2023 Student Research Opportunities

SAiGENCI
SOUTH AUSTRALIAN iMMUNOGENOMICS CANCER INSTITUTE

an alliance of

THE UNIVERSITY of ADELAIDE

Government of South Australia
Health
Central Adelaide Local Health Network

adelaide.edu.au/saigenci

About SAiGENCI

The South Australian immunoGENomics Cancer Institute (SAiGENCI) is being established as a new and independent cancer-focused medical research institute located within the University of Adelaide in South Australia.

The Institute was made possible by an $80 million grant from the Commonwealth and is being jointly resourced by the Federal Department of Health, the Central Adelaide Local Health Network (CALHN) and the University of Adelaide.

The overarching vision for SAiGENCI is to have a fundamentally positive impact on the conduct of cancer research in South Australia, so that fewer patients develop cancer, and the lives of those with cancer is improved.

To achieve this vision, the Institute aims to become a hub for scientific discoveries and development of transformative technologies that will translate into improved clinical outcomes through:

- Forging strong research collaborations
- Developing and testing new technologies and discoveries
- Improving treatment and care options for people living with cancer
- Training South Australian clinicians
- Commercialising new discoveries

SAiGENCI's Director Designate, Professor Christopher Sweeney is a Medical Oncologist at the Dana-Faber Cancer Institute in Boston, Massachusetts, and Professor of Medicine at Harvard Medical School. Prof Sweeney will relocate full-time to Adelaide at the end of 2022 and will lead a core of high performing groups across six scientific programs.

SAiGENCI's Core Scientific Programs

Hormone Dependent Cancers	Computational Systems Oncology
Resistance Prevention	Paediatric and Neuro-oncology
Cancer Epigenetics	Tailored Immunotherapy

SAiGENCI has and continues to build a team of internationally leading cancer researchers and clinicians across these programs, who not only perform at an international level in their own right, but together will develop a distinct institutional culture focussed on excellence and clinical impact.

Our Institute members will also take a lead role across the state in supporting networks with other cancer research groups in South Australia and support a highly collaborative culture across Australia and internationally.

Learn more about SAiGENCI, its research and people via our website https://www.adelaide.edu.au/saigenci/

Training the next generation of cancer researchers

Are you looking for an opportunity to take the next step in your research career?

The Institute has a number of research projects on offer that are suitable for students at different stages of their scientific studies, including summer internships for second- and third-year undergraduate students, Honours, Masters of Philosophy (MPhil) and Doctor of Philosophy (PhD).

Projects will be based at SAiGENCI within the Faculty of Health and Medical Sciences at the University of Adelaide, in either the Adelaide Health & Medical Sciences (AHMS) building, the South Australian Health and Medical Research Institute (SAHMRI) and/or the Central Adelaide Local Health Network (CALHN), all co-located on North Terrace in the Adelaide CBD.

SAiGENCI and the University of Adelaide will provide researchers early in their career with a stimulating and supportive environment to achieve highly ambitious research goals and build connections for their future careers.

See below for program specific details, research groups and available projects.

Higher degree by research opportunities – MPhil and PhD

Who are we looking for?

SAiGENCI is looking for talented, enthusiastic and dedicated individuals who have a shared vision to undertake research that will lead to fewer patients developing cancer and improving the lives of those with cancer.

Perhaps you have or will soon complete an undergraduate, Honours or Masters degree in a scientific field related to cancer research, or maybe you're a clinician looking to add a research component to your skillset.

If you are a high achieving individual who meets the eligibility criteria (see below) and are committed to a two year (MPhil) or three to four-year full-time research project, we would like to hear from you!

What we will offer – The SAiGENCI Graduate Program

The Institute will provide a unique training experience for its students including:

- Immersion in a community of Australia's leading cancer researchers with access to world class facilities and technologies
- Regular research forums and master classes from experts in the field
- Workshops for developing research and data analytical skills as well as career development
- Travel funding support for students to present their research at national and international conferences
- For those enrolled in a PhD, opportunity to participate in a paid 3-month industry internship with a partner organisation

Eligibility Criteria for SAiGENCI Students

The Adelaide Graduate Research School (AGRS) administers all University of Adelaide domestic and international postgraduate research degree applications. Positions are open to both domestic and international applicants who meet the University of Adelaide's entry requirements, including a minimum English language proficiency.

In addition to the University of Adelaide eligibility requirements, SAiGENCI PhD applicants will need to have successfully completed an Honours degree (achieving a First Class final result), Masters coursework degree (achieving GPA > 6) that has included a significant research component and thesis, or a Masters by Research degree. Individuals who have significant research experience and/or have contributed to peer-reviewed research publications will be viewed favourably.

Applicants for SAiGENCI MPhil positions will need to have successfully completed a relevant Bachelor's degree (achieving a distinction average or higher) or have relevant research experience.

Further information on University of Adelaide HDR degree structures and eligibility can be found on the following AGRS website:

Adelaide Research Degrees

https://www.adelaide.edu.au/graduate-research/future-students/adelaide-research-degrees

Research Student Handbook

https://www.adelaide.edu.au/graduate-research/current-students/handbook

SAiGENCI HDR scholarships

Major/base scholarships

MPhil and PhD scholarships will be available for a period of two or three and a half years respectively with an indicative value of AUD $29,863 per annum (2023 rate). Students who meet the University of Adelaide eligibility requirements can apply for these scholarships with applications assessed on a competitive basis.

Tuition fee waivers may be available for international students. Eligibility for a tuition fee waiver will be assessed on a case-by-case basis.

Supplementary scholarships

In addition to the major scholarship, all students selected for a research project with SAiGENCI will receive a $5,000 per annum supplementary scholarship and will be eligible to apply for other competitive scholarships.

How to apply

All applicants will need to apply online through the AGRS as outlined on the How to Apply webpage. We strongly encourage you to apply during one of the University of Adelaide's application rounds shown on the How to Apply webpage. Note, application round dates differ for domestic and international students.

Finding a supervisor and project

Current or recently completed University of Adelaide students

If you have previously studied with the University of Adelaide, contact the leader(s) of the project(s) listed below that excite you to express your interest. Include in your email the level of study you want to undertake (i.e. MPhil or PhD), a copy of your CV and academic transcript.

The supervisor will review your documents and arrange a time to speak with you about the project if they believe you have the right background and experience for the project. If, after talking with the supervisor, you still wish to proceed and you have received the supervisors written support to apply for a position in their group and be considered for a SAiGENCI scholarship, you can begin your online application.

All other applicants

If you have not previously studied with the University of Adelaide, email AGRS (research_degrees@adelaide.edu.au) for information on the University's pre-application

process. Include in your email that you are interested in a SAiGENCI research project and nominate the supervisors listed against the projects listed below that excite you the most. AGRS will provide you with information on the documents you will need to submit, they will review these for completeness, quality and eligibility before providing them to the potential supervisors.

The supervisor will review your documents and arrange a time to speak with you about the project if they believe you have the right background and experience for the project. If, after talking with the supervisor, you still wish to proceed and you have received the supervisors written support to apply for a position in their group and be considered for a SAiGENCI scholarship, you can begin your online application.

