The Institute of Cancer Research

PHD STUDENTSHIP PROJECT PROPOSAL:

PROJECT DETAILS	
Project Title:	**Tumour evolution in super-resolution: Developing new Artificial Intelligence based methods to analyse 4D imaging data of tumour communities."**
Short Project Title:	**Developing AI methods to analyse 4D imaging data of tumour communities."**

SUPERVISORY TEAM	
Primary Supervisor(s):	Professor Chris Bakal
Associate Supervisor(s):	Dr Chris Dunsby
Backup Supervisor:	
Lead contact person for the project:	Professor Chris Bakal

DIVISIONAL AFFILIATION	
Primary Division:	Cancer Biology
Primary Team:	Dynamical Cell Systems

PROJECT PROPOSAL

BACKGROUND TO THE PROJECT

Developing new cancer therapies requires improved understanding of heterogeneity in cell behaviour. This requires determining single-cell responses, rather than the average responses of cell populations that fail to account for outlier cells that can be responsible for drug resistance. There is also increasing interest in more complex 3D cancer models, such as patient-derived organoids (PDO) that better recapitulate the complexity of the in vivo context compared to conventional high-throughput assays of homogenous 2D cell cultures. However, increasing the physiological complexity of cancer models makes them harder to image using optical microscopy techniques, and this makes screening many samples or conditions in high-throughput screening more challenging.

This PhD project is part of a Cancer Research UK funded Accelerator award between Imperial College London, the Francis Crick Institute, the Institute of Cancer Research (ICR), the University of Edinburgh and the Institute for Research in Biomedicine Barcelona. The project will develop, apply and utilise a new state-of-the-art automated light-sheet multiwell-plate oblique plane microscope (OPM) at the ICR to provide 3D imaging of 3D cell cultures and PDOs in 96 and 384-well formats. The PhD student will become expert in the use of the instrument, develop new image analysis pipelines and interpret these results in the context of the biology. The system will be used to provide quantitative single cell-resolved readouts and responses in fixed and live cell cancer models across a wide-range of conditions and provide functionality beyond the commercial state-of-the-art, e.g. providing faster 3D imaging of cell morphology, dynamics and migration in multiwell plate arrays. The project will enable studies of

which cells within a heterogeneous cancer population are effectively killed by chemotherapy and which of the persisting cells are responsible for disease recurrence. It will also be used to explore the role of the tumour microenvironment for quiescent chemotherapy-resistant tumour cell sub-populations.

The ideal candidate would have a keen interest in the development and application of new tools and methodologies to study cancer biology and for drug discovery, and would welcome the multidisciplinary nature of the project. In particular they should have a strong physical- or computer-sciences background. A high level of computer literacy, including experience of computer programming is essential.

PROJECT AIMS

Pending, please check back.

RESEARCH PROPOSAL

Pending, please check back.

LITERATURE REFERENCES

Pending, please check back.

CANDIDATE PROFILE

Note: the ICR's standard minimum entry requirement is a relevant undergraduate Honours degree (First or 2:1)

Pre-requisite qualifications of applicants: e.g. BSc or equivalent in specific subject area(s)	Pending, please check back.
Intended learning outcomes:	Pending, please check back.

ADVERTISING DETAILS

Project suitable for a student with a background in: Pending, please check back.	☐ Biological Sciences

	☒ Physics or Engineering ☐ Chemistry ☒ Maths, Statistics or Epidemiology ☒ Computer Science ☐ Other (provide details)
Keywords: Pending, please check back.	**1.**
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