Lions Eye Institute

40 Years of Impact

A journey of sight saving discovery powered by philanthropy

> My 40 years of medical education and caring for blinding eye disease has reinforced an important principle – the only way to enlightenment is through scientific discovery.
>
> Professor Ian Constable AO

Professor Ian Constable AO, Founder and Patron with Dr Jessica Mountford who hopes to find a cure for early onset myopia in children

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Our Founder and Patron

A message from Professor Ian Constable AO

There is so much I am proud of and thankful for at the Lions Eye Institute.

> **It is a privilege to be able to restore sight.**
>
> Professor
> Ian Constable AO

My passion is to provide eye care to everyone, regardless of cost.

I am proud of what the Lions Eye Institute has become and all it has achieved.

My vision to ensure Western Australians have access to specialist eye care and benefit from first-class medical research has been accomplished.

However, I know there is still so much more to do.

The Lions Eye Institute is in very good hands with Professor Bill Morgan. Professor Morgan carries my passion to eradicate blindness and to provide eye care to people throughout Western Australia. He has an endless drive to find scientific breakthroughs and discoveries to reduce the rates of vision loss and blindness.

I'm excited to see Professor Morgan continue my legacy, build on it and take it to new heights. I'm also delighted to see the next generation of scientists coming through and can only imagine what they will go on to achieve given their already enormous talent and outstanding progress to date.

The future really is bright.

Ian Constable

Professor
Ian Constable AO
Founder and Patron

Founded on innovation, scientific excellence and powered by philanthropy

A message from Professor Bill Morgan

Forty years ago, the Lions Eye Institute was established as both an ophthalmic clinic and a medical research facility, due to the foresight of Professor Ian Constable AO.

> **Often referred to as the most valued of our senses, sight is a gift to be treasured.**
>
> Professor
> Bill Morgan

A model of cutting-edge research in addition to providing the latest treatments to our patients has positioned us as a leader in ophthalmology in the Asia-Pacific region. It has also helped us produce translational research outcomes that have helped many people with eye disease both locally and globally. Today, people come to us from around the Asia-Pacific region to seek the best in eye care, teaching, training and world-class research.

Patient care

Over the past four decades what began as two people working out of Royal Perth Hospital, Professor Constable and a part-time secretary, has now become a multi-site institute with three clinics across the Perth metropolitan region, world-class research laboratories, Lions Outback Vision Kimberley Eye Hub in Broome, and a Vision Van servicing regional and remote Western Australia. The Lions Eye Institute endeavours to provide outstanding ophthalmic care across our vast state.

Translational research

We have increased the understanding of the most common causes of blindness in our community. This includes an improved knowledge of and diagnostic capability for diabetic retinopathy, which is the most common cause of blindness in Aboriginal Australians. We have developed two novel surgical treatments for glaucoma including one for our international neighbour, Indonesia. We were among the first in the world to develop gene therapies for macular degeneration and inherited retinal diseases.

Our founder

This report is a tribute to Professor Constable. Relocating to Perth when it was a small town, he worked tirelessly to establish and develop the Lions Eye Institute into the highly regarded and flourishing clinic and research facility it is today, with its talented ophthalmologists and scientists. Much has been achieved and many have contributed to Professor Constable's vision to make the Lions Eye Institute a world-class organisation. This report reflects on the highlights of the past 40 years and the tremendous impact our work has had.

The future

Despite major scientific advances, blindness remains a significant medical problem globally.

Our research scope has increased and is set to impact upon neurological and neurosurgical diseases. We will use the eye as a window to the brain to improve treatments of other diseases, bringing forth novel therapies such as gene therapy and new forms of surgical treatments. We are increasing our research capacity to include myopia, which alone is set to affect 50 per cent of the world's population by 2050, as well as corneal and immune diseases.

Powered by philanthropy

We have been tremendously fortunate to receive generous philanthropic support over our 40 year history. Our achievements in medical research and our ability to translate that research into patient care wouldn't have been possible without you.

This report pays tribute to the many donors who have joined us on the journey to make this possible. We are delighted to share some of our supporter's stories with you and to acknowledge the impact their contributions have made.

Thank you!

Thank you for joining us on this journey, providing your support, commitment and encouragement. You are the true champions of what has been achieved over the past 40 years and have helped us lay strong foundations for what can be achieved over the next 40 years. Thank you for your ongoing support, we will forever be grateful.

Professor Bill Morgan

Managing Director,
Ophthalmologist and
Researcher

Impact highlights

40 years of sight saving discovery

Professor Ian Constable AO establishes the Lions Eye Institute

1983

Lions Eye Bank is established and begins supplying donated corneas for transplant

1986

1985

Developed one of the world's first intraocular lenses for cataract surgery

1991

Excimer Laser Surgical System developed – it is Australia's first refractive treatment for myopia

1996

Lions Eye Institute Nedlands building officially opens

Barrett Universal II Formula revolutionises cataract surgery

1993

The world's first soft artificial cornea, the AlphaCor, is developed and successfully implanted into patients in Australia, US and India

1998

1999

Professor Ian McAllister develops the central retinal vein occlusion (CRVO) bypass laser surgery procedure, improving vision for sufferers of non-ischemic central retinal vein occlusion

A teleophthalmology trial begins in Western Australia's Gascoyne region, transferring eye disease images from remote locations to health professionals in the city

2003

2005

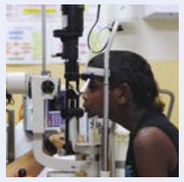
Murdoch clinic opens to service patients in Perth's southern suburbs

The Lions Eye Institute joins forces with the State Government, The University of Western Australia (UWA) and the Western Australian Institute of Medical Research to build a new state-of-the art facility at the QEII Medical Centre and consolidate medical research in the state

2007

2013

Lions Outback Vision officially launches



XEN® Gel Stent receives US Food and Drug Administration (FDA) approval and revolutionises glaucoma treatment globally

2016

2016

Lions Outback Vision Van launches

2018

Professor David Mackey AO receives the largest ever National Health and Medical Research Council (NHMRC) program grant for research into the genetics of eye disease

Professor Elizabeth Rakoczy receives the Florey Medal for her gene therapy research to treat wet age-related macular degeneration (AMD)

2017

The Lions Eye Institute co-invents the Virna Glaucoma Drainage Device that offers a low cost option for the treatment of glaucoma in Indonesia

2019

2019

Professor Mariapia Degli-Esposti receives the Eureka Prize in Scientific Research for discoveries in the field of immune therapy

Western Australia's first optometry program commences at UWA with 42 students

2020

Western Australia's first paediatric initiative for diabetic retinopathy launches

2021

2021

Promising drug developed to treat retinitis pigmentosa gene 11

2022

A dedicated clinic opens in Midland to reach patients living in the eastern metropolitan corridor

The Kimberley Eye Hub officially opens in Broome, the first permanent eye clinic in the North West

2022

2022

The Lions Eye Institute appoints two Professorial Chairs in Optometry Research and Ophthalmic Big Data

Despite many medical advances, blindness remains a significant medical problem throughout the world

Eye disease is increasing globally

Globally

Globally, eye disease is projected to significantly increase over the next three decades. This is due to a growing ageing population, increasing life expectancy and a lack of access to quality eye care for those living in developing countries and rural and remote areas of the developed world. The United Nations **World Population Prospects 2019** report explains that by 2050, the 65 and over age group will be the fastest growing demographic, outnumbering children aged under five for the first time.

Figure 1 represents how the global age structure is shifting over time. A larger proportion of the population will fall in the 65 years and over category in 2060 than any time in history.

