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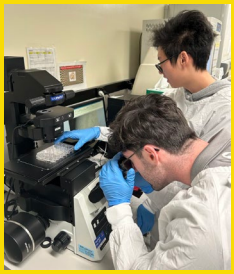

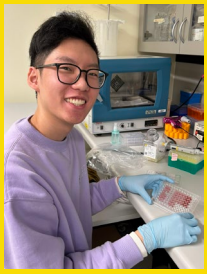


Vision Science Honours VISN4016

Information Booklet 2026

Contents

Why do Vision Science Honours?

Vision Science Honours involves a full-time research project (with supervision) in the School of Optometry & Vision Science. This runs over 3 terms (with no coursework) and involves developing a research hypothesis, aims and project, and undertaking the research and assessing and interpreting results, with supervision.

Vision Science Honours provides a practical, real-world learning experience in a research environment. Students join a SOVS research group and are guided through a project by experienced SOVS academics.

Honours is an opportunity to gain advanced training and knowledge in a specific area of vision science (laboratory-based, bioinformatics, sensory/virtual reality, clinical or public health techniques and applications) and build further skills that can significantly enhance learning and improve employability including:

- Critical thinking
- Time-management and planning
- Oral and written communication
- Data analytics and different software programs
- Experience with variety of information and communication technologies
- Collaboration with various researchers and stakeholders

Honours also provides an opportunity for further research study (for example, PhD)

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Assessments in Vision Science Honours

Assessments for Vision Science Honours are listed below, including marks and approximate timing for submission. Please note Honours can be started in T1, T2 or T3.

1. Literature review (15%)

In the first term, you will prepare a literature review on your project topic. This is to help you learn more about the research field, identify research questions and hypotheses, and further develop skills for critically assessing literature.

2. Proposal Presentation (15%)

After preparing your literature review and research plan (with support from supervisors), you will present your proposed project (15 min talk + 5 min question time) to students and SOVS academics. The feedback can be used to further develop your research project.

3. Thesis (50%)

At the end of Honours, a written thesis is submitted detailing the background, results and critical discussion of your research. This follows a typical format of Introduction, Methods, Results and Discussion chapters, plus references, tables and figures.

4. Final Research Presentation (20%)

After thesis submission you will present your research project (15 min talk + 5 min question time) to SOVS academics and students.

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Applying for Vision Science Honours

Confirm your eligibility

To apply for Vision Science Honours please note you will need:

- To have completed 3-year, full-time BVisSci or BSc (VisSci) (144UOC) or BAdvSci (VisSci, Internal Honours)
- A WAM of 65 (credit) or more (please enquire if less than 65 WAM for special entry)

Finding a supervisor

Before applying for Honours, you need a confirmed supervisor. This can be organised by:

- Contacting the Honours Convenor Dr. Daisy Shu (daisy.shu@unsw.edu.au) to discuss your interests and to help you find a supervisor
- Reviewing available Honours projects in this booklet and contacting supervisors directly
- Checking the SOVS website Research Groups and contacting researchers directly

Apply online (this does not mean you are enrolled)

Applications for Vision Science Honours (VISN4016) can be made for a T1, T2, or T3 start.
To apply:

1. Complete an "Intention to Undertake Honours" at www.unsw.edu.au/science/student-life-resources/honours-how-apply
2. Apply for VISN4106 (also known as **VISNBH4500**) via https://applyonline.unsw.edu.au
3. Find an Honours scholarship here UNSW Faculty of Medicine Honours Scholarships 2025 UGCA1721 and Faculty of Science Honours Scholarships UGCA1737

Note: You require a copy of your transcript and confirmation of a supervisor for the application

T1 2024 Honours applications are now open until December 10th 2025.

Note: late applications can be submitted – ask Dr Daisy Shu for assistance

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Unique offerings in our Honours Program

1. PhD Buddy System: Honours Mentoring Program

The PhD Buddy Program pairs Honours students with PhD students from SOVS to create a supportive mentor-mentee relationship. This program aims to help Honours students navigate their academic journey by providing guidance, sharing experiences, and assisting with research challenges. PhD buddies offer accessible advice for both academic and personal development. Honours students are encouraged to take the initiative to contact their PhD buddies through casual coffee chats, formal meetings, emails, or Teams/Zoom calls.

2. Monthly Check-in Sessions

The "Monthly Check-In Sessions" are designed to facilitate regular communication, feedback, and support for Honours students. They are held generally held on the 1st Thursday of the month in the Level 3 Seminar Room, SOVS. Calendar invitations with specific times/dates will be sent by the course convenor.

During these sessions, all Honours students will have the opportunity to meet with the course convenor to provide updates on their research progress, share any challenges they might be facing, and seek feedback or ideas from both the convenor and their peers. This is an invaluable chance for students to articulate their accomplishments, hurdles, and plans, fostering a sense of community and collective problem-solving.

Each session will include a 20-minute tutorial or discussion on a specific research topic to provide practical insights and tips on crucial aspects of research and academic career progression.

Topics include:

1. Masterclass on writing Literature Reviews: literature search, critical analysis, structure
2. Presentation Skills for Researchers: crafting and delivering impactful presentations
3. Research Tools: from reference managers to software for data analysis and visualisation
4. Mastering Time and Stress Management: strategies for academic success
5. Thesis Writing Essentials: structuring, writing, and refining your thesis
6. Publishing Your Research: the publication and peer review process
7. Embarking on a PhD Journey: exploring the research career track and its opportunities

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2026 Honours Projects*

**new projects can also be negotiated individually with supervisors*

Research Area: Anterior Eye

A. Prof Nicole Carnt

- Which repurposed angiotensin receptor II blocker works best for reducing corneal scars?
- Are contact lens contaminants the culprits in orthokeratology microbial keratitis?

Prof. Fiona Stapleton

- Comparison of Non-invasive Dry Eye Assessment Techniques

Prof. Isabelle Jalbert

- What advice should be given to contact lens wearers during smoky periods?
- Should we recommend air purifiers to manage dry eye disease?

