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| Job Description |  |

**LONDON’S GLOBAL UNIVERSITY**

**Department of Chemistry**

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| **Doctoral Candidate in Synthetic Cells** |  |
| Department: ChemistryLocation: UCL Bloomsbury Campus |  |

#### Reports to:

#### Dr Michael Booth

#### Context

Applications are invited for a Doctoral Candidate with a background in synthetic biology, biochemistry, biotechnology, or related areas to work in the group of Dr Michael Booth (<https://boothlab.uk/>), at University College London, on the SIGSYNCELL Marie Skłodowska-Curie Doctoral Network (<https://sigsyncell.crpp.cnrs.fr/>) exploring novel signaling mechanisms in synthetic cells.

**Introduction to the Doctoral Network**

Current biotechnology solutions based on living cells bear the intrinsic limitations that cells are subject to the random process of Natural Evolution, a major drawback for technological applications. Biotechnologies also need to demonstrate that they can be embedded into environmental life cycles to become sustainable options. The construction of synthetic cells therefore emerges as a ground-breaking new biotechnology that can overcome the limitations of current biotechnology solutions. Early forms of life have spontaneously emerged from non-living matter in prebiotic processes involving self-assembly, self-organization and elementary chemical reactivity in confined spaces. We now have at hand in the laboratory the tools to study these processes and elucidate their role in living systems. We are therefore now at a time where we can find and implement a generic framework for the construction of cellular systems from basic principles and elementary building blocks. In the consortium SIGSYNCELL, we want to develop synthetic cells as systems having the key characteristic functions of living systems: their capacity to interact with their environment. In a laboratory environment, both the cells and the environment can be fully engineered to gradually control and build up the complexity of synthetic cell systems.

**Project: Remote control of transmembrane signal transduction in synthetic cells**

Current methods to signal across synthetic cell membranes almost exclusively involve moving small molecules across the membrane. However, this approach requires the use of a limited set of membrane-permeable small molecules or the use of a membrane pore that leaks additional components from the synthetic cell. A ubiquitous transmembrane signalling method in living cells is by using membrane proteins that change confirmation upon stimulation on one side, leading to activation of a signalling pathway on the opposite side of the membrane, all without moving molecules across the membrane. In this project, we will engineer synthetic versions of these transmembrane signaling systems that allow activation of processes inside and outside synthetic cells without transferring molecules. Beyond generating mimics of vital living signaling mechanisms, we will also construct signaling systems that can be used to spatiotemporally target cancer cells.

For this project hosted at UCL, we are looking for a student with a background and interest in synthetic biology, biochemistry, or a related discipline. The student will be based in the Booth group, who have extensive experience in synthetic cell engineering, having developed light-activated DNA templates to tightly-regulate cell-free protein synthesis within synthetic cells (Booth 2016 Sci. Adv. 10.1126/sciadv.1600056 and Hartmann 2023 JACS 10.1021/jacs.3c02350) and synthetic cells that can controllably communicate with neighbouring bacteria (Smith 2023 Nat. Chem. Biol. 10.1038/s41589-023-01374-7). Please visit our group website for more details about our research: [www.boothlab.uk](http://www.boothlab.uk/).

**Consortium**

SIGSYNCELL is a doctoral network funded by the European Commission via Marie Sklodowska-Curie Actions (MSCA) and a UKRI Guarantee, whose goal is training through research. It is a consortium that brings together a dozen European academic partners, in addition to private companies, coordinated by the CNRS in Bordeaux.

**The Chemistry Department**

The Chemistry Department at University College London is the oldest in England, and today is one of the best in the UK, being ranked 2nd in the UK for the world-class impact of its research in REF(2014). We are located in Bloomsbury, at the heart of London, and offer an exciting and vibrant environment in which to study in one of the UK's top universities. The Department of Chemistry at UCL is committed to supporting excellence in both research and teaching. The department offers undergraduate BSc and MSci programmes in Chemistry and currently teaches 400 undergraduates registered in Chemistry as well as students who select Chemistry on the Natural Sciences programme and first year Chemistry for life scientists.

The Chemistry Department has over 50 members of academic staff carrying out world-leading research. We specialise in the areas of organic synthesis, chemical biology, computational chemistry, nanotechnology, inorganic and materials chemistry, physical chemistry and chemical physics. The department has an annual research income of around £15 million, derived from many sources including the Research Councils (EPSRC, BBSRC, MRC, and NERC), European Commission and a wide range of charities and industrial partners in the UK, Europe and the USA.

Details about our research can be found on the departmental website <http://www.ucl.ac.uk/chemistry>.

#### Main purpose of the job

The postholder will be required to generate synthetic cells, composed of lipid compartments containing cell-free expression systems. Molecular biology and DNA nanotechnology will be used to generate communication mechanisms. *In vitro* and cellular assays (bacterial and mammalian) will then be established to test these communications mechanisms.

Experimental work will be carried out independently but also as part of a team of researchers based in the Chemistry Department and across Europe. The postholder will be expected to supervise PhD and Masters students, assisting experimentally with their research projects, where necessary, and reading drafts of reports and papers, as well as managing lab safety.

