



SENTINEL

European Training Network in Single-Entity NanoElectrochemistry

2 early stage researcher opportunities avbased at the

University of Leeds

Pollard Institute, School of Electronic and Electrical Engineering

Project Descriptions

ESR1: Investigation of Brain Cancer Evolution Enabled by Single-Cell Nanobiopsy

This post will be co-supervised by the Interdisciplinary Nanoscience Centre (iNANO) at the University of Aarhus.

Objectives: This project will develop a nanobiopsy platform based on nanopipettes to track the transcriptional reprogramming of single glioblastoma cells during standard treatment.

Expected Results: Glioblastoma (GBM) is a fatal and incurable brain cancer: 100% of tumours recur, constituting a major unmet clinical need. We will develop, optimise and adapt a nanobiopsy platform that can be used to label and sequentially sample cytoplasmic RNA from specific cells for use in expression profiling by sequencing.

Planned Secondments:

- Aarhus University – surface charge mapping of single-cells. This secondment will expose the ESR to a recently developed technique capable of mapping surface charge density of living cells to understand neurological function
- CEA - theoretical electrochemistry for sustainable energy materials. CEA (Alternative Energies & Atomic Energy Commission) will empower the ESR with numerical simulation skills that will be applied to the study of nanoelectrochemical systems.
- Indiana University - probe design for single-cell analysis. The ESR will be exposed to a recently reported ion channel probe-SICM (ICP-SICM), which incorporates a chemical sensor in the form of an alpha-hemolysin (αHL) ion channel into a lipid membrane formed across a nanopipette tip.

ESR2: Electrochemical Nanosensors to Monitor the Metabolic Activity of Organs-On-Chip

This post will be co-supervised by the Institute of Biomedical Engineering at ETH Zurich.

Objectives: This project will develop functional electrochemical nanosensors based on nanopipettes that will be integrated in advanced microfluidic platforms for organs-on-chip monitoring.

Expected Results: To deliver an integrated platform enabling the recording of the metabolic activity (e.g glucose and oxygen consumption) of human organs-on-chip for developmental toxicology and drug discovery studies.

Planned Secondments:

- ETH Zurich - force controlled single cell analysis. This secondment will rely on the FluidFM technology. The ESR will employ an atomic force microscope (AFM) based on hollow cantilevers for local liquid dispensing and stimulation of single living cells under physiological conditions.
- University of Twente - micro and nanofluidic for single-molecule analysis. The ESR will be exposed to microfabricated nanofluidic devices and their use in sensitive single-entity electrochemical detection experiments.
- Elements - Development of CMOS potentiostats. The ESR will learn fabrication of portable potentiostats using microchips (ASICs) and standard CMOS processes.

What do these roles entail?

As an Early Stage Researcher at Leeds your main duties will include:

- Learning skills so you are able to produce world-class research;
- Developing initiative, creativity and judgement in applying appropriate approaches to research activities;
- Actively participating in all relevant activities organised by the SENTINAL network as advised by the Supervisor;
- Attending meetings as required to discuss the project. This will involve occasional EU-wide travel;
- Ensuring good day-to-day progress of work, and maintaining accurate records;
- Writing up results for publication, attending and presenting at suitable conferences and undertaking other forms of dissemination including patient groups and the general public;
- Working both independently and also as part of a larger team of researchers, including interacting with and providing assistance to other staff in the research group and the SENTINAL network, and engaging in knowledge-transfer activities where appropriate and feasible;
- Contributing to joint discussions within the wider research group and network;
- Maintaining your own continuing professional development.

These duties provide a framework for the role and should not be regarded as a definitive list. Other reasonable duties may be required consistent with the grade of the post.

What will you bring to the role?

As an Early Stage Researcher at Leeds you will:

- Satisfy the [eligibility requirements](#) to enrol on a PhD degree. This includes acceptable English language requirements if English is not your first language.
- The flexibility to travel throughout the EU;
- Good time management and planning skills, with the ability to meet tight deadlines and work effectively under pressure;
- Excellent written and verbal communication skills including presentation skills;
- Proven ability to manage competing demands effectively, responsibly and without close support;
- A proven ability to work well both individually and in a team;
- A strong commitment to your own continuous professional development.

You may also have evidence of a track record in peer-reviewed publications and/or conference dissemination.

About the Employer

The University of Leeds is acclaimed world-wide for the quality of its teaching and research, and continues to be ranked within the top 100 universities in the QS world rankings. Leeds is one of the largest universities in the UK with over 32,000 students (over 7,000 post graduate students) from 141 countries and approximately 8,100 staff of 99 different nationalities, attached to 560 different undergraduate and 300 postgraduate degree programmes. Dr Actis' team will lead the application of nanoelectrochemical techniques for single-cell analysis. It will develop methods for the intracellular analysis of endogenous biological species as well as its bio-molecular characterisation.

There is access to state of the art facilities in nano electrochemistry that include 4 patch clamp amplifiers, over 10 low current potentiostats as well as state of the art clean room facilities for micro-nanofabrication and characterisation. A Scanning Ion Conductance Microscope (SICM) mounted on a spinning disk confocal microscope is also available. The ESR will take advantage of the molecular biology facilities at the Leeds Institute for Cancer and Pathology, including world-class bio-imaging, next-generation sequencing and proteomics facilities.

Further information is available on the research and teaching activities of the [Faculty of Engineering](#), the [Pollard Insitute](#) and the [Marie Skłodowska-Curie](#) research and innovation scheme.

The Faculty of Engineering is proud to have been awarded the [Athena Swan Silver Award](#) from the Equality Challenge Unit, the national body that promotes equality in the higher education sector. Our [Equality and Inclusion](#) webpage provides more information.

Find out more about the benefits of working at the University of Leeds and what it is like to live and work in the Leeds area on our [Working at Leeds](#) information page.

Information for candidates with disabilities, impairments or health conditions, including requesting alternative formats, can be found on our [Accessibility](#) information page or by contacting disclosure@leeds.ac.uk

Rehabilitation of Offenders Act 1974 - a criminal record check is not required for this position. However all applicants will be required to declare if they have any 'unspent' criminal offences, including those pending. Any offer of appointment will be in accordance with our Criminal Records policy. You can find out more about required checks and declarations in our [Criminal Records](#) information page.



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