Applying online for admission and scholarship

Follow the AGRS instructions to create an account to complete your online application. You can save your application at any stage and do not need to complete it in one session. **We encourage you to begin your application well in advance of the application deadline.**

When applying for a SAiGENCI research project and scholarship, enter the details below that are relevant to your situation at the application headings shown.

Domestic applicants

Application Type: Select Admission and Scholarship.

Study Preferences: Enter the relevant details from the table below.

	MPhil Applicants	PhD Applicants
Study Type	Masters by Research	Doctor of Philosophy
Award	Master of Philosophy (Medical)	Doctor of Philosophy in Medicine
School	South Australian immunoGENomics Cancer Institute	
Research	Cancer Research, Genomics or Immunotherapies (select one only)	

Scholarship Selection: For a SAiGENCI scholarship select the relevant "University of Adelaide Research Scholarship" based on whether you are applying for an MPhil or PhD.

Research Interests: Note you will need to complete a short (500-800 word) research proposal on a template available within the application. The research proposal will include a title, summary, details, methods and references. Enter SAiGENCI as the proposed School/Discipline.

International applicants

Financial Support: Select seeking a scholarship from the University of Adelaide.

Study Preferences: Enter the relevant details from the table below.

	MPhil	PhD
Study Type	Masters by Research	Doctorate
Award	Master of Philosophy	Doctor of Philosophy
Research	Cancer Research, Genomics or Immunotherapies (select one only)	

Research Interests: Note you will need to complete a short (500-800 word) research proposal on a template available within the application. The research proposal will include a title, summary, details, methods and references. Enter SAiGENCI as the proposed School/Discipline.

Once all sections of the application are complete, review your details carefully before submitting.

SAiGENCI specific application queries can be directed to Dr Joanna Sundstrom, SAiGENCI Graduate Program (joanna.sundstrom@adelaide.edu.au).

All other queries should be directed to AGRS (research_degrees@adelaide.edu.au).

Honours opportunities

Honours is a one-year qualification studied as an addition to an undergraduate degree. Completing an Honours degree provides an opportunity to investigate an area of interest in greater detail whilst gaining hands on research experience. To learn more about what is involved in an Honours degree, visit the Faculty of Health and Medical Sciences Honours page.

Interested students should first get in touch with a supervisor who works on a project of interest (see projects below) to see if they have the capacity to take on an Honours student.

SAiGENCI Honours scholarships

SAiGENCI will offer Honours scholarships on a competitive basis to high achieving applicants who have completed a relevant Bachelor's degree or have equivalent research experience. The value of SAiGENCI Honours scholarships will be $4,000, paid across two instalments.

Selection of students who will be offered Honours scholarships will be made according to academic merit or equivalent. Academic merit for continuing students will be determined according to students' cumulative Grade Point Average (GPA) or equivalent score.

How to apply

Applicants interested in an Honours research project with SAiGENCI should follow the instructions for the Bachelor of Health & Medical Sciences (Honours) degree as listed on the Faculty of Health and Medical Sciences Honours page.

As a guide, scholarship applications for commencement in Semester 1 close in late November the previous year. Applications for commencement in Semester 2 close in late June of the same year. See the website for exact details.

Summer research internship opportunities

Summer research internships are a great opportunity for undergraduate students in their second or third year to get a taste of what it is like to work in a research lab. Internship opportunities are open to University of Adelaide students and those currently enrolled at other Australian universities.

Students interested in a summer research internship should first get in touch with a supervisor who works on a project of interest (see projects below) to see if they have the capacity to host a student for 6 weeks over the summer semester.

Summer research scholarships

The Institute will offer summer research scholarships on a competitive basis annually to high achieving undergraduate students who undertake a 6-week project with a SAiGENCI research group. Summer research scholarships will be valued at $200 per week for a maximum of 6 weeks.

How to apply

Students interested in a summer research scholarship with a SAiGENCI research group should follow the application instructions on the University of Adelaide, Adelaide Summer Research Scholarships page.

Applications for 2022/2023 Summer Research Scholarships close 30 September 2022.

Projects in Hormone Dependent Cancers

Sweeney Research Group

Prof Christopher Sweeney
Group Leader

Dr Katherine Morel
Research Fellow

Dr Mark Bunting
Research Fellow

The Sweeney Research Group has a translational research focus and works to better understand the underlying biology of prostate cancer and improve therapies for patients.

Prostate cancer is a complex disease that affects millions of men globally. Development of prostate cancer involves corruption of the normal prostate transcriptional network, following deregulated expression or mutation of key transcription factors. The group is interested in understanding how many of these transcription factors affect prostate cancer development, from localised disease to castration-resistant metastatic prostate cancer, and subsequently finding viable therapeutic approaches to benefit patients.

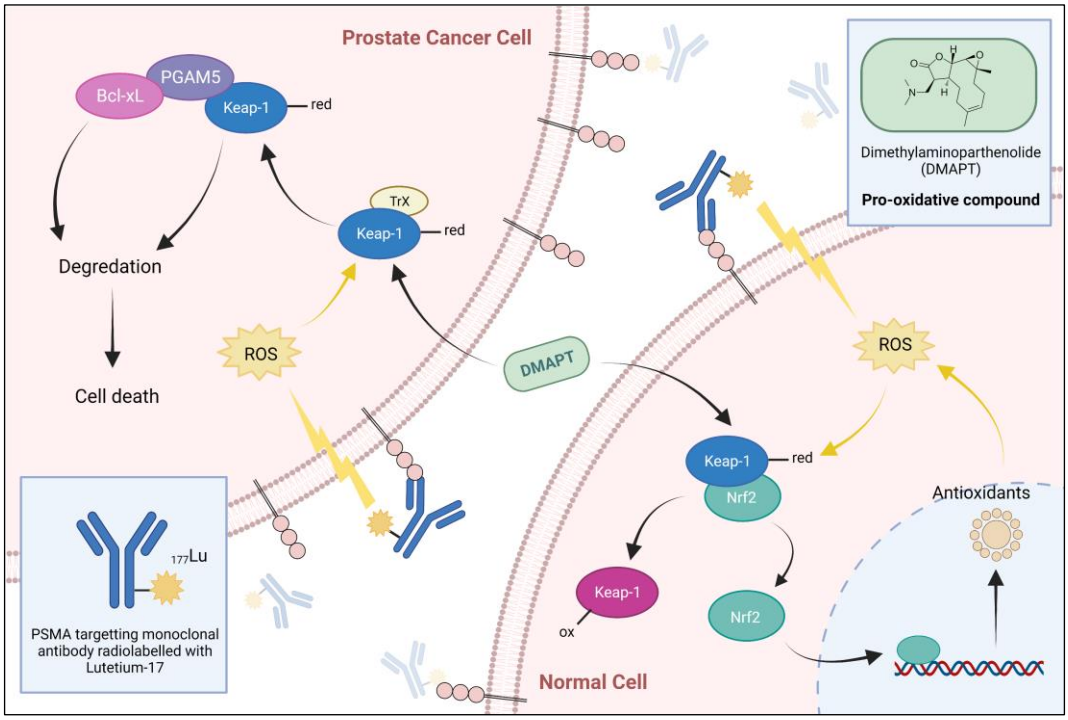
The research team is led by Professor Christopher Sweeney, who has devoted his clinical and academic career to developing strategies to improve the care of patients with genitourinary malignancies with a major focus on prostate cancer and testicular cancer.