A/Prof. Jacqueline Tan-Showyin

- Eye Research Group projects available

Research Area: Posterior Eye

Dr Matt Trinh

- Linking Retinal Integrity with Physiology, Non-ocular Pathology, and Pharmaceutical Drugs (PPP)
- Charting the course of geographic atrophy using a new high-density topographical OCT analysis

Dr Daisy Shu

- Exploring the anti-fibrotic potential of irbesartan for improved outcomes in glaucoma surgery
- Learning from our scars: exploring wound healing and fibrosis in the retina
- Developing a novel nanoparticle drug delivery system for the treatment of age-related macular degeneration
- Colchicine as a novel therapeutic for treating vascular abnormalities in Type 2 Diabetic Retinopathy

Dr Lisa Nivison-Smith

- What do patients think about new intravitreal treatments for geographic atrophy?
- Can a novel choroid high-density analysis be used to predict macular degeneration?
- 'I spy with your little eye': Using gaze tracking to identify barriers to OCT interpretation in AMD

A.Prof Michele Madigan

- Exploring Glucose Metabolism in the Macular Choroid: A Quest for Novel Treatment Targets in Retinal Diseases

Dr. Jack Phu

- Developing a clinician assisting interface for glaucoma diagnosis and progression analysis

Dr. Jerome Ozkan

- Assessing bacterial contamination of intravitreal needles

More Honours projects on next page

2026 Honours Projects*

**new projects can also be negotiated individually with supervisors*

Research Area: Vision Science

Dr Revathy Mani

- Comparison of Objective and Subjective Near Gradient Accommodation Convergence/ Accommodation ratio in emmetropes and myopes

A.Prof Juno Kim

- Using virtual reality to understand visual-vestibular integration

A.Prof Pauline Kang

- Ocular adaptation to optical blur and its implications for Myopia Control

Research Area: Public Health and Healthcare Delivery

Prof Lisa Keay

- Digital Divide: Analyzing needs and barriers faced by older Australians with vision impairments

Prof. Isabelle Jalbert

- Clinical audit as an education tool for optometrist trainees

Research Area: Education

Dr Vinod Maseedupally

- Effectiveness of Vision Science Work Integrated learning program

Anterior Eye Projects

Are contact lens contaminants the culprits in orthokeratology microbial keratitis?

Supervisors:

Scientia A/Prof Nicole Carnt, Dr Kathleen Watt, Dr Brett Drury, Dr Con Petsoglou

The effects of myopia include poorer outcomes of refractive surgery and greater reliance on refractive correction with the long term complications including vision loss due to myopic maculopathy and retinal detachment. Slowing myopia progression significantly reduces these complications. The most effective method of slowing the progression of myopia is the use of contact lenses in children as young as 6 years of age. A popular contact lens modality effective in slowing myopia is orthokeratology, where large reverse curve rigid contact lenses are worn overnight to reshape the corneal epithelium to neutralise the myopia during the day in a way that delivers light to the retina in such a way that it slows myopia.

However, there have been worrying cases of a rare but severe form of corneal infection (microbial keratitis) in children wearing orthokeratology lenses, where 50% of cases result in permanent vision loss. Over 10% of orthokeratology contact lens infections are bilateral compared to around 4% in other lens modalities. We hypothesise that this is due to microbial biofilms and communities in orthokeratology contact lens cases. In this project you will work with Ophthalmologists, Dr Brett Drury at Gold Coast Hospital, Dr Con Petsoglou at Sydney Eye Hospital, microbial keratitis epidemiologist, A/Prof Nicole Carnt with her microbiology team, and Dr Kathleen Watt, an orthokeratology and myopia expert. We will collect and analyse storage cases of orthokeratology and other modality contact lens wearers with microbial keratitis and asymptomatic contact lens wearers to understand whether these storage case microbial communities are the culprits.

Contact

Scientia A/Prof Nicole Carnt

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UNSW SYDNEY

Which repurposed angiotensin receptor II blocker works best for reducing corneal scars?

Supervisors:

Scientia A/Prof Nicole Carnt, Dr Ushasree Pattamatta, A/Prof Andrew White

Angiotensin receptor II blockers (ARBs) are widely used as oral drugs to treat hypertension, and have been shown to have neuroprotective properties. In the cornea, and ARB Losartan has been used off label as a compounded eye drop to reduce corneal scarring. Other options to reduce or eliminate corneal scarring are fraught with side effects for example, corticosteroids can lead to IOP increases and cataract, or long courses of management such as corneal transplantation, with the chance of rejection or failure.

As well as less side effects and long term management, topical ARBs may also have added benefits such as protection of the corneal nerves and better trabecular outflows. Irbesartan is the most effective ARB for lowering blood pressure , is more bioavailable and has action on metabolic, anti-inflammatory and antioxidative pathways. In this project, which will be largely performed at the Centre for Vision Research at Westmead Institute for Medical Research, you will use a cell based model to compare Irbesartan with Losartan. You will join a research group focused on the potential of this repurposed ARB, Irbesartan across a range of eye diseases, including glaucoma.

Contact

Scientia A/Prof Nicole Carnt

n.carnt@unsw.edu.au

UNSW SYDNEY

Comparison of Non-invasive Dry Eye Assessment Techniques

Supervisors:

Prof Fiona Stapleton, Ms Judy Nam

Dry eye is defined as a "multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles" (TFOS, DEWSII). This implies that the diagnosis of dry eye is complex and requires a multi-faceted approach to assess the tear film using different diagnostic modalities. There is an established suite of commonly utilised diagnostic tests for dry eye that are considered the gold standard. However due to its limitations, there has been an advent of novel non-invasive ocular surface analysing techniques.

This study will be examining the capacity of these non-invasive techniques in its ability to predict dry eye disease; by comparing the measurements of the tear film from these novel methods to gold-standard tests in healthy and dry eye subjects.

Contact

Prof Fiona Stapleton

f.stapleton@unsw.edu.au

UNSW SYDNEY

What advice should be given to contact lens wearers during smoky periods?

Supervisors:

Prof Isabelle Jalbert, A/Prof Michele Madigan, Ms Suki Jaiswal

The eye is constantly exposed to ambient air and because of that, eye symptoms are one of the most common complaints reported during periods of poor air quality. Catastrophic bushfire events such as Black Summer in 2019-2020 released toxic particles and gases into the atmosphere, exposing people near and far to the hazardous air pollution. This includes the ~680,000 or ~15% of Australians who wear contact lenses, although very little is known about how smoke interacts with these lenses. Our pilot data suggests that particulate matter from smoke can deposit on contact lenses and disrupt their surface.

The evidence for whether contact lenses should be worn during periods of reduced air quality is lacking. Contact lenses may act as a barrier protecting the cornea from particles. Alternatively, contact lenses may potentiate the toxic effects of air pollution through adsorption of particles (ARVO abstract, 2023) and subsequent 'leakage' into the tear film.

This study will evaluate the effects of air pollution exposure on worn and unworn contact lenses using high magnification microscopy. The study will also investigate whether short term wear of contact lenses can protect the ocular surface from the impacts of pollution.

Contact

Ms Suki Jaiswal

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UNSW SYDNEY

Should we recommend air purifiers to manage dry eye disease?

