

CDT OVERVIEW

The Institute of Chemical Biology (ICB) has been awarded an Engineering and Physical Sciences Research Council (EPSRC) Centre for Doctoral Training (CDT) in Chemical Biology: Innovation for the Life Sciences and is inviting proposals for 4-year PhD studentships. Studentships awarded through this annual call will start in October 2023.

The aim of the CDT is to train a new generation of PhD graduates (>80 over 5 years through an MRes + 3 Year PhD programme) in the art of multidisciplinary Chemical Biology research, giving them the opportunity to develop the next generation of molecular tools and technologies for making, measuring, modelling and manipulating molecular interactions in biological systems. The expanded remit of the CDT now also embraces multi-scale modelling (e.g. graph theory) and experimental approaches (micro-physiological environments) for studying molecular interactions and biological systems. Students on the programme will apply these advances to tackle key biological/biomedical problems and clinical/industrial challenges.

Furthermore, students will merge the development of these molecular tools and technologies with industry 4.0 platforms (e.g. automation, additive manufacturing / 3D printing, AI, machine learning, augmented reality, cloud computing, big data and analytics and Internet of Things) with a view to supporting the industrialization of the life sciences. In order to support this vision, students will benefit from bespoke training that will enable them to work seamless across the physical-life sciences and human-machine interfaces. This is a skill set that is in great demand from industry and addresses the future needs of employers in the pharmaceutical, biomedical, healthcare, personal care, biotech, agri-science and SME sectors.

In addition, students will be armed with an in-depth understanding of product development pipelines across a variety of sectors, acquired through first-hand experience of multi-disciplinary translational research and early stage commercialisation. This will enable them to become leaders of technology innovation and translation in the medical, pharma, life science, personal care and agri-science industries.

THE RESEARCH THEME

Background to the ICB CDT: Chemical Biology is critical to supporting the development and translation of the next generation of molecular tools and technologies for making, measuring, modelling and manipulating molecular interactions in biological systems across multiple length scales. These include protein-nucleic acid, lipid-drug, lipid-nucleic acid and protein-protein interactions. Despite their increasing importance as targets for intervention in biological systems, their exploitation is hampered by many factors which are being tackled by the ICB community. These include large contact surface areas, the absence of readily identifiable binding pockets, low concentrations of particular binding partners, the multi-component nature of these interactions, the multiple time and length-scales over which they occur and a limited understanding of how these interactions combine to generate higher order functions. The development of novel molecular tools and technologies with enhanced quantitative capabilities that can address these bottlenecks is vital to providing the *quantity, quality and type of data* needed for predictive modelling and downstream commercial and medical exploitation of these spatially dispersed multipoint interactions. They also have the potential to generate IP with significant potential for commercial exploitation in their own right (through commercialisation in the instrumentation sector). From enabling biological and biomedical research by unlocking the molecular mechanisms of disease, through to stimulating the design of improved agrochemicals and increasing our understanding of the link between diet and the microbiome, chemical biology is pivotal in reducing the spiralling cost of product development and healthcare.

In parallel, with the arrival of the 4th industrial revolution the life sciences are embarking on a transformative journey that is blurring the lines between disciplines and between man and machine. Developments in robotics are driving the integrated control of lab hardware, enabling R&D workflow automation. Rapid prototyping is reducing technology innovation cycles. Big data offers unprecedented opportunities for AI and machine learning. AI is stimulating developments that can underpin smarter high-throughput approaches for data handling with the promise of offering creative insight. Coupled with the rise of machine learning it is now possible to promote knowledge driven systems design from discovery data. Dovetailing these approaches with new molecular tools and technologies will lead to game-changing rapid design-test cycles that speed up product development.

THE RESEARCH THEME

To support this landscape the Scientific Vision of the ICB CDT encompasses four aims:

1. Develop and validate novel tools and technologies for the study of molecular interactions and their applications to strategic biological/biomedical problems and industry priority areas that cannot be undertaken with the current state-of the art. This will connect physical/mathematical sciences innovation push with life-science pull. The expanded remit of the CDT now also embraces multi-scale modelling (e.g. graph theory) and experimental approaches (micro-physiological environments) for studying molecular interactions and biological systems;
2. Dovetail these technologies with industry 4.0 approaches to maximise insights from molecular interaction studies;
3. Translate research advances for exploitation in industrial/medical applications;
4. Extend the capabilities of previous CDT-technologies, so that these can be translated to end users in different sectors.

