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| Job Description |  |
| **Research Fellow in Synthetic Cells**  **Ref: B04-03281** | Grade 7salary £38,308 - £46,155 pa(including London Allowance) 1.0 FTE*\* Where applicants have not been awarded a PhD appointment will be made at Research Assistant UCL Grade 6B. Where applicants are PhD candidates, appointment will be made at Research Assistant UCL Grade 6B and payment at UCL Grade 7 salary will be backdated to the date of submission of the PhD thesis (including corrections).* *This post is available for 11 months. A preferable start date is March 2023, however, this is negotiable.* |
| Department: Chemistry | Location: University College London, Christopher Ingold Building, 20 Gordon Street, London, WC1H 0AJ |

#### Reports to

**LONDON’S GLOBAL UNIVERSITY**

**UCL Department of Chemistry**

**Dr Michael Booth**

**Context**

Applications are invited for a PDRA to work in the group of Dr Michael Booth in the Department of Chemistry at University College London. The project will involve the generation of novel mechanisms of communication between synthetic cells and living cells.

Controlling cellular behaviour is at the heart of biology and medicine. Approaches to achieve this control rely on either introducing exogenous molecules, from small molecules to nucleic acids and proteins, or the use of genetically modified living cells. Both approaches have limitations, including the off-target effects of individual molecules and the problem of modifying the cells you are trying to study. A growing area of research is the creation of ‘synthetic cells’, which offer promise as novel drug delivery systems and as tools to studying living systems without genetic modification. We have previously generated light-activated synthetic cells (DOI: [10.1126/sciadv.1600056](http://advances.sciencemag.org/content/2/4/e1600056) and [10.26434/chemrxiv-2022-p8xgb-v2](https://chemrxiv.org/engage/chemrxiv/article-details/63b55bb6ff4651ef52429534)) and used these to communicate with living cells (DOI: [10.1101/2022.07.22.500923](https://www.biorxiv.org/content/10.1101/2022.07.22.500923v1)). However, current approaches to interfacing synthetic cells with living cells are limited to specific types of molecular signals.

The aim of this project is to engineer a method that allows the release of any-sized signal molecule from synthetic cells. This will be a step change in the use of synthetic cells as research tools and smart drug delivery devices. Our approach will be to mimic communication mechanisms that occur between living cells, for instance the communication of neurons in the brain. By incorporating functional signal molecules within the synthetic cells, we will then interface them with neighbouring living cells to control their function. This communication mechanism will be initiated by using light-activated DNA nanotechnology, which will allow this universal signalling approach to be remote controlled. The project will be truly interdisciplinary, employing approaches from chemistry, engineering, and biology. This universal, externally controlled release mechanism will unlock the real-world application of synthetic cells for applications in computer-brain interfaces and precision drug targeting.

We are seeking candidates with a background in synthetic biology, ideally with experience in generating giant/small unilamellar vesicles, carrying out assays with living cells, molecular biology, and/or nucleic acids.

The position is funded by BBSRC for up to 11 months. The candidate will join Dr Booth’s research team in the Department of Chemistry at the Bloomsbury Campus of University College London. Information about the group can be found at [boothlab.uk](http://www.boothlab.uk/). The appointee will play a leading role in the research team, including supervising and training PhD and Master’s students.

**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, ranked 2nd in the UK for the world-class impact of its research in REF2014. Our department is situated in Bloomsbury, at the heart of London, and we offer an exciting and vibrant environment in which to study at 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 specialize 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 containing cell-free expression systems. Molecular biology and DNA nanotechnology will be used to generate communication mechanisms. 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. 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**

The successful candidate will have a PhD degree (or be about to be awarded a PhD) in an area of Synthetic Biology or a related discipline. Experience with lipid vesicles, cellular assays, molecular biology and/or nucleic acids would be ideal. They will be required to work in a multidisciplinary, collaborative team and have effective written and verbal communication skills in English.

#### Duties and responsibilities

Main duties:

* To contribute to the design of experiments, experimental set-ups and research themes.
* To generate synthetic cells and modify their activity.
* To test communication of synthetic cells activity with living cells.
* To record, analyse and write up the results of the research.
* To manage, oversee and assist (both experimentally in the lab and in reading report and paper drafts) PhD and Masters research students, including monitoring lab safety as required.
* To contribute to the drafting and submitting of papers to peer reviewed journals.

Academic duties:

* To prepare progress reports on research as required.
* To present at group meetings 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 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.

Professional duties:

* 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)** |
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| **Qualifications, experience and knowledge** |  |  |
| PhD (or about to be awarded a PhD) in Chemistry, Chemical Biology, or a related discipline | Essential | Application |
| Experience in synthetic biology | Essential | Application |
| Experience with synthetic cells | Desirable | Application |
| Experience with cellular assays | Desirable | Application |
| Experience with molecular biology | Desirable | Application |
| Experience with nucleic acids | Desirable | Application |
| Experience of interdisciplinary working | Desirable | Application |
| **Skills and abilities** |  |  |
| Ability to quickly learn new techniques | Essential | Application |
| 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** |  |  |
| Has an excellent general knowledge of related areas of science | Essential | Application/Interview |
| Ability to work independently, collaboratively, and as part of a team | Essential | Application/Interview |
| Demonstrate competence and excellence in research, e.g. as judged by publications (or papers in press) in high quality peer reviewed scientific journals | Essential | Application/Interview |
| Experience of student supervision and project design | Essential | Application/Interview |
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**APPLICATIONS PROCEDURE**

Interview date to be confirmed.

**Enquiries / Visits**

Informal enquiries should be made to: Dr Michael Booth ([m.j.booth@ucl.ac.uk](mailto:m.j.booth@ucl.ac.uk))

**Applications should be completed online** [**http://www.ucl.ac.uk/hr/jobs/**](http://www.ucl.ac.uk/hr/jobs/),

Any questions about the application process should be directed to: [hr.chem@ucl.ac.uk](mailto:hr.chem@ucl.ac.uk)

**SUPPLEMENTARY INFORMATION**

Please use these links to find out more about:

**Employee benefits:** <http://www.ucl.ac.uk/hr/benefits/employee_benefits.php>

**Further information about UCL:** <http://www.ucl.ac.uk/hr/docs/UCLstandard_information.php>

**General information for overseas applicants:**

<https://www.ucl.ac.uk/human-resources/working-ucl/employment-contract-administration-team/immigration>

<https://www.ucl.ac.uk/human-resources/working-ucl/relocating-uk-guide>

**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/>