Projects Available in the Sweeney Research Group

Project Title:	**Modulating oxidative stress responses to augment radiation therapy efficacy in prostate cancer**
Project Supervisor(s):	Dr Katherine Morel & Prof Christopher Sweeney
Suitable for:	PhD
Location of project:	Adelaide Health & Medical Sciences Building, North Terrace, Adelaide

Project outline

Radioligand therapy (RLT), which targets the prostate specific membrane antigen (PSMA), is a recent development in the treatment of metastatic castration resistant prostate cancer. The limiting factor in RLT is to keep the absorbed dose to normal tissue low while delivering high absorbed doses to cancer cells. Strategies to reduce damage to normal tissues are key to more effective PSMA-targeted RLT. Elevated oxidative stress is observed more frequently in cancer cells than in normal cells. It is therefore expected that additional exposure to a low level of reactive oxygen species will push cancer cells toward death, whereas normal cells might maintain redox homeostasis through adaptive antioxidant responses. This would allow for lower radiation doses to be used, reducing toxicity in normal tissues. We aim to investigate the ability of pro-oxidative compounds to increase efficacy of RLT in prostate cancer and understand the underlying mechanisms of this effect.



Proposed mechanism of action for modulation of radioligand therapy (RLT) by DMAPT: Pro-oxidant compound, DMAPT, sensitises cancer cells to RLT, in part, by maintaining Keap1 in a reduced state and enhancing its interaction with PGAM5 and Bcl-xL, resulting in degradation of Bcl-xL in mitochondria. In contrast, DMAPT protects normal cells against radiation via oxidation of Keap1 and release of the Nrf2 transcription factor for activation of mitochondrial antioxidant enzymes.

This project will involve a range of techniques which may include molecular biology and cloning (qPCR, primer design, PCR sequencing, bacterial work, cell line modification), protein analysis (western blotting, ELISA), histology (IHC and IF analysis of tissues) and microscopy. This project will utilise multiple models of prostate cancer, including animal models, 3D organoids and 2D cell lines.

Candidates are required to have a first class Honours or Master's qualification, ideally with experience working in a molecular wet-laboratory research environment. Candidates working on this project may be required to register as a radiation worker.

For more information about this project contact:

Dr Katherine Morel
The University of Adelaide
Email: katherine.morel@adelaide.edu.au
Ph: +61 8 8313 7336

Supervisor Researcher Profiles
https://researchers.adelaide.edu.au/profile/katherine.morel

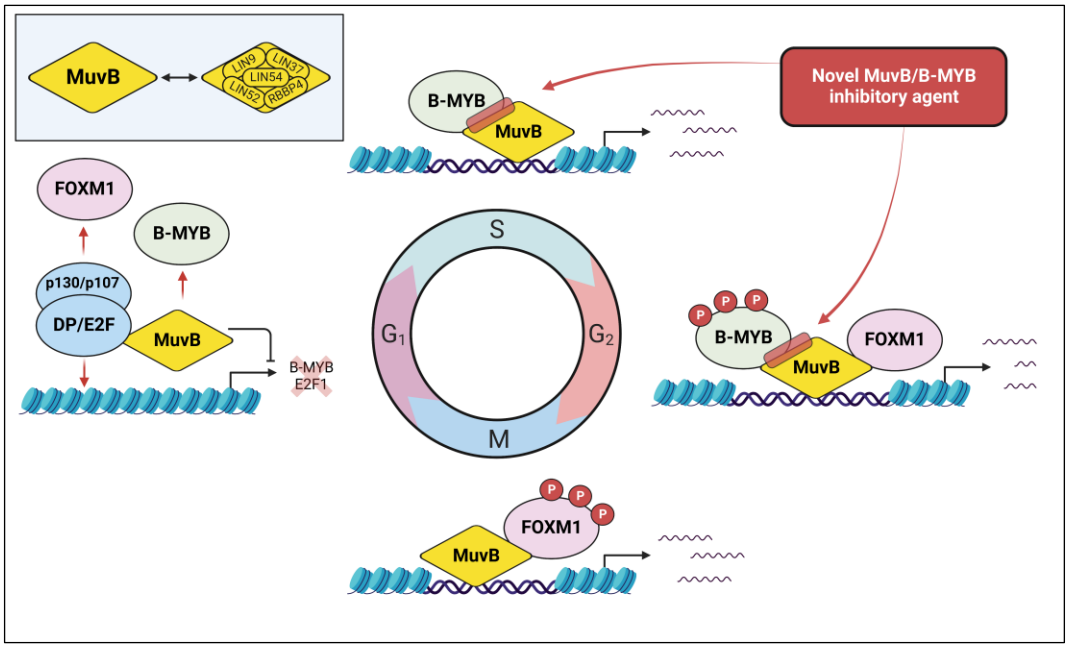
Project Title:	Identification and validation of novel MYBL2 inhibitors for prostate cancer
Project Supervisor(s):	Dr Katherine Morel & Prof Christopher Sweeney
Suitable for:	PhD
Location of project:	Adelaide Health & Medical Sciences Building, North Terrace, Adelaide

Project outline

MYBL2, a MYB family transcription factor, is a physiological regulator of cell cycle progression, cell survival and cell differentiation. It is frequently found to be dysregulated in cancer. In prostate cancer (PCa), MYBL2 is commonly amplified in aggressive castrate resistant disease. In proliferating cells, MYBL2 interacts with the MuvB core to promote mitosis. Alternatively, the MuvB core interacts with p130 and E2F4-DP1 to form the DREAM complex that mediates global repression of cell cycle genes in G0/G1. Developing drugs that directly inhibit oncogenic transcription factors has proven challenging. As such we are interested in investigating strategies to block the docking of MYBL2 to the MuvB core to prevent upregulation of the downstream MYBL2-MuvB transcriptional network. The aim of this project is to investigate and validate candidate compounds from a virtual screening platform as novel MYBL2 inhibitors that can be used in treatment of aggressive PCa.

This project will involve a range of techniques which may include molecular biology and cloning (qPCR, primer design, PCR sequencing, bacterial work, cell line modification), protein analysis (western blotting, ELISA), histology (IHC and IF analysis of tissues) and microscopy. This project will utilise multiple models of prostate cancer, including animal models, 3D organoids and 2D cell lines.

Candidates are required to have a first class Honours or Master's qualification, ideally with experience working in a molecular wet-laboratory research environment.



The MuvB complex binds to B-MYB during S-phase and regulates expression of late S-phase genes. During G2, the MuvB–B-MYB complex recruits FOXM1. Following B-MYB degradation, FOXM1 is activated via phosphorylation and modulates expression of a range of genes that are important for the G2–M transition. In senescence, both B-MYB and FOXM1 are lost and the MuvB complex recruits the transcriptionally repressive p130/p107–E2F4–DP complex, to form the DREAM complex, to restrict expression of genes essential for cell cycle re-entry. In theory, a selective competitive inhibitor could prevent docking of B-MYB to the MuvB core in S-G2 to limit rampant upregulation of pro-survival and pro-proliferative pathways.

