CHILDREN'S MEDICAL RESEARCH INSTITUTE
Jeans for Genes®

Finding cures for children's genetic diseases

PhD Scholarships at Computational Systems Biology Unit
Children's Medical Research Institute
The University of Sydney

Organisation Overview

Children's Medical Research Institute (CMRI) was Australia's first dedicated paediatric research facility and is now one of the world's most highly regarded independent medical research organisations. Our research focuses on the four key areas impacting children's health: cancer, genomics and genetic diseases, neurobiology, and embryology. Our strong international reputation is based on decades of significant research outcomes in these areas of specialty. CMRI is also home to the world-first proteomics project, ProCan, which is changing the way cancer is diagnosed and treated. CMRI's research programs are supported by state of the art facilities and committed research and support staff. Our achievements are made possible by a loyal network of community supporters, highly engaged donors, and the very successful Jeans for Genes® and Great Cycle Challenge fundraising campaigns.

Role Summary

The Computational Systems Biology (CSB) lab (pyanglab.github.io) at Children's Medical Research Institute (CMRI) is recruiting highly motivated PhD candidates to conduct experimentally and computationally combined research in the areas of stem cell biology and epigenomics, with an overarching goal of characterising and modulating molecular programs for controlling cell-identity and stem cell-fate decisions.

Our research focuses on acquisition of cell-identity and cell-fate decisions for cell-fate engineering. The CSB lab have established high-throughput experimental techniques such as single-cell transcriptomics and epigenomics, immunofluorescence, bulk proteomics and phosphoproteomics, and computational expertise in bulk and single-cell multi-omics data analysis.

The key research output from the lab relevant to this position include:

1. Zyner et al. (2022) G-quadruplex DNA structures in human stem cells and differentiation. ***Nature Communications***, 13, 142.

2. Kim et al. (2021) Uncovering cell identity through differential stability with Cepo. ***Nature Computational Science***, 1, 784-790.

3. Kim et al. (2023) Comprehensive characterization of fetal and mature retinal cell identity to assess the fidelity of retinal organoids. ***Stem Cell Reports***, 18(1), 175-189.

4. Yang et al. (2019) Multi-omic profiling reveals dynamics of the phased progression of pluripotency. ***Cell Systems***, 8(5), 427-445.

5. Cinghu, Yang et al. (2017) Intragenic enhancers attenuate host gene expression. ***Molecular Cell***, 68(1), 104-117.

PhD candidates will enroll in either Faculty of Medicine and Health or Faculty of Science at The University of Sydney (USyd) and be co-supervised by Dr Katie Zyner (Conjoint Lecturer, molecular cell biologist, Faculty of Medicine and Health, USyd; www.sydney.edu.au/medicine-health/about/our-people/academic-staff/katherine-zyner.html) and A/Prof Pengyi Yang (Associate Professor, computational biologist, Faculty of Science, School of Mathematics and Statistics, USyd; www.sydney.edu.au/science/about/our-people/academic-staff/pengyi-yang.html) and have ample

opportunity to collaborate with stem cell experts at CMRI and bioinformaticians in the CSB lab and at The University of Sydney including the Sydney Precision Data Science Centre. The ability to undertake multidisciplinary work is essential.

Competitive PhD scholarships ($44,200 per annum) will be offered by CMRI. This PhD opportunity is open to both national and international applicants.

Duration: 3-year fixed term (full time) with 6 months extension.

Key Responsibility Area

- Carry out multidisciplinary research projects that combine experimental ('wet-lab') and computational ('dry-lab') techniques in the broad area of stem cells biology, epigenomics, and developmental biology.
- Prepare and publish work and present scientific results in national/international conferences.
- Develop and co-supervise research projects for honours students.
- Build collaboration with CMRI teams and teams at The University of Sydney and beyond.

Key Selection Criteria

- An undergraduate/background in molecular biology, cell biology, biochemistry, developmental biology and/or computational systems biology or related fields.
- Knowledge of stem cell biology and cellular development.
- Experience in cell culture and experimental design.
- Experience in genetic manipulation of human and mouse cells.
- Data science/bioinformatics skill is highly desirable.
- Ability in the formulation of research strategy and the preparation of research reports and publications.
- Excellence in written and oral communications, interacting with a variety of researchers and stakeholders
- Evidence of self-motivation and potential for undertaking original research

Contact: Dr Katie Zyner (katherine.zyner@sydney.edu.au) or A/Prof Pengyi Yang (pengyi.yang@sydney.edu.au)