Supervisors:

Prof Isabelle Jalbert, Dr Kath Watt, Ms Suki Jaiswal

The prevalence and impact of dry eye disease appears to be increasing globally, in part due to increases in risk factors such as screen and mask usage, and exposure to polluted air. The recent TFOS Lifestyle Report on the impact of environmental conditions on the ocular surface (2023) concluded that both dry air (lack of humidity) and air pollution are associated with dry eye disease. Those with existing disease (e.g., asthma, dry eye) are at increased risk of reporting complaints during periods of poor air quality.

The COVID-19 pandemic helped fuel an increased understanding of the importance of indoor clean air. Air purifiers are increasingly used to filter indoor air and can remove 99.9% of pollutants including virus, allergens, and PM2.5. Whilst associations between dry eye and climate-related and pollution factors are increasingly demonstrated in large population studies, evidence is lacking for whether interventions to improve the air quality can improve dry eye signs and symptoms.

This study will investigate whether the routine use of air purifiers modulates signs and symptoms of dry eye disease.

Contact

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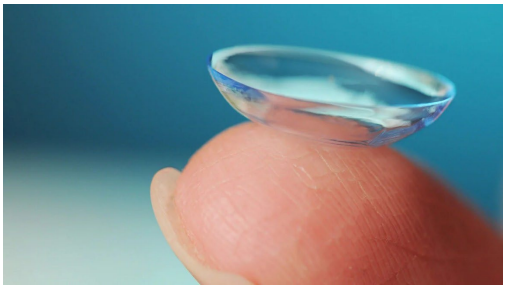
Eye Research Group projects available

Supervisors:

A/Prof Jacqueline Tan-Showyin (Director), Ms Tianni Jia (Research Optometrist)



The Eye Research Group (ERG) has extensive expertise in clinical trials, collaborating with over 20 multinational partners. With a strong background in first-in-man, registration, and post-market trials, the ERG has led numerous multicentre and investigator-initiated studies across a broad range of research areas.

We are accepting Expression of Interest for students wishing to join our Honours Program. This is an exciting opportunity for students to engage closely in advanced research and develop critical skills in the space of clinical trials. Our research focus for next year will be on dry eye, meibomian gland dysfunction, ocular surface disease and contact lenses. We also welcome students to propose and discuss new research projects that align with our objectives and their interests.

Contact

To express your interest, please contact the Eye Research Group (eyeresearch@unsw.edu.au).

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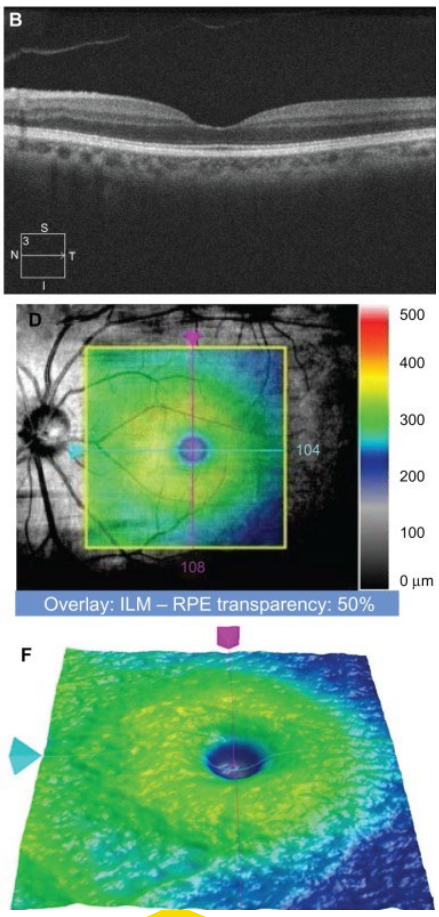
Posterior Eye Projects

Linking Retinal Integrity with Physiology, Non-ocular Pathology, and Pharmaceutical Drugs (PPP)

Supervisors:

Dr Matt Trinh, Dr Angelica Ly, Dr Lisa Nivison-Smith



The PPP project aims to improve the precision of clinical measures of retinal integrity, such as OCT retinal nerve fibre layer and total macular thickness, and colour fundus photography vessel diameters, by exploring relationships with non-ocular factors such as natural physiology, systemic disease, and medication use. This project is designed as a retrospective, translational study. Students will learn how to organise and quantitatively analyse large amounts of patient data from the Centre for Eye Health.

Contact

Dr Matt Trinh

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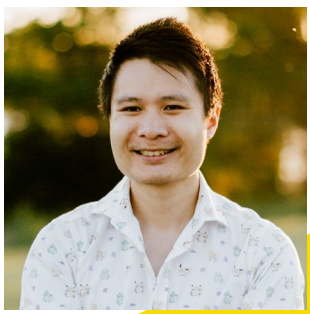

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Charting the course of geographic atrophy using a new high-density topographical OCT analysis

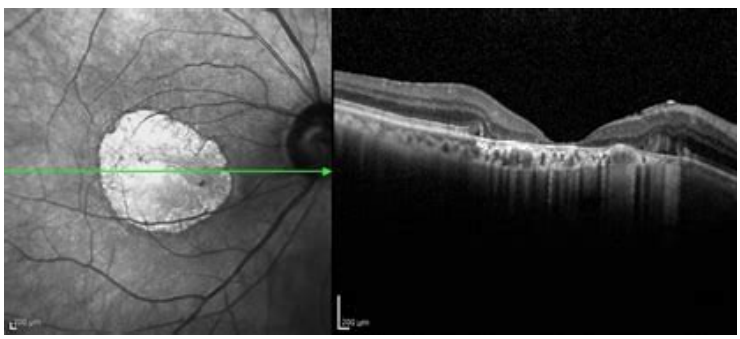
Supervisors:

Dr Matt Trinh, Dr Lisa Nivison-Smith

Geographic atrophy causes vision loss in 90% of age-related macular degeneration. However current measures of geographic atrophy are coarse and binary meaning there is limited information for us to better understand of the pathobiology of disease and develop new treatments.

We recently established a method of characterising subtle, topographical changes in specific retinal layers. This method generates high-density, topographical maps that could improve clinical interpretation and in-depth research investigation.

This project will involve applying this method to patients with signs of geographic atrophy and comparing the sensitivity of this method to the established binary measures. The results of this study will then be used to determine if this tool could be helpful in research and clinical care of AMD.