This is concerning given the rate of training of eye care professionals is the same as the natural population growth rate (1.3 per cent). The actual required rate of training of eye care professionals is 3.7 per cent per annum, given this is the growth rate of demand and the growth rate of the over 65 population.

The World Health Organization

The World Health Organization's **World Report on Vision 2019** notes at least 2.2 billion people have vision impairment, and of these, at least one billion people have an eye disease that could have been prevented. These alarming rates will cause significant challenges to existing eye care practitioners, health providers and governments.

The World Health Assembly recently adopted the resolution for 'Integrated people-centred eye care, including preventable blindness and impaired vision'. This recommendation, led by Australia and Indonesia and co-sponsored by 47 countries, conveys the magnitude of eye disease globally and provides an urgent call to action of World Health Organization's 194 Member States. The Lions Eye Institute was instrumental in driving this resolution forward.

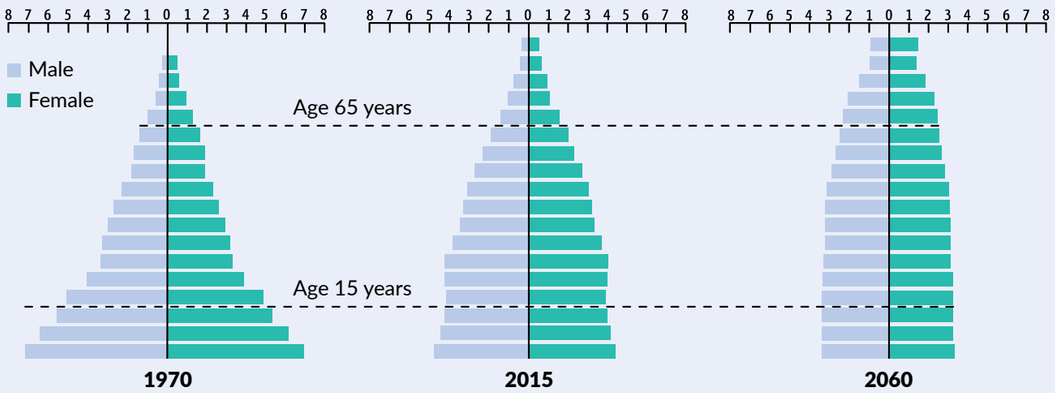
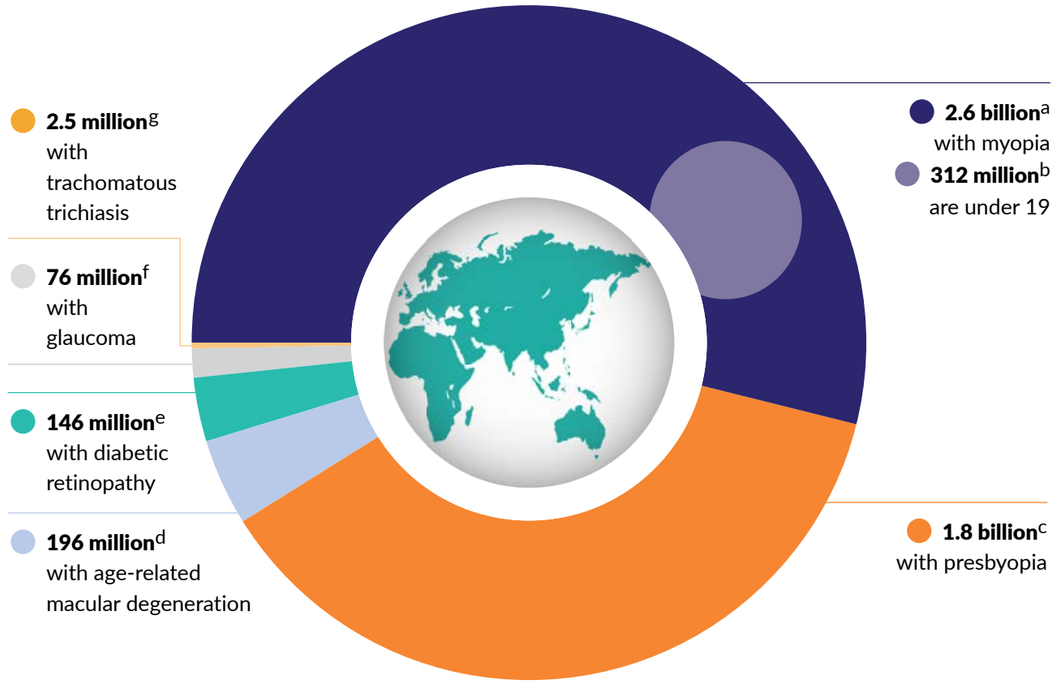


Figure 1: Population Pyramid by age: 1970 – 2060. Source: UN, The Economist

Global estimates of numbers of people affected by selected eye conditions that can cause vision impairment



Source: WHO World Report on Vision 2019

a 2.6 billion (uncertainty interval, 1.97–3.43) people of all ages with myopia in 2020

b 312 million (95% credible intervals (CrI), 265 million to 369 million) aged under 19 years with myopia in 2015

c 1.8 billion (confidence interval [CI], 1.7–2.0) people of all ages with presbyopia in 2015

d 195.6 million (95% CrI 140–261) people aged 30 to 97 years with age-related macular degeneration in 2020

e 146 million adults with diabetic retinopathy was calculated by applying the global prevalence of any diabetic retinopathy (34.6%) reported by Yau et al. [2012] to the estimated global number of adults aged over 18 years of age with diabetes in 2014 (422 million) that was reported in the WHO Global Report on Diabetes, 2016

f 76 million (95% credible intervals (CrI), 51.9–111.7) people (40 to 80 years of age) with glaucoma in 2020

g 2.5 million people of all ages with trachomatous trichiasis in 2019

Eye disease in Australia

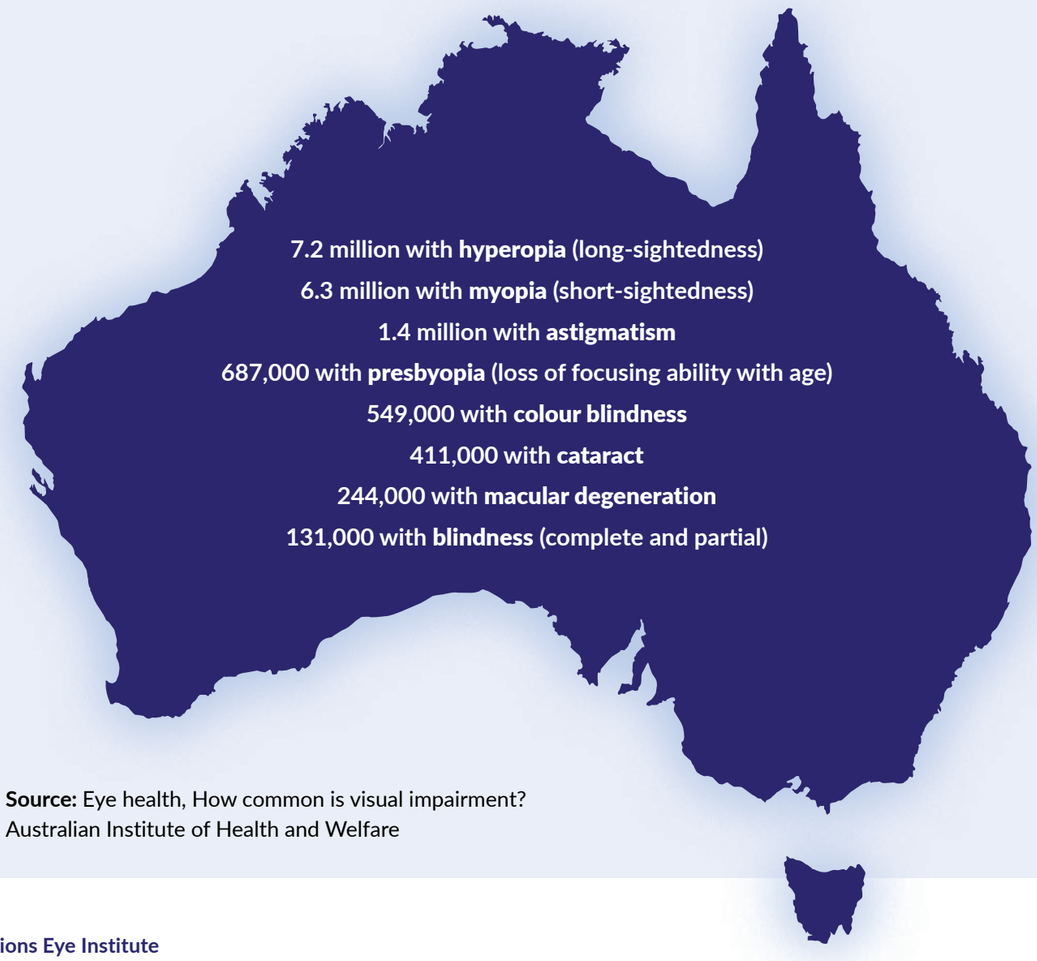
Eye disease in Australia is increasing.