THE STUDENTSHIP

The studentships, starting in the 2023/24 academic year, comprise a 1-year MRes in Chemical Biology and Bio-Entrepreneurship, followed by a 3-year PhD.

The MRes course involves taught elements from October to January in: basic Chemical Biology; Data Science and Measurement Science; Hackspace education (giving students experience of rapid prototyping (additive manufacturing, electronics, robotics, laser cutting, microfluidics, microcontrollers), software engineering/modelling (Python/Machine Learning, Matlab, Fusion 360, biological “toy models”) and biohacking (protein engineering, proteomics, metabolomic assays)); a “Micro-MBA”: the ‘CDT Business Catalyst’. This is followed by a research project that runs from January to September. The research project then continues into the PhD.

During the PhD students benefit from additional transferable skills training including Science Communication with the BBC, a Human Transformation Studies course, Science Policy and the choice between the EVOLVE (workplace-based learning programme) and DISRUPT (tech accelerator programme).

The studentship will cover tuition fees and stipend for a total of 4 years. In addition, there is a consumable allowance of £3,500 per annum and a total of £1,500 towards travel and £2000 for the EVOLVE programme per studentship.

SUPERVISOR ELIGIBILITY

Imperial College rules	Supervisors must fulfil the usual College criteria for eligibility to act as a PhD supervisor.
Number of supervisors and tenure	At least two supervisors on the application must hold an academic position at Imperial College that is tenured over the complete period of the studentship. This does not mean that IC supervisors who do not hold a position for the full four-year period cannot apply. However, in such circumstances a third supervisor (from Imperial College) who could continue the student supervision (if the original supervisor’s tenure was not extended) would have to be added.
Expertise	The supervisors should provide different skill sets, and the most usual division will be to have one “medical/biological/agri-science/personal care” and one “physical/ engineering/ mathematics/industry 4.0” supervisor. These definitions are not meant to be restrictive, nor are they necessarily defined by departmental affiliations. What is important is exposure of the student to multiple disciplines, wherever these are located. Refer also to “Multidisciplinarity” under “Project requirements” below.
External supervisors	The primary supervisor must be Imperial based. Non-Imperial supervisors may be included but at least two supervisors on the application must hold an academic position at Imperial College, as it is vital that the student has a multidisciplinary lab experience. The inclusion of external supervisors should be discussed with the CDT director/ deputy directors before submission of the application form. Please contact them early in the process.



SUPERVISOR ELIGIBILITY

Student registration	For reporting and auditing purposes of the CDT award, all students will be registered in Chemistry, regardless of the departmental affiliation of the supervisors. If there are no Chemistry supervisors, a formal supervisor from Chemistry (either the director or one of the deputy directors of the ICB CDT) will be added at 1% for administrative purposes.
Cap on number of applications	A maximum of 2 applications per supervisor is allowed for a given studentship call.