Contact

Dr Matt Trinh

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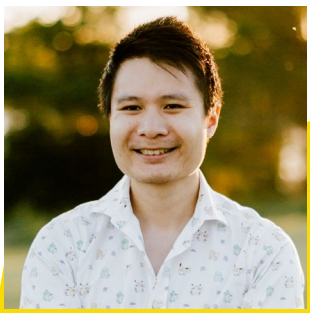
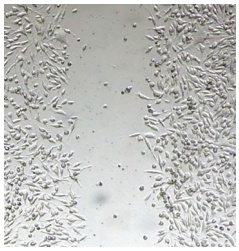
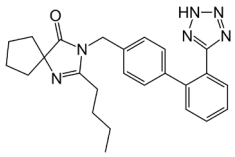


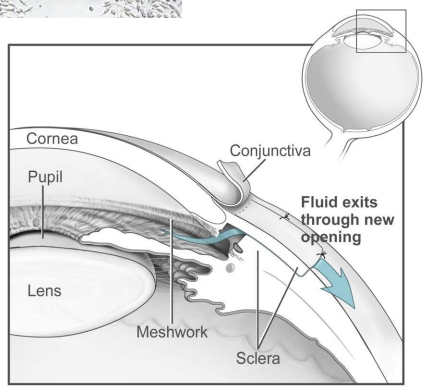
Exploring the anti-fibrotic potential of irbesartan for improved outcomes in glaucoma surgery

Supervisors:

Dr Daisy Shu, A.Prof Nicole Carnt, Dr. Ushasree Pattamatta, A/Prof Andrew White







Glaucoma is one of the leading causes of irreversible blindness in Australia with an estimate of nearly 400,000 Australians suffering from this disease. It is characterised by progressive neurodegeneration of the retinal ganglion cells (RGCs) of the eye. One of the key treatments to reduce the intraocular pressure in glaucoma patients is glaucoma filtration surgery (trabeculectomy). Scar formation under the conjunctiva in the post-surgery period is the critical determinant of surgical success.

Current strategies to modulate wound healing can result in long-term complications from the surgery. This project will investigate Irbesartan, an angiotensin inhibitor, as a novel wound modulating agent to manage postoperative fibrosis that results in treatment failure. The efficacy of irbesartan as an anti-fibrotic agent will be tested on human conjunctival fibroblasts following exposure to transforming growth factor-β2 using various wound healing assays. This project will also explore the molecular mechanisms driving the anti-fibrotic effect of irbesartan with a focus on metabolic and mitochondrial changes. This project will advance our understanding of the wound healing and fibrosis mechanisms underlying scar formation and enable the development of novel treatments to prevent scar formation following trabeculectomy.

Contact

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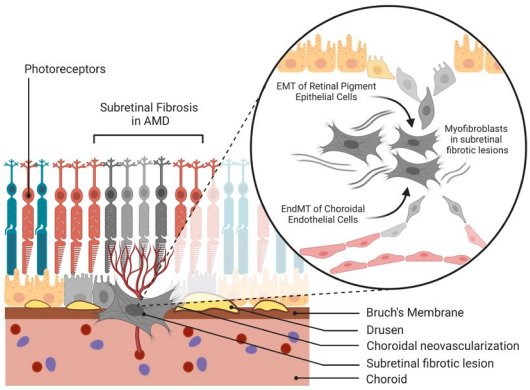
UNSW SYDNEY

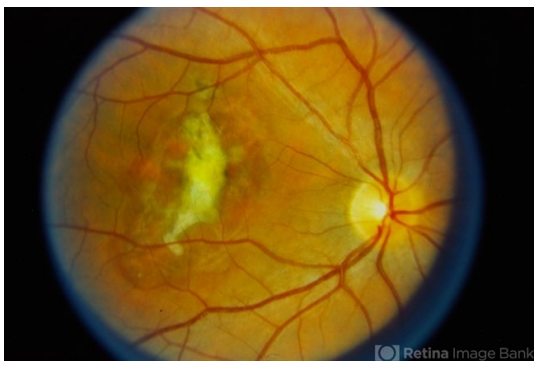
Learning from our scars: exploring wound healing and fibrosis in the retina

Supervisors:

Dr Daisy Shu

Age-related macular degeneration (AMD) is a leading cause of vision loss in older adults, characterized by progressive damage to the macula, the central part of the retina responsible for detailed vision. AMD is broadly classified into two types: dry (atrophic) and wet (neovascular or exudative). Both forms of AMD lead to the end-stage of subretinal fibrosis, resulting in permanent damage to the retinal architecture and irreversible vision loss. There is currently no treatment for subretinal fibrosis and thus, it is imperative that we conduct research in this area.





You will work in the Retinal Research Group of UNSW (Kensington campus) to investigate the molecular mechanisms underpinning wound healing and fibrosis of epithelial and endothelial cells in the retina. This is fundamental discovery research where you will be required to learn wet lab techniques to explore processes such as epithelial-mesenchymal transition (EMT) and endothelial-mesenchymal transition (EndMT) with a focus on exploring the mitochondrial and metabolic alterations during these processes. This research will have broad implications in finding cures for blinding eye diseases such as age-related macular degeneration.

Contact

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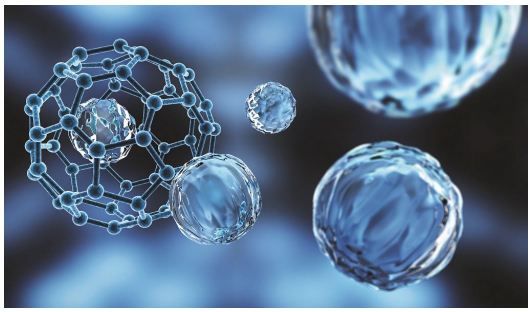
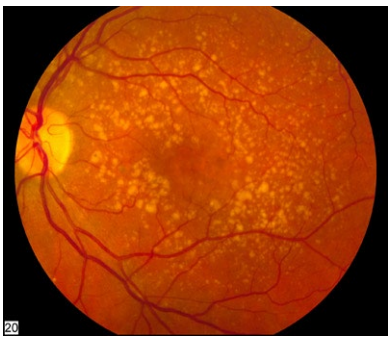
Developing a novel nanoparticle drug delivery system for the treatment of age-related macular degeneration





Supervisors:

Dr Daisy Shu and Dr. Tushar Kumeria

Age-related macular degeneration (AMD) is a leading cause of vision loss in older adults, characterized by progressive damage to the macula, the central part of the retina responsible for detailed vision. Current treatments for AMD often require patients to undergo intravitreal (IVT) injections on a monthly or bimonthly basis, which can be burdensome and uncomfortable. Our research aims to transform this approach by developing an innovative nanoparticle drug delivery system that offers extended therapeutic retention.

You will work in the Retinal Research Group of UNSW (Kensington campus). By utilising advanced nanotechnology, we are working on a system that could allow for drug delivery to last up to six months, reducing the frequency of injections while maintaining efficacy. This breakthrough has the potential to significantly improve patient quality of life and treatment adherence, while enhancing therapeutic outcomes for AMD.

Contact

Dr Daisy Shu

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UNSW SYDNEY

What do patients think about new intravitreal treatments for geographic atrophy?