Eye disease is the most common chronic health condition in Australia, with more than 13 million Australians (55 per cent) reported to have long-term eye conditions in 2017-2018.

Australian Institute of Health and Welfare

These numbers are set to double by 2050. Undersupply of optometrists in Australia (**Deloitte Access Economics, 2018**) make treatment and management of eye disease a challenge.

It is estimated that over 13 million Australians have one or more chronic (long-term) eye conditions, according to self-reported data from the Australian Bureau of Statistics (ABS) 2017-18 National Health Survey (NHS). This includes:



Source: Eye health, How common is visual impairment? Australian Institute of Health and Welfare

Eye health statistics for Aboriginal people

Eye and vision problems are the **most common long term health conditions** experienced by Aboriginal people.

Top three eye diseases causing vision loss and blindness:

Refractive error 61%

Cataracts 20%

Diabetic retinopathy 5.5% (the most common cause of irreversible vision loss)

3x

Vision loss and blindness are **three times more common among Aboriginal adults** than non-Aboriginal adults.

Aboriginal people **experience vision loss at a younger age** than non-Aboriginal Australians.

Around 44% of Aboriginal Australians who had a diabetes test were screened for diabetic retinopathy in 2018-19.

Vision loss is about twice as high among Aboriginal adults in outer regional areas and very remote areas than among Aboriginal adults in other areas.

2x remote

90% of vision loss and blindness from refractive error, cataracts and diabetic retinopathy is preventable or treatable.

In 2018-2019, **13% of Aboriginal Australians** had an eye examination by an optometrist or ophthalmologist.

The average age of those with diabetic retinopathy is **almost 15 years younger** than among non-Aboriginal adults with the same condition.

15 YEARS

Source: Australian Indigenous Health*Info*Net
https://www.aihw.gov.au/reports/indigenous-australians/indigenous-eye-health-measures-2020/summary

Highlights

Research impact

The Lions Eye Institute has worked hard to contribute to a world without blindness and sought to provide better vision for all.

First chair in ophthalmology

In the 1970s Professor Constable was a globally renowned ophthalmologist and researcher having gained his reputation in Boston on a scholarship from the University of Sydney. At the young age of 31 years old Professor Constable was persuaded by Lions Club WA President, Dr Brian King AM MBE, and Dr Robert Linton AM to take on the role of the state's first Professorial Chair in Ophthalmology at UWA. This was a big win for Western Australia and the next 40 years would prove what a critical and successful appointment this would be.

World-class researchers joined

Professor Constable attracted enormous talent to the Lions Eye Institute. Research groups gradually began to form in the 1980s and flourished under his leadership and mentorship. The research environment he created attracted talented scientists from around the world. He provided the right amount of support and the autonomy scientists craved. This proved fruitful, as many of these research teams would go on to achieve groundbreaking feats in the prevention of blindness.

Professor Mariapia Degli-Esposti at the 2019 Australian Museum Eureka Prize Award Dinner with Dr Chris Andoniou (left), Peter Fleming (centre) and Dr Jose Paulo Martins (right)

Government grants and philanthropic support

Our researchers received 80 per cent of government grant funding to eye research in Australia in those early years. We were also extremely fortunate to receive substantial philanthropic support from the Lions Save-Sight Foundation and patients, who helped us to establish a dedicated clinic for patient visits as well as world-class research laboratories. People such as Sir James McCusker, Stan Perron AC, Bill Wyllie and Sir James Cruthers AO were instrumental in our early and subsequent success.

Research teams flourished

The research teams flourished with this injection of funding and went on to produce some of our biggest scientific breakthroughs, inventions, treatments and gene therapies.

Scientific achievements and inventions followed

To name just a few of our success stories, we invented the world's first soft artificial cornea, discovered gene therapy to treat wet age-related macular degeneration, invented a surgical treatment for glaucoma, created the Barrett Universal II Formula used in cataract surgery the world over, developed surgical systems such as the CRVO laser bypass surgery and made a significant scientific discovery into cytomegalovirus infections which was awarded the Australian Museum Eureka Prize for Scientific Research.

> I commenced my position and invited world-class researchers to join me to establish Australia's first research centre of excellence in eye disease.
>
> In the early years our researchers received 80 per cent of government grant funding to eye research in Australia as well as significant philanthropic donations.
>
> The research teams flourished with this injection of funding and went on to produce some of our biggest scientific breakthroughs, inventions, treatments and gene therapies.
>
> Professor Ian Constable AO

RESEARCH IMPACT 1983-2023

989 grants

2,255 publications

21 patents

11 inventions

LIONS EYE BANK

5,682 corneal transplants

2,842 sclera transplanted

200+ clinical trials conducted

Greatest inventions and innovative achievements

Developed **Adenoviral vector 101** gene therapy with Adverum Biotechnologies for the treatment of wet age-related macular degeneration. Listed on NYSE and currently in trials.

Prototype development for non-invasive **intracranial pressure** measurement, which will provide a benefit to hospital accident and emergency departments, and to astronauts in space.

Developed the **first artificial cornea**, the AlphaCor, and successfully implanted it into patients in the US, Australia and India.

Invented the **Virna Glaucoma Drainage Device** a low cost device now being manufactured and used in Indonesia with over 1,000 implanted.

Invented the **XEN® Gel Stent** which has been used successfully in more than **150,000** glaucoma patients globally.

Excimer laser surgical system to correct refractive errors of the eye such as myopia with successful international sales of machines up to 2010.

Developed the **central retinal vein occlusion bypass laser surgery** procedure. A treatment improving vision for sufferers of nonischemic central retinal vein occlusion.

Professor David Mackey AO has been involved in some of **Australia's largest studies**. His gene discoveries, particularly in glaucoma and myopia, have provided the basis for research projects in the quest to find new treatments and identify at-risk patients.

RP11 Developed a drug to treat retinitis pigmentosa gene 11. It has been given the tick of approval by the FDA to start human trials.

DNA bank – Australia's only biobank that stores DNA from patients and their family members with a genetic eye disease. Also home to one of the largest glaucoma biobanks in the world, with over 5,000 DNA samples, supporting research into the genetics of glaucoma.