For more information about this project contact:

Dr Katherine Morel
The University of Adelaide
Email: katherine.morel@adelaide.edu.au
Ph: +61 8 8313 7336

Supervisor Researcher Profiles
https://researchers.adelaide.edu.au/profile/katherine.morel

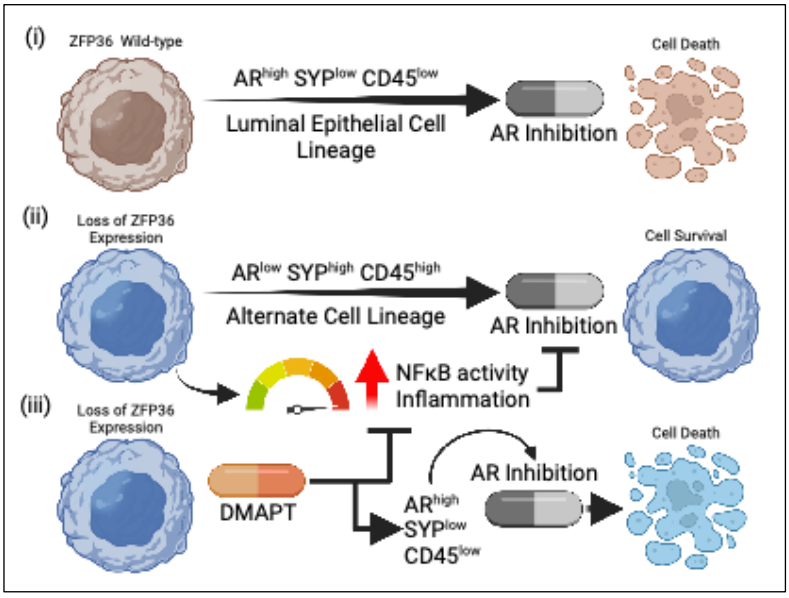
Project Title:	Investigating loss of tristetraprolin in aggressive breast cancer phenotypes
Project Supervisor(s):	Dr Katherine Morel & Prof Christopher Sweeney
Suitable for:	PhD
Location of project:	Adelaide Health & Medical Sciences Building, North Terrace, Adelaide

Project outline

Phenotypic plasticity is a hallmark of cancer and an increasingly realised mechanism of tumour progression, therapeutic resistance, and distant metastatic spread in many cancer types, including breast cancer (BCa). We have previously shown that loss of tristetraprolin (TTP), an RNA binding protein that regulates mRNA stability increases nuclear factor-kappaB (NF-κB) activation leading to changes in phenotypic plasticity that primes a transition to aggressive disease and therapeutic resistance in primary prostate cancer. The activation NF-κB is a commonly observed phenomenon in BCa. As in prostate cancer, it facilitates the development of a hormone-independent, invasive, high-grade, and late-stage tumour phenotype. We hypothesise that loss of TTP may be involved in the transition to a lethal BCa phenotype. The aim of this project is to investigate the effect of TTP loss in BCa and identify therapeutic approaches to counteract this functional loss.

This project will involve a range of techniques which may include molecular biology and cloning (qPCR, primer design, PCR sequencing, bacterial work, cell line modification), protein analysis (western blotting, ELISA), histology (IHC and IF analysis of tissues) and microscopy. This project will utilise multiple models of prostate cancer, including animal models, 3D organoids and 2D cell lines.

Candidates are required to have a first class Honours or Master's qualification, ideally with experience working in a molecular wet-laboratory research environment.



Schematic overview in Prostate Cancer: i) when ZFP36 (TTP) is intact, epithelial cells present with a luminal lineage phenotype and sensitivity to AR inhibition. ii) loss of ZFP36 results in an alternative epithelial cell lineage phenotype with reduced AR expression, increased SYP and CD45 expression, and increased NF-κB activation and inflammation, leading to lack of response to AR inhibition. iii) NF-κB inhibition (via DMAPT) reduces inflammation signalling and restores a more luminal epithelial cell type and responsiveness to AR inhibition.

For more information about this project contact:

Dr Katherine Morel
The University of Adelaide
Email: katherine.morel@adelaide.edu.au
Ph: +61 8 8313 7336

Supervisor Researcher Profiles

https://researchers.adelaide.edu.au/profile/katherine.morel

Projects in Hormone Dependent Cancers

Prostate Cancer Research Group

Prof Lisa Butler
Group Leader

Dr Maggie Centenera
Research Fellow

Dr Shanice Mah
Research Fellow

Dr Zeyad Nassar
Research Fellow

Prostate cancer is a major public health issue, killing approximately 3,300 men in Australia annually.

The Prostate Cancer Research Group (PCRG) is tackling localised and metastatic prostate cancer by developing more robust diagnostics tests, biomarkers for responsiveness to current treatments and new drugs for clinical development.

Professor Lisa Butler leads the PCRG which consists of some 18 researchers, support staff, PhD and honours students.

Visit the prostate Cancer Research Group for more information: https://health.adelaide.edu.au/our-research/prostate-cancer-research-group

Projects Available in the Prostate Cancer Research Group

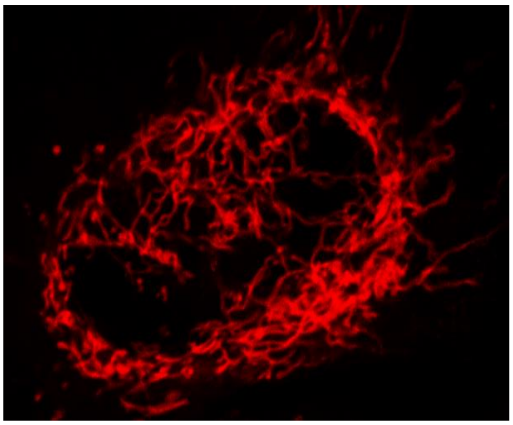
Project Title:	**Exploiting prostate cancer metabolic dependencies to develop new therapeutics and prognostic and predictive biomarkers**
Project Supervisor(s):	Dr Zeyad Nassar & Prof Lisa Butler
Suitable for:	Summer internship, Honours, MPhil, PhD
Location of project:	South Australian Health & Medical Research Institute (SAHMRI), North Terrace, Adelaide

Project outline

Due to the dependence of prostate cancer cells on androgens for growth and survival, androgen deprivation therapy (ADT) is the frontline strategy for advanced prostate cancer management.

Although initially effective, patients inevitably develop resistance to ADT leading to emergence of lethal disease phenotypes such as castrate resistant PCa (CRPC) and neuroendocrine PCa (NEPC), with a median overall survival of less than 2 years. Co-targeting of adaptive pathways that are induced by these treatments is now considered essential to delay disease progression and engender more durable therapeutic responses. Metabolic rewiring is both a hallmark feature of cancer cells, a resistance mediator and a promising therapeutic vulnerability.

This project will employ in vitro, in vivo and ex vivo models coupled with state-of-the-art transcriptomics and mass spectrometry metabolomics techniques to discover new metabolic targets and evaluate their therapeutic potential for lethal castrate resistant (CRPC) and neuroendocrine (NEPC) PCa treatment.



Mitochondria in a prostate cancer cell taken using confocal laser microscopy.

Photo: PhD Candidate, Elizabeth Collis.