**Key Requirements**

* You must not have resided in the UK for more than 12 months over the past 3 years.
* You must have, or be expecting to achieve, a first or upper second-class MSc degree in Synthetic Biology, Biochemistry, Biotechnology or a related discipline and have a genuine desire to complete a PhD in Synthetic Biology.
* Background or profound interest in synthetic biology/synthetic cells (should be specified in supporting statement)
* Knowledge and/or practical experience in molecular biology, lipid compartments, and/or DNA nanotechnology.
* Willingness to work as part of a team and to travel and work across Europe

#### Duties and responsibilities:

* To contribute to the design experiments, experimental set-ups and research themes
* To record, analyze and write up the results of the research.
* To contribute to the drafting and submitting of papers to peer reviewed journals.
* To prepare progress reports on research for funding bodies as required.
* To contribute to the preparation and drafting of research bids and proposals.
* To contribute to the overall activities of the research team and department as required.
* To travel and work across Europe as part of the Marie Skłodowska-Curie Doctoral Network SIGSYNCELL.
* **To undertake a limited amount of teaching in relation to subject area.**
* To contribute to the induction and direction of other research staff and students as requested.
* Responsible for ensuring that equipment is safe and maintained in working order.
* **The job description reflects the present requirements of the post, and as duties and responsibilities change/develop, the job description will be reviewed and be subject to amendment in consultation with the post-holder.**
* 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.
* The postholder will actively follow UCL policies including Equal Opportunities and be expected to give consideration within their role as to how they can actively advance equality of opportunity and good relations between people who share a relevant protected characteristic and people who do not share it.
* The postholder will maintain an awareness and observation of Fire and Health & Safety Regulations.
* To be aware of and act upon:

Disciplinary procedure and disciplinary rules

Grievance procedure

Section 7 and 8 of the Health and Safety at Work Act

# Person Specification

| **Criteria** | **Essential or Desirable** | **Assessment method**  **(Application/Interview)** |
| --- | --- | --- |
| **Qualifications, experience and knowledge** |  |  |
| Achieved, or expecting to achieve, a first or upper second-class MSc degree in Synthetic Biology, Biochemistry, Biotechnology or a related discipline | Essential | Application |
| Background or profound interest in synthetic biology/synthetic cells | Essential | Application/Interview |
| Knowledge and/or practical experience in molecular biology, lipid compartments, and/or DNA nanotechnology | Essential | Application/Interview |
| Highly proficient English language skills (evidence required) | Essential | Application |
| Experience of working in a research environment | Essential | Application |
| **Skills and abilities** |  |  |
| Ability to analyse and write up data | Essential | Application |
| Ability to present complex information effectively to a range of audiences | Essential | Interview |
| Effective written and verbal communication skills in English | Essential | Application/Interview |
| **Personal attributes** |  |  |
| Commitment to high quality research | Essential | Application |
| Ability to work collaboratively and as part of a team | Essential | Application |

**To apply:**

Please upload the following with your application:

* + A cover letter explaining the motivation for applying for the post, understanding of the research project, and previous research experience.
  + A curriculum vitae setting out the educational qualifications as well as any additional scientific achievements and publications.
  + Evidence of English proficiency – for more details please see: <https://www.ucl.ac.uk/prospective-students/graduate/english-language-requirements>
  + Copy of Bachelor’s and Master’s certificates (if available at the time of application).
  + Copy of Bachelor’s and Master’s transcripts.
  + Two letters of recommendation from researchers familiar with your academic activities, e.g. the advisor of your Master’s thesis

**General Information**

**Salary**

Salary is between £35,159 and £46,759 gross per annum at the current rate of exchange. These figures are before employer and employee deductions, including tax, national insurance and pension contributions, subject to the pension choices of the appointee. The level of salary is also subject to the family status of the appointee as to whether they qualify for a family allowance, as well as whether the employee will make pension contributions. Due to potential future changes in the Euro/Pound Sterling exchange rate over the period of the appointment, where amendments are required, corrective payments will be made. Salaries are not subject to either cost-of-living adjustments or increment progression and are inclusive of £5,000 annual London Allowance.

**Equal Opportunities**

[www.ucl.ac.uk/hr/docs/equal\_opportunity.pdf](http://www.ucl.ac.uk/hr/docs/equal_opportunity.pdf)

The Department has been awarded a Silver Athena Swan Award and we support the Athena beliefs that:

* The advancement of science, engineering and technology (SET) is fundamental to quality of life across the globe.
* It is vitally important that women are adequately represented in what has traditionally been, and is still, a male-dominated area.
* Science cannot reach its full potential unless it can benefit from the talents of the whole population, and until women and men can benefit equally from the opportunities it affords.

Further information on Athena Swan is at <http://www.athenaswan.org.uk/>

# Apply

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| To apply for this position visit:ucl.ac.uk/jobsSearch under Ref no:B04-04976 For informal enquiries please contact Dr Michael Booth [m.j.booth@ucl.ac.uk](mailto:m.j.booth@ucl.ac.uk). Any queries on the application process can be directed to H Dansey h.dansey@ucl.ac.uk, as we wish to encourage online applications. |