of the CIRCULIGHT project, a collaboration between nine universities, research institutes and companies across Europe (<https://www.circulight.eu/>).

Photonic Integrated Circuit (PIC) technology, in which many different optical functions are combined on a single chip, is a critical enabler for the world's digital infrastructure, including the internet, data centres and high-performance computing, as well as other vital application areas such as healthcare, avionics and future automotive systems. Present day technology however lacks an effective non-reciprocal element, which can isolate devices from each other and route signals unidirectionally within an integrated system. CIRCULIGHT will provide this capability, thereby enabling major improvements in functionality, complexity and performance. We anticipate that this development will allow PICs to be used in a wider range of applications, to improve the cost-effectiveness of digital systems, and consequently to have major economic impact. The practical realization of efficient non-reciprocal functionality within CIRCULIGHT will be a world-first achievement and a breakthrough in PIC technology.

CIRCULIGHT is based on application of the magneto-bi-plasmonic (MBP) effect, employing magneto-optical (MO) nanoparticle-composite sol-gel materials. This choice of technology will enable the monolithic insertion of circulators on any photonic platform. At UCL, we will concentrate on the implementation of non-reciprocal photonic device elements (isolators/circulators) within a new integrated photonics platform based on the epitaxial growth of quantum-dot III-V semiconductor materials directly on silicon. This revolutionary platform allows active devices such as lasers and optical amplifiers to be integrated monolithically on silicon together with passive waveguides, modulators and other device elements, thereby providing complex functionality in a platform that is compatible with highly cost-effective manufacture.

Funding

The post is available immediately until 30th September 2027 in the first instance. Further funding to support the post may be available.

Main purpose of the job

Within the CIRCULIGHT project, UCL will work with researchers in eight other universities, research institutes and companies, to investigate a radically new approach to the integration of non-reciprocal functionality in photonic integrated circuits (PICs). We anticipate that this research will have very high impact, as noted in the section above.

A major part of the UCL work will be to carry out research on the integration of the CIRCULIGHT magneto-bi-plasmonic device elements into the radically new PIC platform that is currently being developed at UCL, based on the epitaxial growth of III-V semiconductor quantum dot structures on silicon.

UCL leads the CIRCULIGHT work package on “Integrated Circulator Proof of Concept in Systems”, which includes the design and fabrication of a transceiver PIC, together with critical experimental evaluation of its performance.

UCL is also deeply engaged in numerous other aspects of the project, including the design of generic integration building blocks, development of the specific building blocks needed for incorporation into the III-V/silicon platform, characterization of experimental circulator device elements, packaging and system analysis. Furthermore, UCL leads the task on results dissemination and the exploitation plan and will play an important role in wider aspects of impact maximization.

As the main researcher on the project, the Research Fellow will be expected to make major contributions across the full range of the above activities, in collaboration with our partners.

Duties and responsibilities

Main duties include:

- Undertake leading research into integrated magneto-bi-plasmonic-photonic devices and circuits within the CIRCULIGHT project.
- Work with the UCL principal investigator (Professor Wale) to ensure that the goals,

milestones, and deliverables of CIRCULIGHT are met on time.

- Actively collaborate with the other CIRCULIGHT investigators and researchers, by sharing information, attending meetings, making presentations, carrying out joint research, etc.
- Publish and present research to academic and non-academic audiences, by writing journal papers and attending relevant meetings, conferences, and other events.
- Prepare progress reports and similar documents, as required.
- Document the research meticulously for the benefit of future researchers.
- Attend and participate in relevant training events.
- Protect confidentiality as required by the project consortium agreement and seek approval for public disclosures in good time.
- Support the PI in identifying opportunities for the protection of intellectual property, e.g. inventions arising from the project, and support any resulting activities such as the filing of patents.
- As duties and responsibilities change, the job description will be reviewed and amended in consultation with the postholder. The postholder will carry out any other duties as are within the scope, spirit and purpose of the job as requested by the line manager or Head of Department/Division.
- The postholder will actively follow UCL policies including Equal Opportunities and Race Equality policies.
- The postholder will maintain an awareness and observation of Fire and Health & Safety Regulations.