Supervisors:

Dr Lisa Nivison-Smith, Dr Angelica Ly

Geographic Atrophy (GA) is the leading cause of vision loss from AMD. While no treatments for GA are available in Australia, two drugs called Izervay and Syfovre have recently been approved by the FDA as treatment for GA via intravitreal injection. In 2023, Syfovre applied to the Therapeutic Goods Administration, meaning GA treatments could also soon be available in Australia.

Lessons from wet AMD show there are many issues affecting the success of treatment including financial burden, stress, side effects and carer availability. Thus, this project will determine the the attitudes of patients with GA to these potential new drugs using a survey-based study. We will present hypothetical treatment scenarios designed by other patients to determine *what* affects decision-making relating to new treatment (i.e. injection frequency, side effects, visual outcomes), *when* treatment be discussed (i.e. before or after GA diagnosis) and *who* will impact treatment acceptability (i.e. patients and/or carers). These findings will help guide retinal specialists on how to approach discussions with patients on these new potential treatment options for GA.

Contact

Dr Lisa Nivison-Smith

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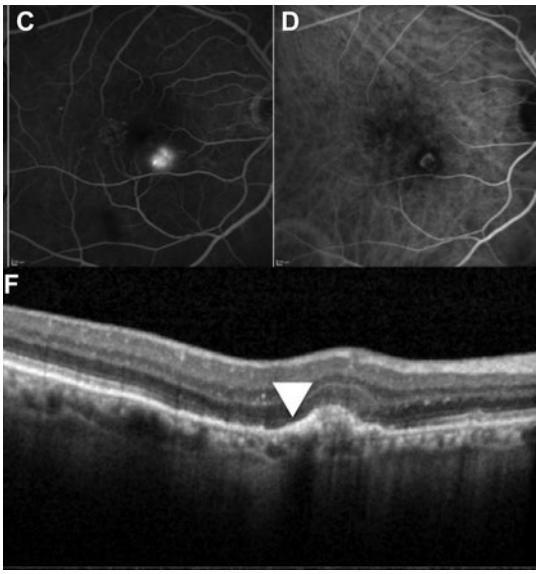
UNSW SYDNEY

Can a novel choroid high-density analysis be used to predict macular degeneration?

Supervisors:

Dr Lisa Nivison-Smith, Dr Matt Trinh



Macular neovascularisation is a major reason for vision loss in age-related macular degeneration (AMD) and several clinical trials show that preventing vision loss hinges on treatment the disease early. Thus, tools to predict which patients are at highest risk of developing macular neovascularization and ensure they are monitored closely are desperately needed.

Our research team has developed a novel, high density analysis tool that can indicate subtle changes in the size and shape of blood vessels of the choroid. As macular neovascularization originates from the choroid, this tool may detect the disease early and help facilitate treatment.

This project will involve applying our tool to a population of AMD patients to test this hypothesis. The results of this study will then be used to determine if this tool can be translated into clinical practice.

Contact

Dr Lisa Nivison-Smith

L.Nivison-Smith@unsw.edu.au

UNSW SYDNEY

'*I spy with your little eye*' Using gaze tracking to identify barriers to OCT interpretation in AMD

Supervisors:

Dr Lisa Nivison-Smith, Rene Cheung

Sensitivity studies show that OCT has high accuracy for detection of high-risk age-related macular degeneration (AMD) lesions and can improve detection and prognosis of disease. However, real-world studies find providing OCT images only improved AMD diagnostic accuracy by ~5%.

One reason for this discordance may the use of highly trained graders in sensitivity studies who can easily identify AMD lesions on OCT versus real-world clinicians who may not have the same training and therefore do not interpret OCT of AMD lesions in the same way. Understanding how "end-users" interpret OCT images is essential to better translate the benefits of OCT to clinical management of AMD.

This study will investigate how real-world clinicians interpret OCT using eye-tracking technology. We will measure gaze patterns of optometrists whilst assessing OCT images of AMD eyes and determine which gaze patterns are linked to high diagnostic accuracy. This can provide evidence to guide clinical education on OCT and develop help in the development of better digital tools for displaying OCT results to clinicians.

Contact

Dr Lisa Nivison-Smith

L.Nivison-Smith@unsw.edu.au

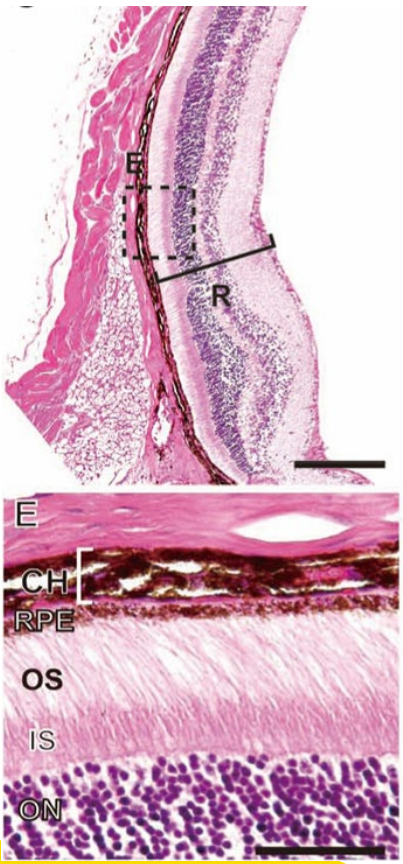
UNSW SYDNEY

Exploring Glucose Metabolism in the Macular Choroid: A Quest for Novel Treatment Targets in Retinal Diseases

Supervisors:

A.Prof Michele Madigan and Dr Ling Zhu

The macular and peripheral regions of the choroid—the vascular layer nestled between the retina and the sclera—differ significantly in their structural and metabolic attributes. Specifically, the macular choroid is denser and thicker, reflecting its role in catering to the high metabolic demands of the macula, the central portion of the retina responsible for detailed vision. Conversely, the peripheral choroid is thinner and less vascular. These anatomical variations have far-reaching implications for retinal diseases like Age-related Macular Degeneration (AMD) and Central Serous Chorioretinopathy (CSC), where choroidal changes can be critical indicators of disease onset or progression. To delve deeper into these dynamics, we are thrilled to offer a one-year Honors project titled 'Exploring Glucose Metabolism in the Macular Choroid: A Quest for Novel Treatment Targets in Retinal Diseases.' The research will be conducted primarily at Sydney University in the Biomedical Building at Australia Technology Park (near Redfern Station).



The project aims to investigate the glucose metabolism specific to the macular choroid, with the goal of uncovering novel avenues for treating retinal diseases. Participants will gain invaluable experience in cutting-edge metabolic analysis techniques, contributing to a more comprehensive understanding of retinal pathophysiology and the development of targeted treatment options. No prior wet-lab experience is required, with support from a research team of hands-on laboratory supervisors, and experienced research assistants.