Mitochondria (cell powerhouses), are involved in releasing energy from food. Cancer cells produce more energy than normal cells to support tumour growth. Prostate cancer cells rely mainly on lipids as fuel to supply the increasing demands on energy. Targeting mitochondria dynamics or the enzymes that break down lipids into energy may be a new way to slow tumour progression.

The candidate will develop skills in molecular pharmacological techniques, gene editing, metabolomics, drug candidate testing (in vitro, in vivo and ex vivo models) and flow cytometry.

Our ideal candidate will have a first class Honours or Masters qualification in biomedical sciences, pharmacology or biochemistry.

For more information about this project contact:

Dr Zeyad Nassar
The University of Adelaide
Email: zeyad.nassar@adelaide.edu.au
Ph: +61 8 8128 4368

Supervisor Researcher Profiles

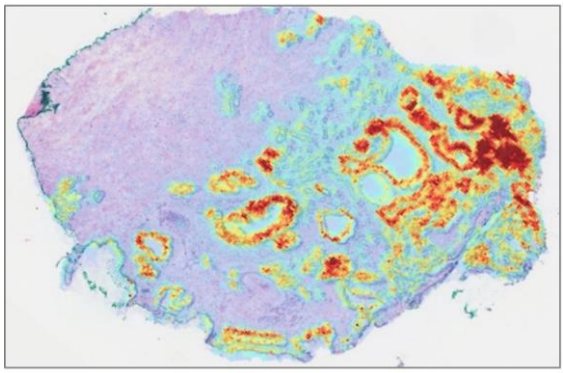
https://researchers.adelaide.edu.au/profile/zeyad.nassar
https://researchers.adelaide.edu.au/profile/lisa.butler

Project Title:	**Unravelling the molecular heterogeneity of clinical prostate tumours**
Project Supervisor(s):	Dr Shanice Mah & Prof Lisa Butler
Suitable for:	MPhil, PhD
Location of project:	South Australian Health & Medical Research Institute (SAHMRI), North Terrace, Adelaide

Project outline

A hallmark of prostate cancer (PCa) is its dependence on androgen signalling, and the androgen receptor (AR) is the primary therapeutic target for advanced disease. However, resistance to antiandrogen therapies is inevitable and leads to lethal and aggressive forms of PCa that remain incurable. PCa is a highly heterogenous and multifocal disease, a characteristic that has posed a major challenge to the development of novel treatments. Spatial heterogeneity, a fundamental feature of the tumour microenvironment (TME), is critical to understand how the organisation and interaction of different cell types within the tumour drive disease progression and drug resistance.

This project will utilise cutting-edge spatial technologies and data integration to investigate how androgens influence the genes, lipids and proteins of the TME to promote PCa progression. This will identify novel tumour and TME-specific vulnerabilities for development of new targeted therapies to improve outcomes for men with prostate cancer.



Mass spectrometry imaging of phosphatidylcholine lipids in a clinical prostate tumour. Image: Dr Paul Trim

The candidate will develop skills in bioinformatics/computational biology and wet-laboratory based techniques including tissue imaging.

Our ideal candidate will have interest in bioinformatics and some microscopy skills. This project would also suit a clinical HDR candidate.

For more information about this project contact:

Dr Shanice Mah
The University of Adelaide
Email: chuiyan.mah@adelaide.edu.au
Ph: +61 8 8128 4376

Supervisor Researcher Profiles

https://researchers.adelaide.edu.au/profile/chuiyan.mah
https://researchers.adelaide.edu.au/profile/lisa.butler

Project Title:	Identification of biomarkers of response to CDK4/6 inhibition in prostate cancer
Project Supervisor(s):	Dr Maggie Centenera, Prof Lisa Butler & Prof Lisa Horvath (Garvan Institute of Medical Research, NSW)
Suitable for:	Summer internship, Hons, MPhil, PhD
Location of project:	South Australian Health & Medical Research Institute (SAHMRI), North Terrace, Adelaide

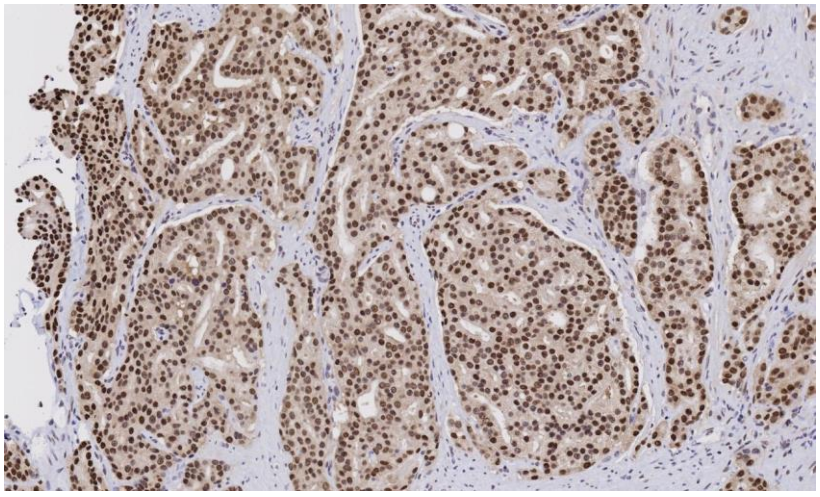
Project outline

Despite promising preclinical efficacy, CDK4/6 inhibitors have not lived up to their promise in the clinic for prostate cancer, and we want to understand why - for this and other drug classes that have had similar clinical "failures".

This project uses patient-derived explant models of prostate cancer to identify protein and lipid biomarkers of response to the CDK4/6 inhibitor, ribociclib, in prostate cancer. These markers will then be validated in 2 clinical trials- one neoadjuvant study run in collaboration with our group in Australia, and the other with long term collaborators at Thomas Jefferson University in the US (Kevin Kelly and Karen Knudsen) in advanced prostate cancer.

The student will develop skills in western blotting, PCR, immunohistochemistry, cell culture techniques and pre-clinical cancer models.

Our ideal candidate will have a background in biological sciences and is interested in translational research that involves patient samples from clinical trials. This project would also suit a clinical HDR candidate.



Microscopic image of a prostate tumour. We searched for expression of a potential new protein biomarker using a technique called immunohistochemistry. The brown spots are the cancer cells that express the protein/biomarker, and the blue spots are cells that do not express the protein/biomarker.