PROJECT REQUIREMENTS “ANNUAL CALL” - ASSESSED COMPONENTS

		Threshold / maximum score
Science Remit (fit to theme)	Proposals will typically be concerned with the development of new molecular tools and technologies in Chemical Biology to study specific molecular interactions that address key challenges in the healthcare, med-tech, biotech, personal care, agri-science, and nutrition sectors . Project proposals concerned with either translational or basic research will be considered, but in both instances there must be underpinning innovation in the physical sciences. In particular, note that the proposed research should address the next generation of new molecular tools and technologies for the making, measuring, modelling and manipulating molecular interactions in biological systems (including across multiple lengths scales), such as (but not restricted to) protein-nucleic acid, lipid-drug, lipid-lipid, lipid-nucleic acid, protein-protein and lipid-metabolite interactions. The enhanced quantitative capabilities of these new tools and technologies should address the bottlenecks vital to providing the quantity, quality and type of data needed for predictive modelling and downstream commercial and medical exploitation.	(3.0/5.0)
Physical science innovation	The application must demonstrate innovation in the physical sciences . Technologies can be experimental or theoretical (making, measuring, manipulating and modelling). A solely biological/medical proposal, no matter how interesting, is unfortunately not within the remit of the ICB CDT. Typically, projects will involve the development or the translation of a new technology applied to a biological problem. Modification of an existing technology to solve a specific biological problem is allowable, but there has to be considerable novelty in the development of the technology underpinned by innovation in the physical sciences. Translation into a new sector without innovation in the physical sciences is not within the remit of the CDT.	(5.0/10.0)
Multidisciplinarity	It is fundamental that the project is inherently multidisciplinary. Therefore, it must include at least two supervisors. The supervisors should provide the different skill sets, and the most usual division will be to have one “medical/biological/agri-science/personal care sciences” and one “physical” supervisor. These definitions are not meant to be restrictive, nor are they necessarily defined by departmental affiliations. What is important is exposure of the student to multiple disciplines, wherever these are located. It is expected that the student will typically undertake work in each research environment for some part of the study, including the MRes project.	(4.0/6.0)



PROJECT REQUIREMENTS “ANNUAL CALL” - ASSESSED COMPONENTS		Threshold / maximum score
Feasibility and Suitability	<p>ICB CDT PhD studentships are fully funded for 4 years (1+3 year format). The first year is an MRes course with taught components in the first few months and a research project subsequently starting in January and finishing in September. Even though this research project directly feeds into the 3-year PhD, the proposal must put forward a self-contained MRes project that can be achieved within 9 months.</p> <p>If the proposed project builds on a previously funded CDT studentship you must include details of the innovation that has been successfully achieved to date and how the new studentship pushes this forward through innovation in the physical sciences.</p> <p>OR</p> <p>If the suggested technology is completely new, please explain why you think the proposed research will be successful and include a discussion of a risk mitigation plan (“plan B for the student”)</p> <p>Regarding the SARS-CoV-2 pandemic, supervisors should ensure that a remote project alternative can be devised, should this be necessary. However, proposals will not be scored based on this.</p>	(5.0/10.0)
Impact	Describe the intended impact / scientific merit that would arise from this work. This can include fundamental biological insight, a translational element (e.g. how the application of the new technology could be applied to other biological problems) and / or any other added value that the project can bring to the ICB, such as outreach, new collaborations (with companies) and follow-on funding. Indicate the timeframe for the achievements listed in your impact statement.	(2.5/4.0)
Responsible Research Innovation	Explain how the project was designed with Responsible Research and Innovation (RRI) in mind. e.g. is the topic you are researching potentially controversial? Is there a significant ethical or moral component? For more information on RRI please go to: https://www.ukri.org/councils/epsrc/guidance-for-applicants/what-to-include-in-your-proposal/health-technologies-impact-and-translation-toolkit/research-integrity-in-healthcare-technologies/responsible-research-and-innovation/	(3.0/5.0)
Industry 4.0	Describe how the project and student training therein is aligned with industry 4.0 technologies. These could include but are not restricted to automation, additive manufacturing / 3D printing, AI, machine learning, augmented reality, cloud computing, big data and analytics and Internet of Things.	(3.0/5.0)
Please note the different weighting and threshold of each requirement!	Maximum Score: 45	