Invented the **Barrett Universal II Formula**, considered one of the most accurate intraocular lens power calculation formulas. Globally recognised to improve the refractive accuracy outcomes of cataract surgery.

Developed **immune therapy** to manage treatment of cytomegalovirus (CMV) in transplant patients. This breakthrough provides a new strategy to control CMV reactivation and has the potential to reduce rates of sickness and death among organ and bone marrow transplant recipients.

80 clinical trials and studies are managed per year. Clinical trials enable new developments and treatments for blinding eye conditions to be made available to patients attending the Lions Eye Institute's clinics.

The Perron Paediatric Retinopathy Initiative treats diabetes-related vision loss in children, undertakes research to detect the disease earlier and find new treatments. This ensures that no child in Western Australia will lose their eyesight due to diabetes.

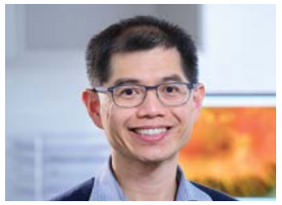
Meet our world-class researchers behind these innovations and inventions

Professor Ian Constable AO
Founder of the Lions Eye Institute and leader in ophthalmic care in Western Australia. Led the clinical trials to discover gene therapy to treat wet age-related macular degeneration and the artificial cornea.

Professor Bill Morgan
Co-invented the original XEN® Gel Stent and Virna glaucoma drainage device, intracranial pressure (ICP) prototype and space agency work.

Professor Dao-Yi Yu AM
Co-invented the XEN® Gel Stent that revolutionised the treatment of glaucoma, CRVO bypass, ICP prototype and Tonometer.

Professor David Mackey AO
Received the largest National Health and Medical Research Council government grant for eye research in Australia.



Associate Professor Fred Chen
Leading development of cures for genetic eye disease, in particular retinitis pigmentosa, and significant clinical trials.

Professor Ian McAllister
Pioneered the CRVO bypass laser surgery procedure.

Professor Mariapia Degli-Esposti
Received the Eureka Prize in Scientific Research 2019 for discoveries in the field of immune therapy.

Professor Graham Barrett AM
Leading cataract surgeon and intraocular lens design, calculation and assessment pioneer.

Associate Professor Hessom Razavi
Developed the virtual reality eyeball navigation system to enhance teaching in eye care for medical students. This virtual eyeball also helps demystify eye disease for patients.

Professor Elizabeth Rakoczy
Recipient of the prestigious CSL Florey Next Generation Award for leading pioneering research to discover gene therapy for wet age-related macular degeneration.

Associate Professor Angus Turner
Established Lions Outback Vision and led world-first research that proved an artificial intelligence device can accurately detect eye disease in Aboriginal Australians.

Professor Chandra Balaratnasingam
Established the Perron Paediatric Retinopathy Initiative. This is the state's first screening and treatment clinic to manage and treat diabetes-related vision loss in children.

The most common treatment for glaucoma

XEN® Gel Stent

Invented by Professor Dao-Yi Yu AM

An invention to treat glaucoma, the leading cause of irreversible blindness. The XEN® Gel Stent invented by Professor Dao-Yi Yu AM at the Lions Eye Institute over two decades (1996-2016) has revolutionised glaucoma treatment globally.

There is no cure for glaucoma. Glaucoma patients are at high risk of vision loss and blindness as the disease causes continuous deterioration of vision due to abnormally high eye pressure. Once vision is lost it cannot be restored. Previous glaucoma procedures did not produce consistent results. Surgeons often reported that although the operation went smoothly on the day, complications would arise the following day.

1980s

During the 1980s, Professor Yu devoted himself to leading a team in the development of the optimal glaucoma treatment system. A device and surgery that would cause minimal damage to the eye yet create long term fluid drainage to the surrounding tissue. This would minimise post-operative complications and speed up recovery. In 1996 Professor Yu and his team began working on elements that would become one of the most common glaucoma surgeries performed globally.

Since its US FDA approval in 2016, the XEN® Gel Stent has been successfully implanted in over 150,000 patients globally (including 1,000 in Western Australia).

The XEN® Gel Stent received CE safety certification in the European Union in 2017 and was approved by Australia's Therapeutic Goods Administration in 2018. It is globally recognised as one of the safest and most effective treatments for glaucoma.

The XEN® Gel Stent allows surgery to be performed earlier in the course of the disease. It allows patients to stop taking eye drops and free themselves from continual glaucoma medication side effects. Its effectiveness at reducing pressure in the eye is generally better than medication and rivals its competitors.

Description of the innovation

The XEN® Gel Stent is comprised of a number of innovative elements that make up a complete surgical system, including:

- Development of a world-first gelatine glaucoma stent
- Development of a world-first robotic introducer system
- Development of a world-first ab-interno (within eye) injection technique

The 30 minute procedure to implant the gelatine stent is done under a local anaesthetic and involves only a 1.5mm incision into the clear part of the eye, which does not need stitches. Patients recover faster and with less risk of complication compared to other standard surgery. As this surgery is safer (and much shorter in duration) it is the preferred option earlier in the glaucoma treatment process.

Professor Bill Morgan examining Jill's XEN® Gel Stents. Jill has had a stent implanted in both eyes

The XEN® Gel Stent transformed glaucoma treatment

Professor Yu transformed glaucoma surgery with the invention of the XEN® Gel Stent. It remains the most effective minimally invasive glaucoma surgical technique with proven long-term effectiveness. Published data demonstrates effective drainage and pressure reduction for more than seven years.

Impact

Around 300,000 Australians and more than 70 million people worldwide are affected by glaucoma. The potential of the XEN® Gel Stent to save sight is enormous.

More than 150,000 glaucoma patients have retained their eyesight since the XEN® Gel Stent was approved by the FDA in 2016.

Numerous publications confirm its validity as one of the most effective and safe surgeries for glaucoma patients.

Globally, it is now one of the most common treatments for glaucoma.

The XEN® Gel Stent has helped glaucoma patients by:

- Reducing time in surgery
- Reducing vision loss
- Speeding up recovery and reducing complications
- Reducing post-operative follow up visitations
- Decreasing medication use and side effects
- Increasing quality of life and living standards
- Decreasing the economic impact of vision loss
- Decreasing the social impact of vision loss

Philanthropic and government support

This invention was made possible due to seed funding from the McCusker Charitable Foundation in the late 1980s which was leveraged to obtain other major government grant funding.

Modifying viruses to restore sight

Gene therapy treatment for wet age-related macular degeneration

Invented by Professor Elizabeth Rakoczy

> **I have been fortunate to be around when recombinant gene technology became available so we could turn infectious viruses into useful delivery vehicles to develop localised 'biofactories' of a desired medication. In this case, in the retina at the back of the eye.**
>
> **Professor Elizabeth Rakoczy**

The Hon Greg Hunt MP presents Professor Rakoczy with the CSL Florey Medal at Parliament House in 2017

Professor Rakoczy propelled the pioneering research that led to the development of a new gene therapy for wet age-related macular degeneration (AMD).

There are 112,000 people in Australia who have wet AMD, with 8,000 new cases diagnosed each year.

Wet AMD is a long-lasting eye disorder that causes blurred vision or a blind spot in the central vision. The macula is the part of the retina that gives the eye clear vision in the direct line of sight. Wet AMD is usually caused by blood vessels that leak fluid or blood into the macula. This can result in a rapid and severe loss of central vision, which can make it difficult to perform everyday activities such as reading, driving and recognising faces. Wet AMD is a serious and progressive condition, and if left untreated it leads to permanent vision loss.

