Convergence Science Centre

Guidelines:

Applications for CRUK Convergence Science Centre PhD studentships

CRUK Convergence Science PhD Studentship Proposal Application Guidelines

These guidelines explain what we are looking for in proposals for Convergence Science PhD Studentships. We advise careful reading before completing and submitting the accompanying application form.

KEY DATES

Application deadline: **23rd November 2020**

Funding decision: December 2020

Funding commences 1st October 2021

Applicants are advised to read the MIT White Paper "[The Third Revolution: The Convergence of the life sciences, physical sciences and engineering](#)" which outlines key concepts of convergence science.

Cancer Research UK Case Studies on multidisciplinary research which can found [here](#) and [here](#).

These articles are key examples of convergence research and give insights on the type of proposals we are looking for.

1. What is the Convergence Science PhD Studentship?

The CRUK Convergence Science Centre is a partnership between the Institute of Cancer Research and Imperial College London, which brings together world leading expertise in cancer research, engineering and the physical sciences to address the big challenges in cancer. One of our strategic goals is to train the next generation of convergence scientists by building cross-institutional research teams with supervisors from distinct disciplines who will equip our PhD students with cutting-edge convergence research skills.

The Centre has four strategic themes and **we are seeking cross-institutional, convergence science PhD proposals within one or more of the thematic areas**. Our strategic themes are as follows:

I. *Convergence Therapeutics*

We need new approaches to complement and enhance existing drug discovery pipelines. Engineering and physical sciences can transform the discovery and development of more effective cancer therapies – from automation in screening, new chemical approaches to drug discovery, novel targeted therapies and drug delivery devices, improvements in pre-clinical model systems to recapitulate the heterogeneity of cancer in a patient, through to the development of treatment guidance platforms for surgery and radiotherapy.

The initial focus for this theme is on 'drugging the undruggable' – with a focus on identifying novel strategies to therapeutically target proteins and protein families where prior drug discovery efforts have not been successful.

II. *Integrative Early Cancer Detection and Diagnosis*

Detecting tumours at an earlier stage before they spread around the body can increase the likelihood that surgery and radiotherapy will be curative. We need new approaches to improve cancer detection and diagnosis; methodologies need to be both sensitive and specific – that is, they need to be able to detect low levels of disease (sensitivity) and accurately distinguish cancer from other diseases/normal biology (specificity). These characteristics are required to reduce false positives (telling someone they have cancer when they do not) and false negatives (missing a cancer when it is present). Diagnostics also need to be cost effective such that they can be used at a population level without vastly increasing the overall cost of treatment.

The initial focus for this theme is on the development of tools and methodologies that harness cancer metabolism for early detection and diagnosis.

III. *Multidisciplinary Discovery Research*

The Multidisciplinary Discovery Research theme is focused on supporting collaborations that will elucidate previously uncharacterised processes in the development of a spectrum of tumour types. By exploiting key mechanisms in the establishment of disease we can provide the rational basis for the development of strategies to prevent, detect, diagnose and treat cancers. This theme will focus on understanding the fundamental mechanisms of cancer development, growth and

spread. Areas of interest includes the development of tools and methodologies that will allow the understanding of the relationship between the tumour and its environment, the visualisation of therapies *in vivo* to understand mechanism of action and discovery research to understand tumour heterogeneity and evolution.

The initial focus of this theme is on maximising the potential of cancer organoids through the development of improved 3D culture methodology, co-culture and microfluidics systems combining cancer organoids with stromal or lymphoid cells, and the development of analytical tools and methods to better characterise cancer organoid biology.

IV.   *Therapy Monitoring Technologies*

The successful development and clinical application of therapy monitoring technologies requires multidisciplinary research spanning discovery science, translational research and clinical trials. There are key research challenges that need to be addressed across all of these domains, which will not only build our understanding about how therapies work in patients, but also inform clinical decision making. We will support research that elucidates the mechanism of action of cancer therapeutics in patients, including the distribution, localisation and side effects of treatment and mechanisms of resistance. To improve clinical decision making, we will also support proposals focussed on the continuous monitoring of treatment response in patients, including *in vivo* and wearable sensor technologies and improved imaging-based modalities.

The initial focus of this theme is to develop approaches to visualise therapeutics to better understand their mode of action and their mechanisms of resistance and normal tissue toxicity.

A comprehensive description of our themes can be found on our webpages.

2. What are we offering?

We are offering four highly competitive convergence science PhD Studentships that are inclusive of home fees (funding for overseas fees is not provided; however, overseas students may discuss other options to support the difference in international fees with prospective supervisors), a fixed annual stipend of £21,000 and a consumable budget for a period of four years. Applications should demonstrate a clear strategy/pathway for training students in convergence research that will ensure success in their future careers.

