Job Description

Postdoctoral Researcher – Computational Cancer Genomics

UCL Grade 7: £36,770 - £ 43,200 per annum (inc. London Allowance)

Department: UCL Cancer Institute, Department of Oncology

Location: Paul O'Gorman Building, London (UK)

Reports to

Dr Simone Zaccaria, UCL Cancer Institute, Department of Oncology, CRUK Lung Cancer Centre of Excellence. www.ucl.ac.uk/cancer/zaccaria-lab

Context

We are seeking a collaborative and self-motivated computational cancer genomics post-doc to work on metastatic evolution and migrations using novel single-cell whole-genome DNA sequencing (scWGS) data.

The project will focus on the development of computational methods to analyse metastatic evolution and migrations using novel scWGS data. A recent CRUK-funded project will generate a unique scWGS dataset of >200,000 metastatic cells obtained from non-small cell lung cancer patients in the TRACERx study and the national autopsy programme, PEACE. The unique combination of cutting-edge revolutionary scWGS technologies with the TRACERx/PEACE availability of longitudinal extensive metastatic tissue sampling (>40 samples per patient), clinical annotations, and orthogonal multiomics datasets makes this project an unprecedented opportunity for investigating complex metastatic processes. However, methods for the evolutionary analysis of these novel scWGS data do not currently exist. Therefore, to tackle this critical but unmet need, the aim of the candidate will be to design mathematical models and develop algorithms to identify genomic alterations from scWGS data, and to reconstruct the evolutionary and migration histories of single metastatic cancer cells. Moreover, the candidate will be expected to participate in their code implementation and applications.

The successful applicant will have a proven track record in cancer computational biology, have previous experience with NGS data analysis, be fluent in the Python programming language, and is expected to have strong skills in the field of genomics and desirably one or more of the following: cancer and evolutionary biology, statistics, algorithmics, and mathematics. Prior experience in the development of algorithms to identify genomic variants from DNA sequencing data and investigate their evolution is particularly desired.

Dr Simone Zaccaria is the group leader of the UCL Computational Cancer Genomics (CCG) research group and bioinformatics deputy lead within the Lung Cancer Centre of Excellence. He was recently awarded a CRUK Career Development Fellowship, supporting this project. The CCG group is a multi-disciplinary computational group of successful cancer researchers. The team is filled with passionate and determined individuals who create a stimulating, exciting, and dynamic environment in which the successful candidate will participate and grow as a scientist. Moreover, CCG provides a positive and social environment, with regular team research activities as well as team social gatherings. Importantly, the research in the CCG group is fully conducted in close collaboration with local and international scientists and clinicians, especially across the TRACERx and PEACE consortia (Prof Charles Swanton, Dr Mariam Jamal-Hanjani, Dr Nicholas McGranahan, etc.). These collaborative environments will thus provide the successful candidate with opportunities to learn from a large and inter-disciplinary network of world-renowed experts and talented professionals.

The post is funded for 3 years in the first instance with a start date after 1st June 2022 and with the possibility of extension for another 2 years. For further information and informal enquiries, please contact Dr Simone Zaccaria (s.zaccaria@ucl.ac.uk).

TRACERx (TRAcking lung Cancer Evolution through therapy/Rx):

TRACERx is a multi-year project started in 2014 and is the first longitudinal cancer genomics study that forms a national UK consortium focused on deciphering cancer evolution over space and time. Funding is generously provided by CR-UK, the Rosetrees Trust, the Novo Nordisk Foundation and the UCL Biomedical Research Centre (£13 million over 9 years).

TRACERx involves multi-region sequencing analyses of lung cancer (5000+ exomes, whole genomes, transcriptomes in 850 patients) through the disease course, from pre-invasive through to primary and metastatic disease, to understand lung cancer evolution. This work is supported by excellent, existing bioinformatics facilities available in our Centre together with substantial investment in bioinformatics staff, data storage, and computer processing power. Newly discovered driver events are functionally analysed in preclinical models and validated for drug discovery initiatives as part of the Centre's program.

The TRACERx project is highly successful, as of 2018 more than 400 patients have been fully analysed with the initial data already resulting in a flow of high-impact publications, including manuscripts in Nature, Cell, Science and the New England Journal of Medicine.

The PEACE (Posthumous Evaluation of Advanced Cancer Environment) study

PEACE is a pan-cancer national research autopsy programme in which post-mortem sampling allows access to tissue from all sites of metastasis, and to date has recruited over 345 patients and performed over 190 autopsies. PEACE aims to investigate the biological processes underpinning metastatic disease, including genomic drivers of tumour dissemination and failure of the adaptive immune system. The combination of both TRACERx and PEACE with patient co-recruitment has established an unprecedented resource of multi-regional matched primary and metastatic tissue, and therefore facilitates tissue- and blood-based analyses from diagnosis to death. This is the first national autopsy programme at such scale with a consortium of high calibre scientists and clinicians focussed on various projects relevant to metastasis and drug resistance.

The UCL Cancer Institute:

The 2007 opening of the Cancer Institute in the Paul O'Gorman Building heralded a new era in cancer research and medicine at UCL. The Institute consolidates cancer research across the campus. In particular, it fosters links between basic cancer researchers across Biomedicine, and with the clinical activities of our partner Hospitals (University College London Hospitals including Queen Square, Great Ormond Street Hospital for Children and the Royal Free Hospital). The Institute is a £40 million investment by UCL, The Wolfson Foundation, Children with Leukaemia and Atlantic Philanthropies. The overall grant income in 2007 was £37 million from the principal medical charities concerned with cancer (CRUK; Leukaemia Research Fund), other charities including the Wellcome Trust, and from government agencies such as the Medical Research Council. The Institute covers an internal floor area of 8,832m^2 and house over 300 scientists.