Wet AMD is the most common cause of blindness in the developed world and is currently treated with painful eye injections (anti-VEGF therapies) delivered by a retinal specialist every four to eight weeks. However, the gene therapy developed by Professor Rakoczy has the potential to extend treatment benefit from weeks to years.

A 20 year journey to find a scientific breakthrough

In the early 1990s, the world's first gene therapy treatments were taking shape. Professor Rakoczy and her international team were second in the world to demonstrate that gene therapy can work. She demonstrated that vision of dogs which suffered from Leber's Congenital Amarousis (LCA) can be recovered. Since then, this approach has become a clinical reality and to date around 200 people have been treated world-wide.

However LCA is a relatively rare disease when compared to the millions that suffer from wet AMD. To address the treatment of wet AMD Professor Rakoczy invented a novel gene therapy approach called the "**biofactory**". The **biofactory** produces the medication **in situ** in the eye and eliminates the necessity of regular injections that remain the standard treatment to date. A single injection of the **biofactory** into the eye provides protection from the development of leaky new blood vessels for years. Pre-clinical trials demonstrated a near permanent treatment.

The science behind this treatment was 20 years in the making. When the **biofactory** trials started at the Lions Eye Institute it was the first time in the world that a gene therapy approach was used to treat a common, complex disease.

It takes a dedicated team

It took the dedication and commitment of more than fifty scientists, cell and molecular biologists, physicists, statisticians, virologists, veterinary scientists, ophthalmologists and students who worked together for over 20 years to bring this treatment to fruition.

Seed funding

The original laboratory work that led to the clinical trial was supported during the early 1990s by a National Health and Medical Research Council (NHMRC) grant, Juvenile Diabetes International, Foundation for the Prevention of Blindness USA, Richard Pearce Bequest, Retina Australia and the Lions Save-Sight Foundation.

Professor Rakoczy's research will impact thousands of lives

The gene therapy for wet AMD is an example of a basic research project that could be translated into a revolutionary treatment for patients. It has the potential to help millions of people suffering from wet AMD, who will be able to have single injection therapy to control their condition. It is one of a handful of projects in Australia that has been successful achieving "**bench to bedside**" reach.

Human trials

Human clinical trials phase one and two have been successful. One of those involved in the trial was Gwenda Boultbee, 91, who had macular degeneration diagnosed in one eye. "I've been able to drive, which I probably wouldn't have been able to because the sight in that eye's very good, it's almost normal," she said.

"The gene therapy is marvellous, it's absolutely wonderful. I feel blessed to be able to have had it."

Adverum Biotechnologies PTY, United States

A US company called Avalanche Biotechnologies (now Adverum Biotechnologies) licensed the technology in 2005 and successfully floated on the NASDAQ in 2014 raising $400 million then subsequently raised $300 million to bring this new treatment to market.

Phase one and two human trials were successfully completed at the Lions Eye Institute. Adverum Biotechnologies has continued human trials and a modified version of the originally licensed medication called ixoberogene soroparvovec (Ixo-vec) received fast track designation from the FDA for the treatment of wet AMD.

Ixo-vec also received PRIME designation from the European Medicines Agency and the Innovation Passport from the United Kingdom's Medicines and Healthcare Products Regulatory Agency for the treatment of wet AMD.

After COVID related delays it is expected to reach the market in 2025.

Florey Medal of scientific achievement

Recognising the international importance of this research, Professor Rakoczy was awarded the 2017 Florey Medal. The Florey Medal, established by the Australian Institute of Policy and Science, recognises significant lifetime achievement in biomedical science and/or human health advancement. This is the first time the Florey Medal has been awarded for gene therapy research.

National Health and Medical Research Council Top 10 best paper

In 2005, the NHMRC named this research in its ten of the best national research projects.

A vision that became reality

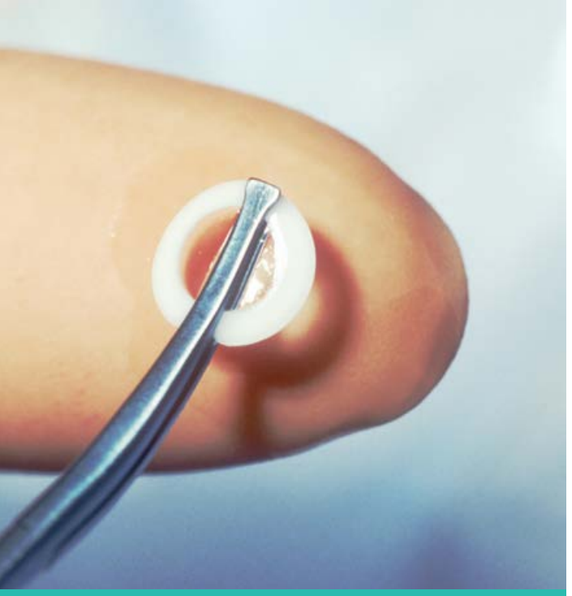
The Lions Eye Institute was established to develop sight saving treatments via first-class research and to commercialise the end products to generate income for further research projects.

Ixo-vec is a perfect example of the success of this strategy developed by our visionary founder, Professor Ian Constable.

Inventions restoring sight

Artificial cornea

Professor Traian Chirila developed the first soft artificial cornea, the AlphaCor, produced and successfully implanted into patients in the US, Australia and India.



The AlphaCor improved the sight of patients who were unlikely to have success from a traditional human donor transplant

Invented by Professor Traian Chirila

People have attempted to make an artificial cornea for more than 200 years.

Scientists at the Lions Eye Institute succeeded with the AlphaCor by using a one-piece polymer device comprising a clear core that enables vision, and a sponge rim that encourages the ingrowth of host cells to anchor it in place in the eye. AlphaCor is the world's first true soft artificial cornea.

The AlphaCor was the result of twelve years of research at the Lions Eye Institute supported by the National Health and Medical Research Council.

Corneal blindness

Corneal blindness refers to a type of blindness that occurs when the cornea becomes damaged or diseased to the extent that it results in significant vision loss or complete blindness. The cornea is the clear, dome-shaped outer layer of the eye that covers the iris, pupil and anterior chamber, and it plays a critical role in focusing light into the eye.

The most common causes of corneal blindness include infections, injuries, degenerative diseases and inherited genetic disorders.

Treatment

Corneal blindness can generally be treated by a human donor tissue graft, however it does not succeed in all cases. To help patients who were not suitable to receive a graft, scientists at the Lions Eye Institute carried out research into what would become the world's first soft artificial cornea, providing a sight saving solution.

Image of a person's eye with corneal blindness

Funding

In 1995 the Lions Eye Institute was awarded a government grant valued at nearly $3 million for research into the development of an artificial cornea for the human eye. By 1998 the artificial cornea had been designed and developed and implanted into seven patients. Patrick Critchison, aged 79, became the first patient in the world to receive an artificial cornea transplant. In the same year, the implants were trialled in surgery and proven to improve people's cosmetic appearance when they have lost an eye.

Human trials

Multi-centre clinical trials, led by scientists at the Lions Eye Institute, were supported by the National Health and Medical Research Council. The trials were conducted in patients considered at high risk for corneal graft failure between 1998 and 2002. The results consistently demonstrated better outcomes with AlphaCor than donor tissue for many high-risk indications. Although a number of the patients studied had poor visual potential due to other diseases in the eye unrelated to the cornea, many experienced a visual improvement that enabled them to be classed as functionally sighted instead of legally blind.

The research also demonstrated that when the device needs to be changed, it can either be swapped for another AlphaCor or replaced with human corneal tissue. No patient in the study lost visual acuity or lost structural integrity to their affected eye.