3. What are we looking for?

We are looking for high quality novel convergence science proposals suitable for a PhD project within one or more of our research themes. Proposals must address an unmet need in understanding cancer. Applicants should articulate the cancer related question(s) and outline the need for novel engineering or physical sciences approaches to address them. **The application of existing tools or methodologies is not considered to be convergence science.** For example, the application of existing bioinformatics tools to biological data is not considered to be convergence science – the generation of new approaches to model and analyse biological data iteratively with biological experimentation would be considered within remit.

To train successful convergence scientists, we expect that students will be exposed to scientific research across different disciplines. Therefore, the proposal should clearly articulate how the learnings from one discipline will inform experimental strategies in the partner discipline and vice versa, and how the student will be trained in the relevant experimental techniques. Applications must span different disciplines with cross-institutional joint supervisory partners.

4. How will we assess your application?

Your application will be reviewed by the Convergence Science Centre Training Committee comprising equal membership from Imperial College London and the Institute of Cancer Research. The Committee membership reflects convergence research expertise and will judge your proposal in the following areas:

CANCER LED	• Addresses an unmet need in cancer which aligns with the Centres Strategic Research Themes.
CONVERGENCE APPROACH	• Addresses the need for a convergence science approach to meet the challenge. • The appropriateness of the research teams and how the student will be trained in multidisciplinary research/share their time appropriately between teams.
NOVELTY	• Quality and originality of the research • Clear and justified research questions • Translational potential.
FEASIBILITY	• Training plan, including how the student will be trained in a multidisciplinary manner that will benefit their career prospects. • Achievability of the project for a postgraduate student for the duration of the funding.

5. Are you the right applicant?

Please note that studentships will not be allocated in consecutive years to successful applicants even when a new bid is submitted with one-half of a previously successful partnership. Consider the following questions before completing the application form. Your eligibility as an applicant depends on a positive answer.

- Do you have access to the space and equipment necessary for successful completion of the studentship? ☐
- Do you have approval from your Head of Department/Division to apply for this studentship? Please note that students applying to this programme will share their time working across both institutions. However, they can only be registered at one institution (the primary) with affiliate or visiting status at the other (the secondary). The tuition

fees will only be paid to the primary institution whereas research expenses will be shared between both institutions. ☐

- Do you fulfil the eligibility criteria to supervise PhD students according to your home institution guidelines; including tenure at your institution for the duration of the studentship? ☐
- Is your application a cross-institutional bid between Imperial College London and the Institute of Cancer Research ☐

6. How should you complete the application form?

Proposal Title: Please provide a short title that accurately summaries your project. This will be used to advertise the project to prospective students.

Supervisors: Please provide the name and contact details of the joint lead supervisors (Lead Supervisor 1 and 2, respectively). Also indicate the number of previously supervised research degrees. NB: This is an equal partnership between supervisors. Lead Supervisor 1 (Main contact) is the supervisor at the institution where the student will normally be registered. Please include any additional supervisors whom you deem necessary for the success of your project, e.g. institutes, partners or associates.

Proposal outline: Outline the scientific aims and approaches to be employed explaining why this meets the convergence science remit, in particular the development of novel approaches to address the research question and any translational potential. Within this section, you should include any relevant preliminary data that supports your hypothesis and proposed approach. (*Up to 1000 words and 1 additional page of figures. Figure legends should not be used to add additional experimental details.*)

Proposal feasibility: Describe the suitability of your proposal for a PhD project, include a timeline showing the achievability of the project within four years. (*Up to 250 words*)

Convergence science approach: State the novelty of the technologies and methodologies from the different disciplines to be employed. Outline the roles and contributions of the supervisors/teams and provide a tailored strategy for training in multidisciplinary research, this might include taught modules, technical training courses etc. Give details of the project timeline and how you anticipate your student will share their time across the participating teams. Please note that applications that **do not** justify the convergence of distinct disciplines and approaches or only use well established methodologies to address the research question will not be considered within remit. (*Up to 750 words*)

Research themes alignment: Identify the priority themes to which your work aligns and outline how your work addresses the priority theme(s). (*Up to 250 words*)

Literature references: Include a bibliography in the standard Harvard format listing any articles referred to in your proposal.

Advertising details: If your application is successful, we will advertise your project on external websites. Please list up to 6 key words/phrases that students might type into search engines to find your project.

Project suitability: Please indicate from the list provided the student background that will be the right fit for your project.