Person Specification

Criteria	Essential or Desirable
Qualifications and knowledge	
PhD (or about to submit) in Photonics, Electronic / Electrical Engineering, Physics or a closely related field (e.g. Materials Science)	Essential
Track record of high-level research in photonics, semiconductor devices, or a related discipline	Essential
Understanding of the principles of optical devices	Essential
Track record of publications in leading journals / conferences	Desirable
Skills and abilities	
Commitment to high quality research	Essential
High level of literacy and numeracy	Essential
High level of accuracy and a keen attention to detail	Essential
Able to communicate clearly, both orally and in writing	Essential
Able to work both independently and collaboratively as part of a team, recognising when advice / input needs to be sought	Essential
Experiences	
Experimental work in a relevant branch of physics, engineering or another relevant discipline	Essential
Practical experience of photonic integrated circuits, optical waveguides, and/or plasmonics	Desirable
Experience of using optical and electronic test equipment	Essential
Experience of programming (e.g. MATLAB, Python) and/or relevant technical software packages (e.g. Lumerical, Photon Design, CST Studio, COMSOL)	Desirable
Personal Qualities	
Able to work supportively, respectfully, and harmoniously with colleagues and students of all cultures and backgrounds	Essential
Commitment to and knowledge of advancing equality, diversity and inclusion	Desirable
Commitment to scientific and professional integrity	Essential
Willing to travel to meetings with partners in EU countries	Essential

How to Apply

Interested applicants are encouraged to make Informal enquiries about the position to **Prof. Michael Wale** at M.Wale@ucl.ac.uk

All applications should be submitted via UCL online recruitment system at the following link:

<http://www.ucl.ac.uk/hr/jobs/>

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If you have any queries regarding the application process, please contact Rebecca Thomas at

becca.thomas@ucl.ac.uk

UCL Taking Action for Equality.

About UCL

University College London (UCL) was founded in 1826 as the third university in England, after Oxford and Cambridge. UCL is the first university in England to admit students of any race, class or religion, and the first to welcome women on equal terms with men. UCL is organized into 11 constituent faculties, within which there are over 100 departments, institutes and research centres. UCL has 983 professors and more than 7000 academic staff who are dedicated to research and teaching of the highest standards. Its student community is almost 50,000, the largest in the UK. There are 30 Nobel Prize winners and three Fields medalists amongst UCL's alumni and current and former staff. UCL is rated 2nd in the UK for research power (REF 2021). It has a strong tradition and large knowledge base in medical research with a dedicated institute on Healthcare Engineering and 10+ hospitals. UCL has world-class support for researchers and has been voted the best place for postdoctoral researchers to work for consecutive years by The Scientist magazine. The main campus of UCL is located in central London, close to British Museum, West-End and Thames River.

About the Department of Electronic and Electrical Engineering

The Department of Electronic and Electrical Engineering (EEE) at UCL was established by Professor Sir Ambrose Fleming, inventor of the thermionic valve and hence the

founder of the discipline of electronics, in 1885, as the first department of electrical technology in England. That same pioneering tradition of innovation and excellence continues to underpin our work. We push in new directions across research, education and entrepreneurship, building on our long-established links with industry and benefitting from our loyal and supportive alumni community.

We are committed to develop individuals and careers, across staff and students, developing and supporting our subject discipline.

The Department is recognized as one of the leading departments for research in its subject area, worldwide.

Current research areas include Information and Communication Engineering; Electronic Materials and Devices (including Nanotechnology); Optical Communications & Networks; Photonics and Sensors, Systems and Circuits. The Department is also part of the world-leading London Centre for Nanotechnology. Our experimental research facilities are a particular strength, and we are well placed to support experimental research in the areas of:

- Photonic integrated circuits and their applications
- Molecular beam epitaxy of silicon and compound semiconductors
- Electronic Materials and Quantum Devices
- High-speed, ultra-wideband, optical communications systems & networks
- Experimental wireless systems, sensing and signal processing

The Department has an extensive teaching programme, both at undergraduate (BEng and MEng) and Masters levels and a strong commitment to research-led teaching.

Further information regarding UCL may be found at:

www.ucl.ac.uk/

Information about the departments may be found at:

www.ucl.ac.uk/eee