APPLICATION AND REVIEW PROCESS

How to apply	<p>The awards will be made based on written applications to the ICB. Applications to the ICB must be made using the separate application form provided.</p> <p>When filling in the application form it is important to demonstrate that your proposed project meets all the criteria listed. Proposals should clearly outline the innovative aspect of the research counterbalanced by its achievability in terms of time and funds.</p> <p>Please specify your research infrastructure, including the access to resources already in place and any additional needs in the feasibility section.</p> <p>With the award of a studentship, supervisors automatically become ICB members. Therefore, you must select at least three of the “ICB membership activities” (listed in the Annex) you would like to get involved in.</p>
Page Limit and Font	<p>Please complete your application by entering your text only into the tables in the word document and restrict your application to the four-page limit. Do not use a font less than 10 pt Arial. Note that we cannot consider applications longer than four pages and in any other format than .doc or .docx. Annexes and additional tables are not allowed.</p>
Review and Award	<p>Each proposal will be independently scored by academic and industrial members of the ICB research board whose expertise cuts across the full remit of the ICB CDT. In addition, applicants can suggest Imperial College academics that have the necessary expertise to review the application.</p> <p>Following the ranking according to the scores from the markers, each studentship application will be discussed in a moderation meeting prior to finalising the ranking.</p> <p>Ultimately, the ICB Research Board will be responsible for deciding which and how many applications should be supported.</p>
Relevant Dates	<p>APPLICATION DEADLINE: Please email the completed application form as .doc or .docx file to Emma (e.pallett@imperial.ac.uk) by Wednesday 23rd November 2022, 9 am.</p> <p>Applicants will be informed as soon as possible after the reviewing process.</p>
Any Questions?	<p>We actively encourage participants to discuss potential projects with the ICB CDT Director or Deputy Directors if they are unsure of the procedure or the remit.</p>

POST AWARD

Student Eligibility	<p>The awarding body for the ICB CDT studentships is the EPSRC. Students must therefore conform to the eligibility requirements laid down by the EPSRC, which normally means that the student must be categorised with UK fee status.</p> <p>Following the UK's departure from the EU, UKRI have amended their policy with regard to international fee status students; information can be found on the UKRI webpages: https://www.ukri.org/wp-content/uploads/2021/03/UKRI-170321-InternationalEligibilityImplementationGuidance.pdf Please notify the management team if you would like to recruit an Overseas student prior to any offers made.</p> <p>All students must have a good honours degree (2.1 or above) in a <i>physical sciences</i> subject at MSci level (or equivalent).</p>
Recruitment	<p>Eligible students will be interviewed by the ICB-CDT Board and the project supervisors.</p> <p>It is the responsibility of supervisors to ensure that studentship places are filled by 30th of June 2023. Any studentship that does not have a suitable student signed up at this time will be deemed to have forfeited the award, which will be reassigned to reserve projects – this deadline will be strictly enforced.</p>

POST AWARD

Supervision splits	All ICB students are registered in the Department of Chemistry. The lead supervisor must therefore be based in the Chemistry department. This can be a nominal supervisor (1%) and does not have to be listed on the application form.
MRes	The 4-year programme typically comprises a 1-year MRes followed by a 3-year PhD.
ICB events and EVOLVE programme	The CDT programme, under the administration of the ICB, involves colloquia and student organised conferences. In order to encourage wide interactions, we make attendance at these programmes a mandatory requirement for both students and supervisors. Students must also attend relevant CDT specific courses in transferable skills and take part in the EVOLVE or DISRUPT programmes, both last 2 months.
ICB membership	With the award of a studentship, supervisors automatically become ICB members and you will be approached by the CDT management regarding ICB responsibilities chosen on the application form (see Annex).

ANNEX

ICB core activity to be listed on the application form. Choose at least three activities you agree to be responsible for if you are awarded a studentship.

Successful applicants will be expected to contribute throughout the duration of the 4-year ICB PhD studentship to the training of our cohorts in both the MRes and PhD years as requested by the MRes course or ICB Directors. This includes (but is not limited to): marking of assessments; tutoring; mentoring.

In addition to this, we would request that you select at least three of the below ICB core activities to be responsible for if you are awarded a studentship:

1. Co-organise an ICB CDT colloquium
2. Give a talk at an ICB CDT colloquium or CDT Winter School
3. Co-organise an ICB CDT careers seminar
4. Supervise ICB CDT cohort site visits to industry partners
5. Contribute to MRes taught training (e.g. lectures, group learning seminars)
6. Contribute to the ICB CDT newsletter/ website
7. Attend and act as tutor at a ICB CDT transferable skills course
8. Take part in industry hackathons
9. Act as member of judging panels at events such as the ICB CDT Tech Accelerator
10. Act as a member of an ICB CDT expert panel to mark future proposals
11. Take part in ICB CDT technology showcase events / SME workshops
12. Join the ICB CDT BOOST mentoring programme (giving advice to student pursuing independent research or starting up their own companies)
13. Act as an ICB CDT cohort mentor for 1 year (includes visiting students at residential courses)