Argus Biomedical

The AlphaCor technology was licensed to Argus Biomedical in December 2000. Commercialisation activity included establishing a commercial production facility in Perth, implementing a quality system audited to the Therapeutic Goods Administration and CE Mark (European) standards, and submitting the technology for approval by the US Food and Drug Administration. As a result of these efforts, the AlphaCor was made commercially available to the world's leading corneal surgeons.

Commercialisation

The development of the AlphaCor, both scientifically and commercially, represents a model case study illustrating how grant funded research and development can be progressed through clinical trials to a global commercial product, utilising expertise available in Australia.

In 2002, the AlphaCor became the world's first internationally approved artificial cornea. This stimulated the development of artificial corneal innovation across the globe.

Globally recognised to improve the outcomes of cataract surgery

Barrett Universal II Formula

Developed by Professor Graham Barrett AM

Leading cataract surgeon and intraocular lens designer, Professor Graham Barrett AM, developed the calculation that is globally considered to be the most accurate intraocular lens power calculation formula that has stood the test of time.

Cataracts are the leading cause of vision impairment, causing a third of worldwide blindness.

94 million

Cataracts affect approximately 94 million people and cause moderate to severe vision loss in over 80 per cent of cases. As populations age and average life expectancy continues to increase worldwide, the number of people with cataracts will continue to grow.

World Health Organization

Cataracts

Cataracts cause vision loss and blindness.

Cataracts can develop due to a variety of factors including ageing, injury to the eye and certain medical conditions or medications. The most common cause of cataracts is age-related changes to the lens of the eye, which can cause it to become more opaque over time.

Once you have cataracts, the lens of your eye will always be cloudy – it won't recover. Glasses and improved lighting may help to improve vision in the early stages of cataracts, but surgery is the only effective way to remove a cataract.

Barrett Universal II Formula

The Barrett Universal II Formula is globally considered to be the most accurate intraocular lens power calculation formula, with studies of more than 18,500 eyes establishing that the Barrett Universal II Formula has lower prediction errors compared to other formulae.

The Barrett Universal II Formula is a mathematical equation that uses several parameters to calculate the intraocular lens (IOL) power needed to replace the natural lens during cataract surgery.

The Barrett Universal II Formula is globally recognised and used to improve the refractive accuracy outcomes of cataract surgery.

The formula is based on the patient's pre-operative measurements including the axial length of the eye and the keratometry readings.

Patients receive more accurate corrections in their intraocular lenses when undergoing cataract surgery.

Thanks to the Barrett Universal II Formula, surgical treatment of cataracts is very safe and painless.

The surgery involves removing the clouded lens and replacing it with an artificial clear lens. The procedure generally only requires a local anaesthetic and is carried out by an ophthalmologist. It usually takes about half an hour.

Cataract surgery is generally very successful in restoring vision. Once the clouded lens is replaced, a cataract won't form again in that eye.

Professor Barrett's formula has impacted millions of lives

In recognition of Professor Barrett's significant service to ophthalmology, in 2022 he was awarded a Member (AM) in the General Division of the Order of Australia.

In addition, he has been the recipient of numerous industry awards including the RANZCO Norman Gregg Medal; the Ridley Medal from the European Society of Cataract and Refractive Surgeons; the Binkhorst Medal, awarded by the American Society of Cataract and Refractive Surgeons; and the Asia-Pacific Academy of Ophthalmology Susruta Award.

He is the founding and past President of the Australasian Society of Cataract and Refractive Surgeons, past President of the Asia Pacific Association of Cataract and Refractive Surgeons and past President of the International Intraocular Implant Club.

A treatment to cure patients with nonischemic central retinal vein occlusion (CRVO)

A cure for central retinal vein occlusion

Invented by Professor Ian McAllister

CRVO bypass laser procedure invented by Professor Ian McAllister.

A decades-long commitment to finding a cure for CRVO

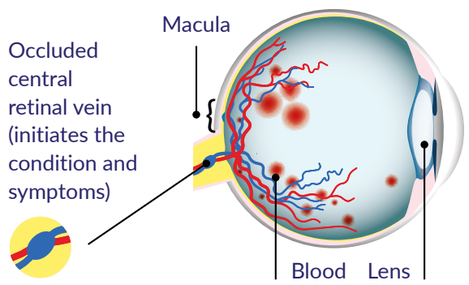
Over nearly two decades, and with funding received from two government grants in the late 1990s and in the mid 2000s, Professor Ian McAllister designed a bespoke laser with powerful precise measurements to treat and cure people with CRVO.

Since 2010 it has been used to treat over 400 patients, with some referred from the eastern states, Indonesia and the US. Over the years, with refining, success rates increased from 75 per cent to 85 per cent.

What is central retinal vein occlusion?

The retina is a thin layer of tissue at the back of the eye, near the optic nerve. It needs a constant supply of blood to function properly.

CRVO is a blockage of the main vein carrying blood out of the retina. There is only one exit point for the blood, through the optic nerve. When this vein is blocked it causes pressure in the vein to rise resulting in swelling and leakage of blood into the surrounding retinal tissue. Complications include loss of central vision, severe pain and eventually blindness.



Previous treatments were not a permanent solution

Prior to Professor McAllister's groundbreaking discovery, the only treatments available for CRVO were painful, regular injections into the eye. These injections can be expensive, and some people need them for the rest of their life. The injections contain vascular endothelial growth factor (VEGF) inhibitors, which slow blood leaking into the eye from the blocked vein. It is this leakage that can cause vision loss.

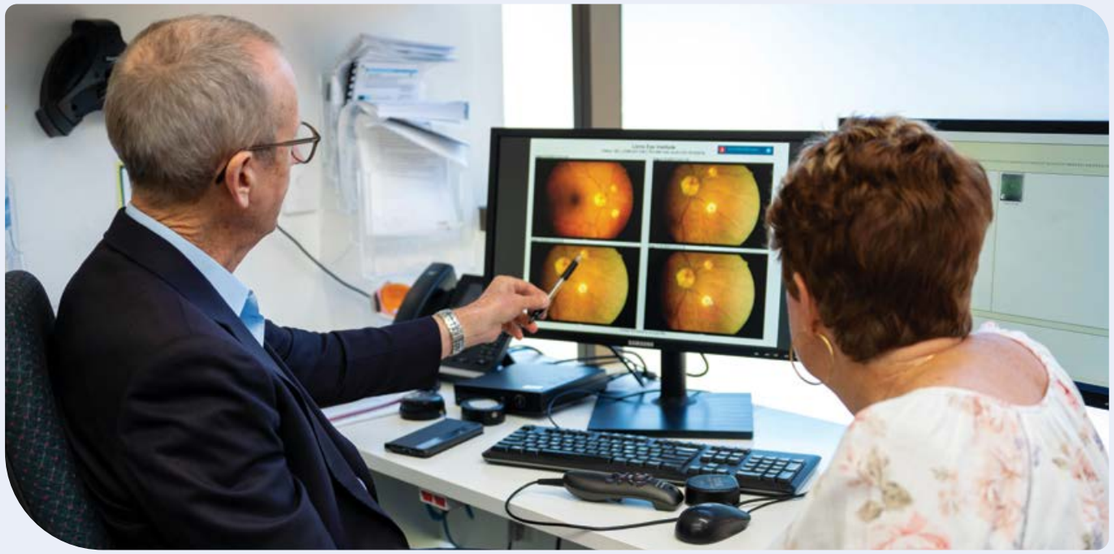
The injections give some improvement in vision, but this does not last very long and does not resolve the blockage which continues to cause high pressure within the vein.

Eyesight restored

Clinical trials led by Professor McAllister showed that using injections in conjunction with his laser anastomosis treatment offered the best success rate for patients. One treatment, the laser, addresses the pressure in the vein and the other treatment, the injection, prevents further leakage.