Photo: Dr Maggie Centenera

For more information about this project contact:

Dr Maggie Centenera
The University of Adelaide
Email: margaret.centenera@adelaide.edu.au
Ph: +61 8 8128 4361

Supervisor Researcher Profiles
https://researchers.adelaide.edu.au/profile/margaret.centenera
https://researchers.adelaide.edu.au/profile/lisa.butler

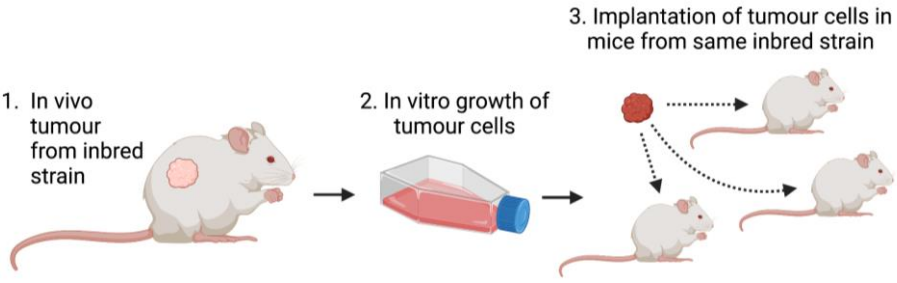
Project Title:	**Ceramides: from a metabolic biomarker to a targetable vulnerability**
Project Supervisor(s):	Dr Shanice Mah, Prof Lisa Butler & Prof Lisa Horvath (Garvan Institute of Medical Research, NSW)
Suitable for:	Summer internship, Hons, MPhil, PhD
Location of project:	South Australian Health & Medical Research Institute (SAHMRI), North Terrace, Adelaide

Project outline

Plasma lipids (particularly ceramides) are prognostic for poor patient outcome across the natural history of prostate cancer (localised to metastatic).

This project will establish a high fat diet model of prostate cancer in mice (known to increase circulating ceramides) with an intact immune system to evaluate the link between circulating lipids, tumour metastasis and the interactions between tumour and host lipids. We will also test the ability of novel clinical inhibitors of sphingolipid metabolism to suppress cancer metastasis and improve survival.

The candidate will develop skills in animal studies and wet-laboratory techniques including lipidomic profiling.



Mouse model to study cancer metastasis.

For more information about this project contact:
Prof Lisa Butler
The University of Adelaide
Email: lisa.butler@adelaide.edu.au
Ph: +61 8 8128 4360
Supervisor Researcher Profiles
https://researchers.adelaide.edu.au/profile/lisa.butler
https://researchers.adelaide.edu.au/profile/chuiyan.mah

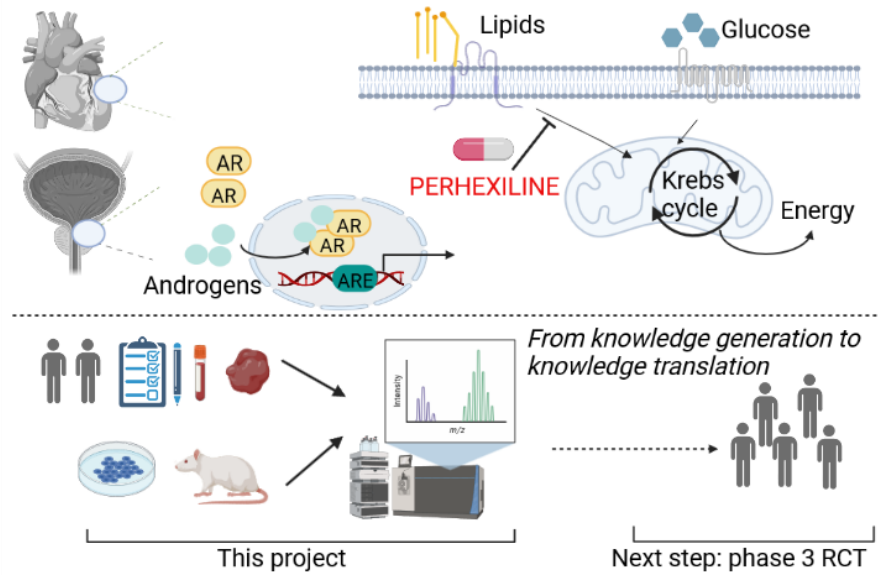
Project Title:	Cardio-oncology: targeting fatty acid oxidation in prostate cancer
Project Supervisor(s):	Prof Lisa Butler, Dr Zeyad Nassar & Dr Cher-Rin Chong (Adelaide Medical School)
Suitable for:	Summer internship, Hons, MPhil, PhD
Location of project:	South Australian Health & Medical Research Institute (SAHMRI), North Terrace, Adelaide

Project outline

This project builds on our published work showing that fats are the main energy source for prostate tumour cells, and that targeting metabolism of these fats (irrespective of their source) is an effective approach to control prostate cancer growth.

We are interested in repurposing inhibitors from cardiology/angina to kill two birds with one stone - improving prostate cancer control but also treating the known cardiac complications of prostate cancer treatment. Initial preclinical work will focus on evaluating this approach in patient derived prostate cancer explants- trying to understand who will benefit most rather than a one size fits all approach, with the near-term view of translating this research into an ongoing clinical trial pipeline. In parallel, we are also developing novel inhibitors that selectively block metabolism of polyunsaturated fatty acids (PUFAs), which may be even more effective and less toxic than global blockade of fat metabolism.

The candidate will develop skills/techniques in cell biology, metabolism, biochemistry and preclinical models of prostate cancer. Our ideal candidate will have a high level Honours or Masters qualification in biomedical sciences, pharmacology and/or biochemistry. This project would also suit a clinical HDR candidate.



Project overview- from knowledge generation to knowledge translation

For more information about this project contact:

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Supervisor Researcher Profiles

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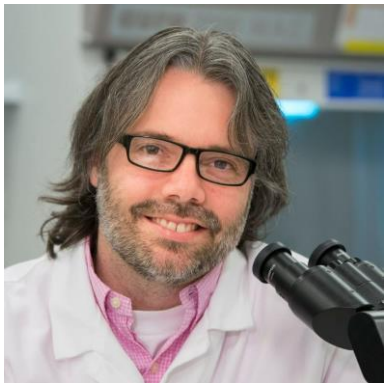
https://researchers.adelaide.edu.au/profile/zeyad.nassar
https://researchers.adelaide.edu.au/profile/cher-rin.chong

Projects in Cancer Epigenetics

Polo Research Group



Prof Jose Polo
Group Leader

The relationship between epigenetics and cancer is well established. The Polo Research Group is interested in understanding transcriptional and epigenetic mechanisms that govern cell identity. We particularly focus on factors that regulate pluripotency of stem cells, reprogramming of somatic cells into induced pluripotent stem (iPS) cells and other cells, and regulate cancer growth and development.

Professor Jose Polo is the inaugural Director of the Adelaide Centre for Epigenetics (ACE) and Program Leader of the Cancer Epigenetics program of the South Australian immunoGENomics Cancer Institute (SAiGENCI).

Projects Available in the Polo Research Group

Project Title:	**Pluripotency factors and cancer**
Project Supervisor(s):	Prof Jose Polo
Suitable for:	Honours*, MPhil, PhD
Location of project:	Adelaide Health & Medical Sciences Building, North Terrace, Adelaide

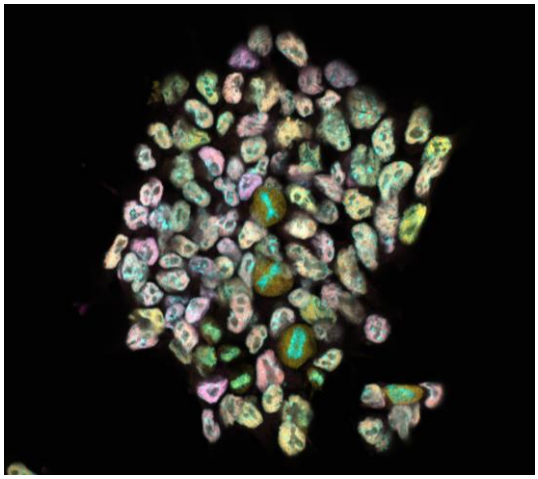
Project outline

Pluripotent stem cells can self-renew indefinitely and give rise to all cells of the adult organism. These remarkable capacities are the result of a core transcriptional network controlled by OCT4, SOX2 and NANOG, whose expression is lost upon differentiation. Several cancers have been shown to reactivate OCT4, SOX2 and/or NANOG, with high expression levels positively correlating with cancer progression and severity. Since they are linked to proliferative and multi-lineage differentiation capacity of cancer cells, they present attractive anticancer targets. However, they are considered "undruggable" since they lack catalytic active sites for molecules to bind.