Contact

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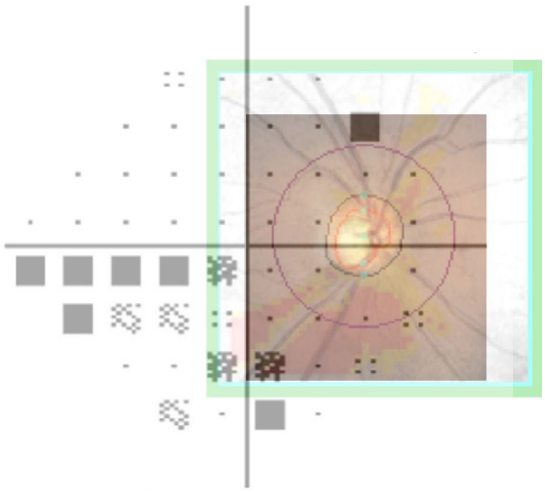
UNSW SYDNEY

Developing a clinician assisting interface for glaucoma diagnosis and progression analysis

Supervisors:

Dr Jack Phu, Henrietta Wang



Glaucoma is a leading cause of irreversible blindness worldwide. In addition to half of all cases of glaucoma being undiagnosed in the community, a further half of those with so-called glaucoma receive false positive diagnoses. Evidently, glaucoma diagnosis is deceptively challenging, in part due to the wealth of potential clinical information, each with different levels of relevance to the individual patient.

Currently, clinicians have a heterogeneous approach to glaucoma diagnosis. This has played a role in the inconsistency of diagnosis, ultimately leading to an unnecessary consumption of scarce health care resources.

Innovations from our research group have highlighted features and regions of interest that are diagnostically high-yield for glaucoma diagnosis, and, equally important, its differentiation from other disease processes. This project seeks to understand how clinicians use and weigh clinical information for glaucoma and optic nerve disease differential diagnosis, and to develop an evidence-based tool to assist in clinical decision making. This project will leverage large datasets obtained from the Centre for Eye Health, and clinical expertise amongst optometry and ophthalmology collaborators.

Contact

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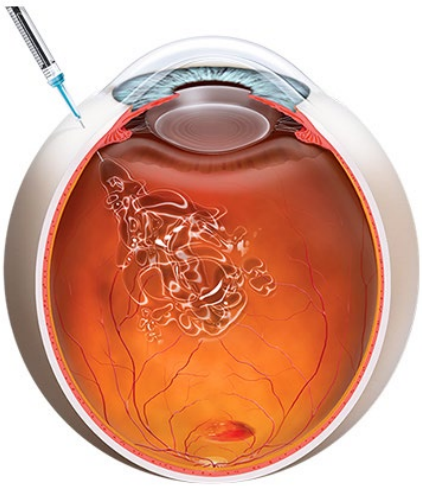
UNSW SYDNEY

Assessing bacterial contamination of intravitreal needles

Supervisors:

Dr Jerome Ozkan and Prof Minas Coroneo

Intravitreal (IVT) injections into the eye are used to treat age-related diseases including age-related macular degeneration, diabetic retinopathy and retinal vein occlusion. A devastating post-surgical complication is exogenous endophthalmitis, caused by inoculation of microbes into the vitreous cavity. Previous studies, using conventional culture methods, have found up to 18% of IVT needles following injection are contaminated with bacteria even after extensive sterilisation of the ocular surface. Our previous research showed evidence for bacteria on IVT needles after injection and visually confirmed their adherence using scanning electron microscopy. The diversity of bacteria detected on the used needles was also similar to that found on the ocular surface microbiome. This suggests the risk of exogenous endophthalmitis remains even with sterilization of the conjunctival surface.



This project will determine the extent and type of bacterial contamination of intravitreal needles under controlled laboratory conditions. The knowledge gained from this research may in future help make intravitreal injections safer.

Contact

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UNSW SYDNEY

Unravelling melanocyte interactions in the human choroid

Supervisors:

A/Prof. Michele Madigan and Dr Alex Macmillan

The vascular pigmented choroid between the outer eye wall (sclera) and the inner eye tissues covers ~85% of the inner human eye surface and is critical for normal eye function. The choroid supports the outer neural retina/retinal pigment epithelium, with roles that include light absorption, thermoregulation and limiting oxidative stress. 'Choroidal disruption' is increasingly seen as an underlying feature of many human posterior eye diseases. For example, reduced choriocapillaris blood flow is seen in early stages of atrophic age-related macular degeneration, and altered choroid blood vessels and increased choroid thickness contribute to pachychoroid spectrum disease. As well, the effects of light (including spectral composition) on choroidal thickness are important during emmetropisation and myopia development.

The choroid stroma includes extensive complex networks of blood vessels and autonomic/sensory nerve fibres within a loose mesh of collagen and elastic fibres and extracellular matrix. Many cells populate the stroma including immune cells (macrophages, mast cells and lymphocytes), intrinsic choroidal neurons, pericytes and non-vascular smooth muscle cells, Schwann cells, fibroblasts, and melanocytes. *See next page for further details*