Results from the trials have shown that patients who receive the combination of treatments still need some injections, but very few compared to patients who don't have the laser treatment. Additionally, patients who receive the combination of treatments end up with better vision. In many cases vision is completely restored within a few months, and soon after, some patients can stop the injections completely.

Patients can then resume their normal daily activities such as working, driving, or looking after their children or grandchildren.



Professor McAllister with patient Dianne

25 years of research

In CRVO, the exact location of the blockage cannot be seen as it lies within the optic nerve making attempts to unblock it impossible. Over a period spanning 25 years Professor McAllister and his research team have explored a number of avenues to overcome this, resulting in the development of the bypass laser treatment to permanently restore vision in people with CRVO.

"The vein itself, which is about the diameter of an eyelash, is in an incredibly high-risk area of the eye," said Professor McAllister.

"Even if you manage to remove the blockage, the circumstances that created it are still present and it will likely reoccur. If you can't unblock it, the other thing is to try and work out how to bypass it. This creates an alternative passage for the blood to exit the eye."

How the bypass procedure works

A special high-powered laser is used to create a channel between the blocked vein (which is under high pressure), through a tough barrier called Bruch's membrane, and into a nearby choroidal vein (which has lower pressure). The difference in pressure encourages blood to flow through to the choroidal vein and exit the eye. In a normal eye there are no connections between these two vascular layers.

Dianne, a patient of the Lions Eye Institute, has had her vision restored thanks to Professor McAllister's invention for CRVO

"It's called creating an anastomotic connection. The procedure can be done as an outpatient treatment, is completely painless and requires no anaesthetic or surgery," said Professor McAllister.

Professor McAllister's life's work has focused on retinal venous occlusive disease.

Scientific breakthrough in ocular immunology

Discovery into the life-threatening viral infection, cytomegalovirus

A team led by Professor Mariapia Degli-Esposti and including Dr Chris Andoniou and Peter Fleming from the Lions Eye Institute, in collaboration with Professor Geoff Hill now at the Fred Hutchinson Cancer Research Center in Seattle, made groundbreaking discoveries into improving the outcomes of viral infections in bone marrow transplant recipients.

Using a world-first pre-clinical model, they found a way to manage cytomegalovirus, one of the most common life-threatening viral infections that affects bone marrow and organ transplant patients. The team discovered that antibodies can efficiently and safely prevent the virus from coming back and causing disease if they are matched to the infecting strain of cytomegalovirus (CMV strain-specific antibodies). This discovery will guide new treatments to ensure patients can more safely receive life-saving transplants.

The research was published in 2019 in the prestigious journal **Science** and awarded The Australian Museum's prestigious Eureka Prize for Scientific Research.

Professor Degli-Esposti, who is now jointly based at the Monash Biomedicine Discovery Institute and heads the Lions Eye Institute's Experimental Immunology Group, said receiving the Eureka Prize was a great acknowledgment of the team's research and a tremendous honour.

This award also indicates the potential of this research to improve outcomes for patients not only in Australia, but globally.

Professor Mariapia Degli-Esposti

Viral infection can contribute to the development of autoimmune diseases

This research focused on Sjogren's Syndrome, a highly prevalent autoimmune disease in which a person's own immune system attacks the glands that produce secretions, including tears and saliva. Patients with this disease suffer overwhelming discomfort, and the syndrome can result in severe damage to the cornea. There is no cure for Sjogren's Syndrome or its ocular complications.

The team, including Dr Iona Schuster, developed a new preclinical model for Sjogren's Syndrome that fully mimics the human conditions, yielding fresh perspectives on this disease. Specifically, they demonstrated that inflammation triggered by a prevalent viral infection may play a role in the development of the disease, and they identified critical pathways that contribute to disease development. These groundbreaking studies were published in **Immunity**, the world's leading immunology journal.

These findings are poised to inform novel strategies for treating patients with Sjogren's Syndrome, and potentially other autoimmune or inflammatory diseases which have complications that severely affect vision.

Eye disease drug trial gets tick of approval

Treatment for retinitis pigmentosa

There is new hope for sufferers with retinitis pigmentosa (RP11).

Associate Professor Fred Chen has dedicated his career to solving the mystery behind inherited retinal diseases, the leading cause of childhood blindness.

Associate Professor Chen's groundbreaking research into a drug to treat retinitis pigmentosa gene 11 has been given the tick of approval by the FDA to start human trials.

This is the first treatment of its kind to reach human clinical tests for retinitis pigmentosa, a rare inherited eye disease that causes progressive vision loss. There's a well-characterised patient population here in Perth with this disease and they don't have any treatment options. The drug was developed through testing on samples provided by these patients.

Vision Pharma, a joint venture between the Lions Eye Institute and PYC Therapeutics, is the company bringing this drug to market.

Inherited retinal diseases

Inherited retinal diseases (IRDs) are a broad group of genetic eye conditions causing severe vision loss and legal blindness. IRDs can commence at birth but are more commonly diagnosed in childhood. However, if left undiagnosed they may cause severe irreversible sight damage in adulthood. IRDs, caused by a genetic fault, affect one in 2,000 people globally.

Philanthropy advances science faster

We wish to acknowledge the important part our supporters have played in this scientific breakthrough. With the help of our philanthropic supporters, government grants and other grant funding, Associate Professor Chen and his team have been able to significantly advance their research resulting in sight saving outcomes for sufferers of IRDs.

RP11 drug receives US FDA approval

Associate Professor Fred Chen with his patient, Eamon

Genetic studies

Australia's largest population studies

Conducting large population studies can identify genetic and environmental factors causing disease, thereby guiding research, interventions and public health policy.

Globally renowned expert Professor David Mackey AO and his team are conducting population studies to discover which genes and environmental factors are involved in various eye conditions. His gene discoveries, particularly in glaucoma and myopia (short-sightedness), have provided the basis for research projects in the quest to find new treatments and identify at-risk patients.

Researchers at the Lions Eye Institute have worked on some of Australia's biggest population studies.

Professor Mackey received the highest ranked National Health and Medical Research Council Program Grant awarded in 2019 for a population study into glaucoma and has been involved in some of Australia's largest studies.

The Lions Eye Institute has also been involved in several of Western Australia's largest population studies.

The **Busselton Healthy Aging Study** commenced in 1966 and is globally recognised as one of the longest running population health research programs of its kind.

The study has collected measures on **vision** and hearing disorders, respiratory and cardiovascular disease, muscle strength and physical function, obesity, diabetes, sleep disorders, bone health, spinal pain, and mental health and cognition from over 5,100 adults born between 1946 and 1964.

Eye examinations are conducted at two time points and a genome-wide association study carried out on the entire cohort. A major finding of the study was that people with skin cancer were half as likely to have myopia. This result shows that while spending more time outdoors increases the risk of skin cancer, it reduces the risk of myopia.

The Raine Study is a longitudinal study that began in 1989, recruiting nearly 3,000 women at around 18 weeks of pregnancy. **It is one of the world's largest and most successful studies of the influences of genetics, pregnancy, childhood and adolescence on subsequent health and developmental outcomes.**

The 20 year and 28 year follow-up of 2,000 participants from Gen-2 of the Raine Study included a focus on eye health. Participants have recently been re-examined as part of the 28 year follow-up. This is one of the first studies of eye health and diseases in young adults, for which very little data exists. A major finding from the study was that people can develop myopia even in their early adult years and this relates to lack of time outdoors.