To provide therapeutic alternatives, the Polo research group has adapted and developed various novel techniques to determine how expression and function of the pluripotency factors OCT4, SOX2 and NANOG are controlled in various physiological and pathological cell types, including embryonic stem cells and cancer respectively.

The candidate will develop skills/techniques in a combination of different molecular, biochemical, cellular techniques and genome wide approaches (RNA-seq, MS-MS, ATAC-seq, ChIP-seq, SC-RNA-seq, etc.) to dissect the nature and dynamics of such events.

Our ideal candidate will have high academic achievement and relevant experience and interest in stem cell and/or epigenetic and biochemical techniques.



Mouse embryonic stem cells stained for OCT4 (yellow), NANOG (magenta) and DNA (cyan)

This project has both wet laboratory and bioinformatic components.

*We are accepting MPhil and PhD candidates for both wet laboratory and bioinformatics components. Honours students for bioinformatics only.

For more information about this project contact:

Prof Jose Polo
Email: jose.polo@adelaide.edu.au

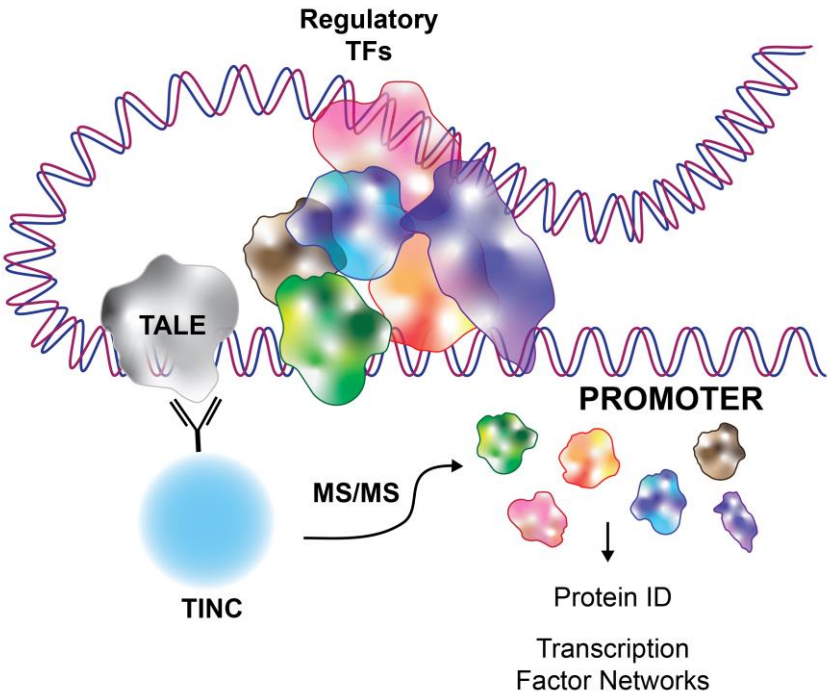
Dr. Sandii Constable
sandii.constable@adelaide.edu.au

Project Title:	**Uncovering the regulatory complex of Bcl6 in lymphomas**
Project Supervisor(s):	Prof Jose Polo
Suitable for:	Honours*, MPhil, PhD
Location of project:	Adelaide Health & Medical Sciences Building, North Terrace, Adelaide

Project outline

Cellular identity is controlled by transcription factors (TFs), which bind to specific regulatory elements (REs) within the genome to regulate gene expression and cell fate changes. Recent advances in epigenome profiling techniques have significantly increased our understanding of which REs are utilised in which cell type, however, which factors interact with these REs remains largely elusive.

A major impediment to dissecting protein complexes at specific genomic loci is the shortage of appropriate techniques. The most common technique to assess TF binding is chromatin immunoprecipitation (ChIP), which relies on antibodies to interrogate the binding sites of a single TF. Yet, ChIP does not allow dissection of the composition of a multi-protein complex at a specific locus.



Graphical representation of TINC: TALE-mediated isolation of nuclear chromatin

Importantly, the Polo research group has developed a novel epigenetic technique termed TINC (TALE-mediated Isolation of Native Chromatin), which allows us to do exactly that (Knaupp et al., Stem Cell Reports 2020). TINC relies on epitope-tagged TALEs, which are DNA-binding proteins engineerable to target specific genomic regions.

Upon cross-linking of the cells, the target regions are isolated based on affinity purification of the TALE and associated nucleic acid and protein molecules are analysed by next generation sequencing and mass spectrometry, respectively. In our proof-of-concept experiments, we dissected the protein complex formed at the Nanog promoter, a key pluripotency RE. We identified TFs previously known to bind to this locus as well as novel proteins whose role in pluripotency we further validated (Knaupp et al., Stem Cell Reports 2020). Consequently, with this valuable technique at hand, this PhD project aims at deciphering how the BTB/POZ transcriptional repressor and oncogene BCL6 is (mis)regulated in B-cell lymphomas, which in turn has major potential in identifying novel therapeutic targets.

The candidate will develop skills/techniques in a combination of different molecular, biochemical, cellular techniques and genome wide approaches (RNA-seq, MS-MS, ATAC-seq, ChIP-seq, SC-RNA-seq, etc.) to dissect the nature and dynamics of such events. Our ideal candidate will have high academic achievement and relevant experience and interest in stem cell and/or epigenetic and biochemical techniques.

This project has both wet laboratory and bioinformatic components.

*We are accepting MPhil and PhD candidates for both wet laboratory and bioinformatics components. Honours students for bioinformatics only.

For more information about this project contact:

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Projects in Cancer Epigenetics

Single Cell and Spatial Technologies Lab

Assoc Prof
Luciano Martelotto
Group Leader

Luciano Martelotto's lab specialises in developing and implementing new technologies in the fields of Single Cell and Spatial-Omics. This research brings together the fields of molecular biology, biochemistry, technology and engineering.

Luciano's work in cancer fingerprinting and heterogeneity using single cell technologies has been paramount to the field. Ongoing research within the group will develop technologies useful for basic and clinical researchers at SAiGENCI and across the field of cancer research.