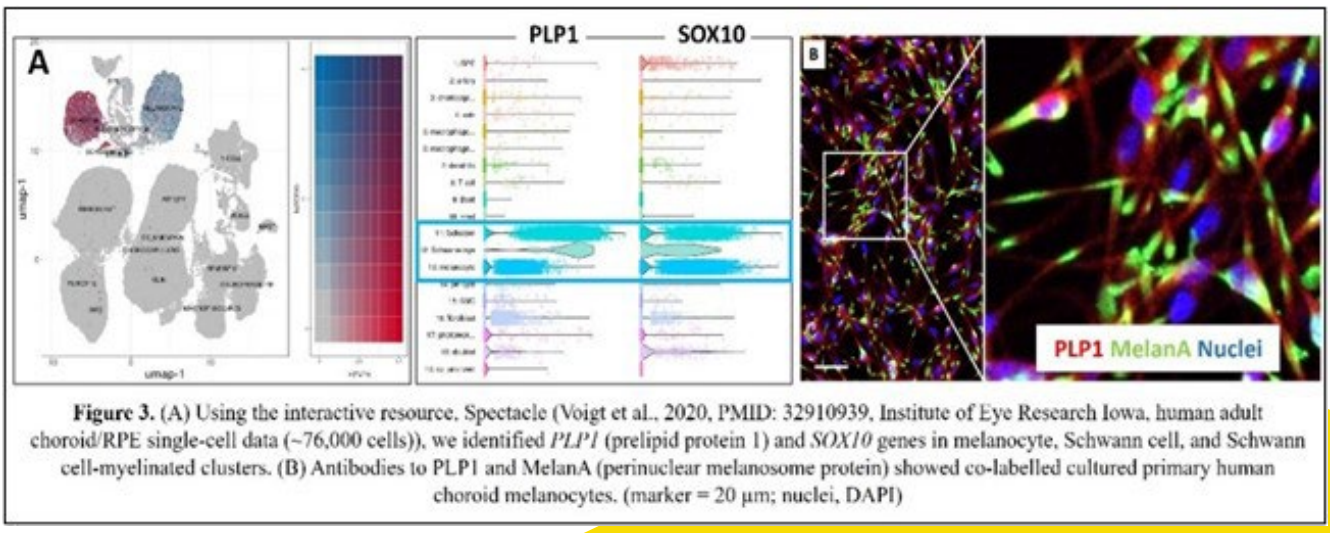

Figure 3. (A) Using the interactive resource, Spectacle (Voigt et al., 2020, PMID: 32910939, Institute of Eye Research Iowa, human adult choroid/RPE single-cell data (~76,000 cells)), we identified *PLP1* (prelipid protein 1) and *SOX10* genes in melanocyte, Schwann cell, and Schwann cell-myelinated clusters. (B) Antibodies to PLP1 and MelanA (perinuclear melanosome protein) showed co-labelled cultured primary human choroid melanocytes. (marker = 20 µm; nuclei, DAPI)

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UNSW SYDNEY

Continued from previous page

Unravelling melanocyte interactions in the human choroid

Supervisors:

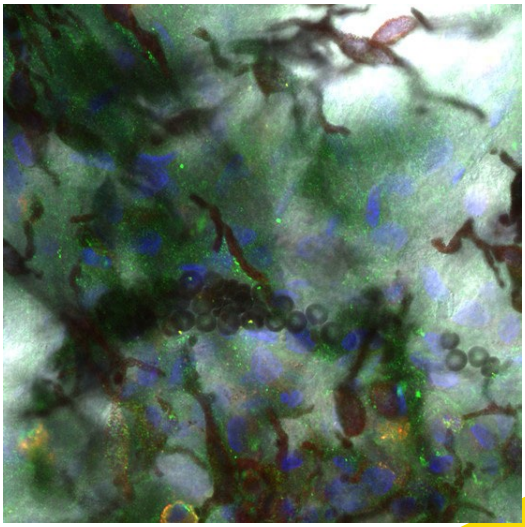
A/Prof. Michele Madigan and Dr Alex Macmillan

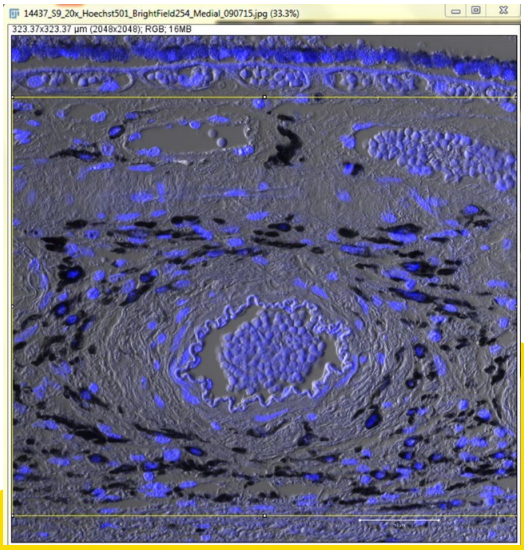
This study will focus on human choroidal melanocyte networks in eye sections and flatmounts (including macular and peripheral locations). We hypothesise that heterogeneous populations of choroidal melanocytes interact with and support medium and outer choroidal vessels. and outer choroidal nerves (autonomic/sensory) and intrinsic choroidal neurons.

The study aims to:

1. Investigate the topographical distribution of melanocytes and melanocyte associations with outer choroid vessels and choroid nerves in normal adult human eye sections (including choroid/suprachoriod/sclera), and choroidal tissue flatmounts. This will involve microscopy and image analysis.

2. Develop advanced microscopy and imaging techniques to study label-free adult human eye sections and flatmounts. These approaches will help profile extracellular matrix in regions of choroid/vessel/nerve interactions and characterise structural features of the choroid-sclera interface (including lamina fusca).





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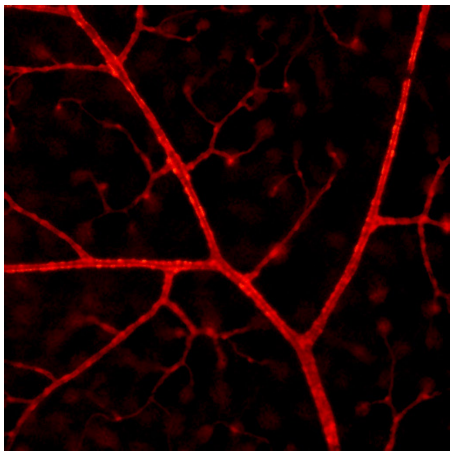
UNSW SYDNEY

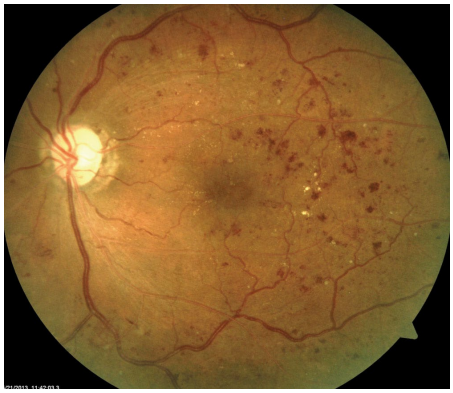
Colchicine as a novel therapeutic for treating vascular abnormalities in Type 2 Diabetic Retinopathy

Supervisors:

Dr Daisy Shu, A/Prof. Michele Madigan, Dr. Ashish Misra

This project aims to investigate the effectiveness of colchicine in treating diabetic retinopathy by targeting vascular abnormalities in a Type 2 Diabetes mouse model. Diabetic retinopathy is a leading cause of vision loss in the working population, and current therapies are limited to anti-VEGF injections. Colchicine is an orally administered drug currently used to treat atherosclerosis in Type 2 Diabetes, offering potential cardiovascular benefits. Our research will explore whether its anti-inflammatory properties also reduce retinal vascular damage. If successful, this study could position colchicine as a novel, non-invasive therapy for both heart and eye complications in diabetic patients.





You will work in the Retinal Research Group of UNSW (Kensington campus) in collaboration with Dr. Ashish Misra's group at the Heart Research Institute (Newtown). The innovative feature of this T2DM mouse model is that the vascular smooth muscle cells of blood vessels are fluorescently labelled in vivo with TdTomato (red fluorescent label), enabling immediate visualisation of retinal vasculature. You will learn many key wet lab techniques in cellular and molecular biology in this project.