Main purpose of the job

The successful candidate will be based within the UCL Cancer Institute (CI). The CI laboratories are extremely well equipped, with an attractive working environment. The research will be conducted in close collaboration with the other CRUK Lung Cancer Centre laboratories (e.g., Swanton lab, Jamal-Hanjani lab, and McGranahan lab) at both the Francis Crick Institute and UCL Cancer Institute together with national and international partners in the TRACERx and PEACE consortia.

The successful candidate will join an established and renowned multi-disciplinary team of computational biologists, cancer evolutionary biologists, and lung cancer translational research clinicians where all stages of cancer discovery, from target identification through design of novel therapeutics to clinical trial validation, are achievable within the UCL Cancer Institute and the Francis Crick Institute.

Duties and responsibilities

- To work within the CCG group, and collaborating groups at UCL and Francis Crick Institute.
- To work closely with other members of the team to interpret results.
- To design and develop computational methods to identify genetic alterations and mutations from single-cell DNA sequencing data.
- To design and develop computational methods and mathematical models to reconstruct the evolutionary history and metastatic migration patterns of cancer cells.
- To participate in the running and development of the single-cell bioinformatics pipeline for TRACERx and PEACE single-cell whole-genome sequencing data.
- To provide expert mathematical, algorithmic, and statistical support.
- To employ novel informatics techniques based on evolutionary principles to the analysis of single-cell cancer genomics and tumour subclonal evolution.
- To liaise and coordinate between the project collaborators.
- To liaise and coordinate between various working groups involved in the sequencing of TRACERx and PEACE clinical samples to ensure the delivery of high quality sequencing data in a time efficient manner.
- Ensure the necessary computational requirements are met to allow for secure data storage and processing of the single-cell sequencing datasets.
- To understand cancer biology and the relevant literature sufficiently to take own ideas forward as lead author on new projects.
- To assist in the delivery and rapid processing of tumour sequencing data.
- To liaise with scientific staff with different expertise (clinical, biological, wet lab, sequencing, pathological, imaging, etc.) to maximise use and interpretation of orthogonal tumour data to decipher lung cancer evolutionary strategies.
- To record all experiments in an accurate, detailed, timely, and clearly presented manner, and use this to prepare data summaries, presentations, and reports as and when required.
- To mentor more junior lab members, including PhD and MSc students.
- To attend and report research results at regular group, TRACERx/PEACE, and national meetings.
- To contribute to the dissemination of scientific results by means of writing papers for publication, and presenting orally and in poster form at national and international meetings.
- To act at all times in accordance with the highest professional standards, and ensuring that these are maintained in the delivery of all aspects of research.
- To maintain own continuing professional development, including participation in staff development and review procedures in accordance with UCL guidelines, including annual formal appraisal.
- To adhere at all times to the policies, rules and regulations of the Department, Institute and UCL.
- The post holder will actively follow UCL policies including Equal Opportunities and Information Governance policies.
- The post holder has a responsibility to carry out their duties in a resource efficient way and actively support UCL's Sustainability Strategy, policies and objectives within the remit of their role.
- The post holder will maintain an awareness and observation of Fire and Health & Safety Regulations.
- As duties and responsibilities change, the job description will be reviewed and amended in consultation with the post-holder.
- The post-holder will carry out any other duties as are within the scope, spirit and purpose of the job as requested by the line manager or Head of Department/Division.
- To be aware of and act upon UCL policies for:
  - Disciplinary procedure and Disciplinary rules;
  - Grievance procedure;
  - Section 7 and 8 of the Health and Safety at Work Act;
  - Departmental Fire Guidelines;
  - Equal Opportunities and Race Equality Policies.

Person Specification G7

Criteria	Essential or Desirable	Assessment method (Application/Interview)
Qualifications, experience and knowledge		
Postdoctoral qualification (PhD)	Essential	A
Previous postdoctoral experience	Desirable	A/I
Evidence of independence and original contributions to research	Essential	A/I
Previous experience with DNA sequencing data	Essential	A/I
Previous experience with computational method or algorithm development	Essential	A/I
Knowledge of data science, algorithm development, and statistical analysis	Essential	A/I
Previsious experience in developing and using bioinformatics pipelines	Desirable	A/I
Previous experience with cancer genomics	Desirable	A/I
Previous experience with single-cell genomics	Desirable	A/I
Previous experience in the field of cancer evolutionary biology	Desirable	A/I
Previous experience and knowledge of phylogenetics	Desirable	A/I
Mentorship experience	Desirable	A/I
Evidence of publications	Essential	A/I
Good knowledge of statistics	Desirable	A/I
Skills and abilities		
Fluent in Python	Essential	A/I
Fluent in BASH, R, Perl, AWK, Java, or C++	Desirable	A/I
Excellent written and verbal communication skills	Essential	A/I
Ability to analyse data and write up results in a timely manner	Essential	A/I
Ability to present complex data at meetings	Essential	A/I
Good inter-personal skills with an ability to liaise effectively with other members of the group	Essential	A/I
Good presentation skills (to internal and external audiences, including international conferences)	Essential	A/I
Previous experience of collaboration with clinicians and wet lab scientists	Desirable	A/I

Criteria	Essential or Desirable	Assessment method (Application/Interview)
Previous experience with managing or running national and international collaborations	Desirable	A/I
Experience with HPC environments	Desirable	A/I
Experience with Git and version control	Desirable	A/I
Ability to represent the PI at consortium and other meetings	Desirable	A/I
Personal attributes		
Able to work in a team	Essential	A/I
Excellent attention to detail	Essential	A/I
Commitment to high quality research	Essential	A/I
Commitment to UCL's policy of equal opportunity and the ability to work harmoniously with colleagues and students of all cultures and backgrounds	Essential	A/I