Projects Available in the Single Cell and Spatial Technologies Lab

Project Title:	**Technology development for single nucleus RNA-sequencing profiling of archival tumour samples**
Project Supervisor(s):	Assoc Prof Luciano Martelotto & Prof Jose Polo
Suitable for:	PhD
Location of project:	Adelaide Health & Medical Sciences Building, North Terrace, Adelaide

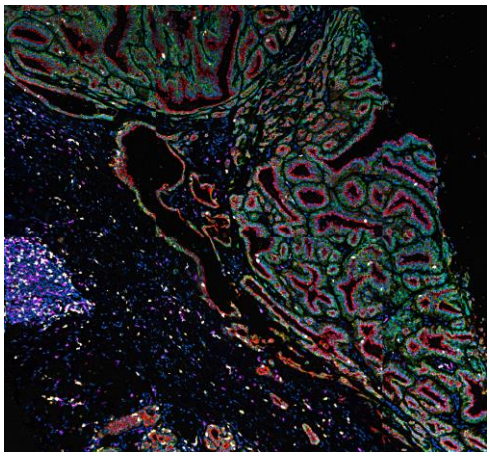
Project outline

For this project we aim to develop and validate a sensitive and efficient high-throughput molecular and computational platform to extract, sequence and analyse nuclei from formalin-fixed paraffin-embedded (FFPE) samples for use in cancer research, paving the way for clinical applications.

Currently, the vast majority of human tumour material is routinely prepared by FFPE for diagnostic purposes. This poses challenges for molecular analysis of these specimens mainly caused by protein and nucleic acid cross-links formed during the preparation. Development of single-cell methods for genomic investigations of FFPE tissue samples would open the door to utilising large FFPE tissue repositories for the identification of disease pathways, biomarkers and drug targets.

The PhD candidate will bring together sample preparation methods, state-of-the-art technological advances in probe base profiling and computational biology to harvest transcriptome information from the largely untapped pathology archives at a single cell level. This proposal addresses the need to create technology with high throughput and sensitivity, which can unlock those vast human tissue archives, thereby advancing precision medicine.

Our ideal PhD candidate will have a Masters degree (including research experience) or a first class Honours degree in computational biology and informatics.



Normal breast tissue imaged using a spatial proteomics technique called PhenoCycler.

Photo: Luciano Martelotto

For more information about this project contact:

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Supervisor Researcher Profiles

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Projects in Computational Systems Oncology

Davis Research Group

Prof Melissa Davis
Group Leader

Dr Ning Liu
Research Fellow

Dr Dharmesh Bhuva
Research Fellow

Professor Melissa Davis leads a multidisciplinary team of bioinformaticians, biostatisticians, computer scientists and computational biologists who work together to address complex informatic challenges in systems oncology. The research group values collaborative multi-disciplinary and inter-disciplinary science, and encourages a strong team work ethic to accomplish research goals.

The Davis Lab is focused on research that uses computational techniques to solve difficult questions in cancer biology and is particularly interested in the role of cellular plasticity in cancer progression and metastasis. We also create bioinformatics methods that are both world class and widely used and have ongoing research projects on the development of advanced methods working with newly emerging spatial molecular measurement platforms. Other research projects focus on the integration of heterogeneous multi-omic data sets and network analysis methods for systems biology, as well as more focused projects, such as the prediction of drug sensitivity in patients, and work to understand the impact of molecular heterogeneity on survival in cancer.

Our PhD students, like our research team, have a variety of backgrounds and skills, however a common thread is that they all have well developed computational and analytical skills.

Projects Available in the Davis Research Group

Students with a background in or aptitude for mathematics, statistics, computer science, bioinformatics, or other analytical sciences are encouraged to contact Professor Davis to discuss potential research projects in areas of mutual interest.

For more information contact:
Prof Melissa Davis
The University of Adelaide
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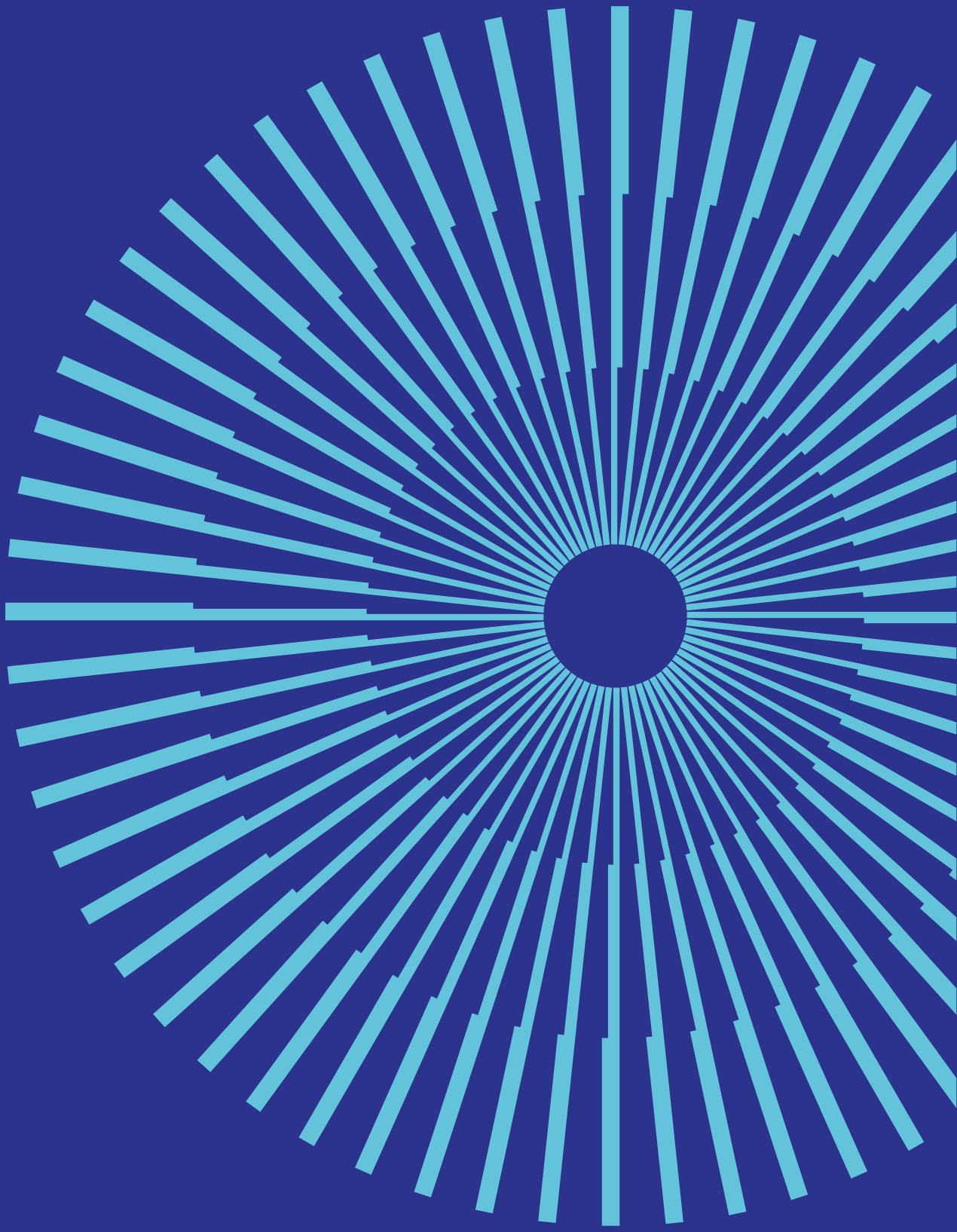

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