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Vision Science Projects

Comparison of Objective and Subjective Near Gradient Accommodation Convergence/ Accommodation ratio in emmetropes and myopes

Supervisors:

Dr Revathy Mani, Dr Nayuta Yoshioka, A. Prof Sieu Khuu

AC/A measure signifies the relationship between accommodation and vergence mechanisms. Assessment of the AC/A ratio plays an important role in the diagnosis and management of non-strabismic and strabismic anomalies and in prescribing addition lenses. Clinically Gradient AC/A is measured by the Cover Test, Modified Thorington method or using the Howell card. These methods are based on ocular alignment measured by an examiner or by a subjective response from patients based on the eye's position. However, such approaches are highly subjective, and no study has measured ocular alignment as an indicator of AC/A using more objective methods. Previous studies have measured accommodative response using an autorefractometer but not ocular alignment. This study aims to measure ocular alignment and accommodative response objectively using an eye-tracking and auto refractometer for the measurement of AC/A. This project will enable students to understand the dynamics of accommodation and vergence while using subjective and objective evaluation of AC/A ratio.

Contact

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UNSW SYDNEY

Using virtual reality to understand visual-vestibular integration

Supervisors:

A.Prof Juno Kim

You will work with a diverse Sydney-based supervisory team to investigate how virtual reality can be used to understand physiological constraints in normal humans when engaging in physical activities like walking. You will use motion capture innovations and head/eye tracking to determine how visual motion influences our perception and navigation through real/virtual environments. The research will have broad implications for improving immersive technologies.

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SENSORY PROCESSES RESEARCH LABORATORY

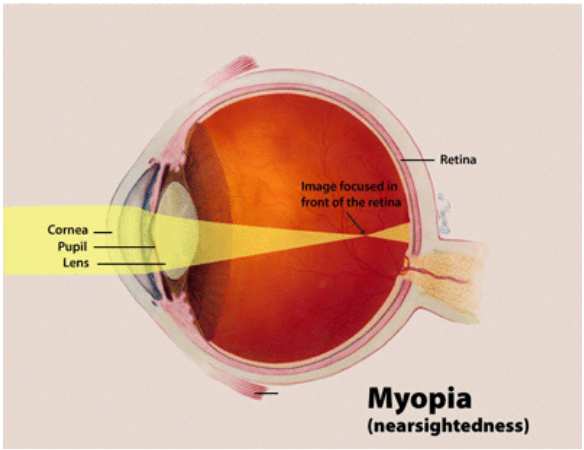
UNSW SYDNEY

Ocular adaptation to optical blur and its implications for Myopia Control

Supervisors:

A/Prof Pauline Kang and A/Prof Sieu Khuu

The prevalence of myopia is increasing worldwide and various treatments have been developed to slow or stop the progression of myopia to reduce the risk of development of associated ocular pathologies. Optical treatments including contact lenses and spectacles lenses are prescribed to myopic children under the premise that retinal blur can influence eye growth and refractive error development. However, our understanding of how the eyes adapt to optical blur and its implications on myopia treatment is not well understood. This study will evaluate the eyes adaptation to optical blur in different parts of the visual field and with different degrees of optical blur.



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UNSW SYDNEY

Public Health Projects

Digital Divide: Analyzing needs and barriers faced by older Australians with vision impairments

Supervisors:

Prof Lisa Keay and Dr Sheela Kumaran

Digital inclusion wears-off with age and drops to a significant low in those over 65 years of age (Australian Digital Inclusion Index =48). Compared to younger counterparts, older people face significant challenges accessing online government, health and business services, connecting socially and being safe online. These challenges are more prominent for people with vision impairments, impacting their mental wellbeing and overall quality of life. Using a mixed methods study design, employing surveys and qualitative research, this study will assess the digital skills and knowledge, confidence, social connectedness, loneliness, online safety concerns and barriers to digital inclusion of old people with vision impairments. This is an exciting opportunity for students interested in low vision and equity to understand the impacts of vision impairment (VI) beyond clinical implications. The student will be part of a larger team working towards improving digital inclusion for older Australians with VI, including partners at Macquarie University. Full scope research experience will be gained from ethics application, conduct data collection and analysis including NVivo qualitative software, survey tools such as REDCap/ Qualtrics and quantitative statistical packages (R, SPSS).

Contact

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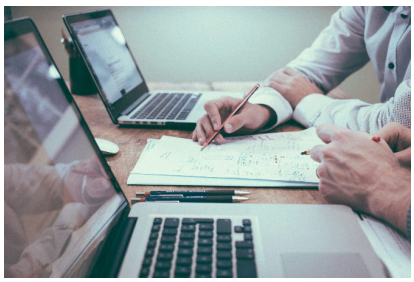
UNSW SYDNEY

Clinical audit as an education tool for optometrist trainees



Images from Unsplash

Supervisors:

Prof Isabelle Jalbert, Scientia Professor Fiona Stapleton, Dr Melinda Toomey, Dr Rajendra Gyawali

A gap exists between recommended care and care delivered by health practitioners often called the evidence-to-practice gap. Self-audit of practice accompanied by reflection has been shown to effectively improve care delivery in many areas of practice. A common barrier to implementation of self-audit tools in practitioners is lack of engagement from practitioners in the process which is often associated with very negative connotations.

The iACT tool was developed by the iCareTrack with a view to improve the delivery of diabetic eyecare and glaucoma in Australia optometry practices. Effectiveness of the intervention has been limited by poor engagement with the tool.

This research will pilot the feasibility and effectiveness of introducing clinical audit as an education tool to optometrist trainees and measure awareness and knowledge, attitudes, and practices related to glaucoma and diabetes eyecare in the general community and in eyecare practitioners.

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Education

Effectiveness of Vision Science Work Integrated learning program

Supervisors:

Dr. Vinod Maseedupally, A/Prof. Sieu Khuu and Prof. Isabelle Jalbert

This research project will focus on collecting and analysing feedback from participants in the Work Integrated Learning (WIL) program to evaluate their experiences and outcomes. The aim is to assess how well the WIL program supports Vision Science and Optometry students in developing skills, enhancing their learning, and preparing for their careers.

Data will be gathered through surveys or interviews, exploring topics such as the alignment of placements with academic learning, skill development, challenges faced, and the program's impact on career aspirations.

The findings from this project will provide valuable insights into the effectiveness of the WIL program and help identify areas for improvement. The student will be responsible for analysing the data, identifying key trends, and offering recommendations to enhance the program. This research will provide practical research experience while contributing to the ongoing development of the WIL program, strengthening the link between academic study and industry practice.

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Thank you for your interest in our Vision Science Honours Program. More Honours Projects can be negotiated with supervisors so please get in touch to discuss project ideas.

If you have any questions, please do not hesitate to reach out to the VISN4016 Course Convenor, Dr. Daisy Shu at daisy.shu@unsw.edu.au

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