The ORIGINS Project is the largest study of its kind in Australia, following 10,000 children from before birth. Learning about early life events and their impact on the eye will provide data to improve child and adult health. The unique long-term study is one of the most comprehensive studies of pregnant women and their families in Australia, recruiting families who are receiving pregnancy care or planning to deliver their baby at Joondalup Health Campus, as well as families from the Joondalup and Wanneroo communities. Professor Mackey's team has approval to start eye examinations of the ORIGINS children over the next five years. **This study will help provide an increased understanding that an individual's lifetime health and disease may be programmed at a very early stage, while a child is still in the womb.**

The total ORIGINS population will consist of more than 20,000 individuals within family units – including mothers, partners, children and siblings.

Global and national collaborations are key

Professor Mackey is a lead investigator in the International Glaucoma Genetics Consortium and the Consortium for Refractive Error and Myopia and is past President of the International Society for Genetic Eye Disease and Retinoblastoma.

In 1993, Professor Mackey initiated the Glaucoma Inheritance Study in Tasmania, thereby creating one of the largest glaucoma biobanks in the world with over 5,000 DNA samples and clinical material from familial and sporadic cases of glaucoma.

Professor Mackey has collaborations from numerous institutions worldwide. These include:

- John Hopkins University
- University College London
- Massachusetts Eye and Ear Institute
- National Human Genome Research Institute
- Boston Children's Hospital
- QIMR Berghofer Medical Research Institute
- Duke University Medical Centre
- Flinders University
- University of California
- University of Tasmania
- Kings College London
- Centre for Eye Research Australia

Professor Mackey is the world's most published author in glaucoma genetics.

127 loci identified to cause glaucoma in global population study

Professor Mackey was involved with the genome-wide meta analysis that identified 127 primary open-angle glaucoma (POAG) loci with consistent effect across ancestries. POAG is a heritable common cause of blindness world-wide.

Multi-ethnic meta-analysis

The research involved a large multi-ethnic meta-analysis of genome-wide association studies on a total of 34,179 cases and 349,321 controls, identifying 44 previously unreported risk loci and confirming 83 loci that were previously known. Most loci have broadly consistent effects across European, Asian and African ancestries.

Several new genes identified

The study also found that the integration of multiple lines of genetic evidence support the functional relevance of the identified POAG pathogenesis, including the following genes: SVEP1, RERE, VCAM1, ZNF638, CLICS, SLC2A12, YAP1, MXRAS and SMAD6.

Treatments identified

New treatments have been identified for at-risk patients. Several drug compounds targeting POAG risk genes were identified in the study that may be potential glaucoma therapeutic candidates.

Publication

Genome-wide meta-analysis identifies 127 open-angle glaucoma loci with consistent effect across ancestries. Nat Commun. 2021 Feb 24;12(1):1258. doi: 10.1038/s41467-020-20851-4. PMID: 33627673; PMCID: PMC7904932. https://pubmed.ncbi.nlm.nih.gov/33627673/

Professor David Mackey AO was named in the 2023 Ophthalmologist Power List. The list highlights the excellence and impact of the 100 most influential and inspirational people in ophthalmology from around the world.

Large population studies have several advantages:

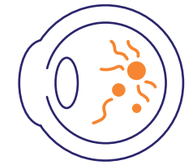
1. **Statistical power:** Large population studies can provide greater statistical power, which means they are better able to detect small but meaningful differences or associations between variables. With a larger sample size, the results are more likely to be representative of the population being studied and less likely to be affected by chance.
2. **Generalisability:** Large population studies allow for more generalisable findings. With a larger and more diverse sample, the results are more likely to be applicable to different populations, settings and contexts.
3. **Increased accuracy:** Large population studies can increase the accuracy of estimates by reducing sampling error. With a larger sample the margin of error decreases, and the estimates are more likely to be closer to the true population values.
4. **Subgroup analysis:** Large population studies allow for subgroup analysis. Researchers can examine the associations between variables in different subgroups, such as age, sex, race, ethnicity, or socioeconomic status, which can provide insights into health disparities and inform targeted interventions.
5. **Longitudinal analysis:** Large population studies can enable longitudinal analysis. Researchers can follow the same individuals over time and examine changes in variables, such as health outcomes or risk factors, which can provide insights into the natural history of diseases or the effectiveness of interventions.

Ben, a participant of the Perron Paediatric Retinopathy Initiative

A new initiative preventing childhood blindness

Perron Paediatric Retinopathy Initiative

Thanks to the support of the Stan Perron Charitable Foundation, an initiative has been set up to treat diabetes-related vision loss in children, undertake research to detect the disease earlier and find new treatments.



Australia has one of the highest rates of type 1 diabetes in the world, with nearly 2,500 new cases each year – an average of seven new cases a day.

Nearly 100 per cent of children with type 1 diabetes will eventually develop diabetic retinopathy.

Diabetes-related vision loss

Type 1 and 2 diabetes are a major cause of severe and irreversible vision loss in children and adolescents globally, with a peak onset in 11 to 12 year olds. In 2014, there were approximately 40 million people with type 1 diabetes worldwide. The disease prevalence increased by 28 per cent over the preceding seven-year period in the 10 to 19 year old age group.

New screening clinic ensures early detection

Led by Professor Chandra Balaratnasingam, in 2021 the Lions Eye Institute established the state's first screening and treatment clinic.

In collaboration with Perth Children's Hospital and Diabetes WA, at risk patients are identified and immediately referred to the Lions Eye Institute's paediatric screening clinic for testing of diabetes-related vision loss.

Early detection ensures that no child in Western Australia will lose their eyesight due to diabetes. At the first signs of diabetic retinopathy, patients will be provided with a management and treatment plan.

Exploratory research

Led by Professors Balaratnasingam and Dao-Yi Yu AM, exploratory research is underway to:

1. Develop new ways to detect early retinal vascular dysfunction prior to vision loss.
2. Develop new ocular therapeutic interventions to treat retinal vascular dysfunction due to diabetic retinopathy.

Philanthropy accelerating medical advances for our children

Thanks to the Stan Perron Charitable Foundation, children and adolescents with diabetes have access to an ophthalmic screening clinic along with the hope that research may lead to new cures and treatments.

Established in 1986

Lions Eye Bank of Western Australia

5,682
corneal transplants

2,842
sclera transplanted by Lions Eye Bank

The Lions Eye Bank is responsible for collecting, processing, and distributing corneal and sclera tissue throughout Western Australia.

To date, it has provided high quality tissue for almost 6,000 procedures. With the increasing number of Western Australians requiring a corneal transplant, there is a consistent and growing demand for corneas.

Eye tissue donation can restore sight, prevent blindness, and dramatically change the quality of an individual's life. Donor tissue is also crucial to advancing research and developing surgical techniques.

Research Fellow Dr Jelena Kezic

Dr Kezic, transplant coordinator and Research Fellow at Lions Eye Bank, is examining ways to optimise donor cornea preparation and testing new ways to improve the longevity of endothelial grafts for corneal transplantation.

This research will help corneal transplant patients avoid recurrent surgeries and is testing the use of eye drops containing a Rho-kinase inhibitor drug. This drug has been shown to promote wound healing and has the potential to increase the numbers of corneal endothelial cells (which can be lost or damaged during surgery) and are needed for clear sight.

The Lions Eye Bank was established in 1986 by Lions Save-Sight Foundation. It is a not-for-profit organisation and completely self-funded through cost recovery.

The Lions Eye Bank of Western Australia is the only eye bank in the state. It is one of only five eye banks in all of Australia. At the Lions Eye Bank, all donor tissue is used for either transplantation, ethically approved research, or surgical training with the consent of the donor's family. This tissue is crucial for advancing research and developing treatments.

Global leader in ophthalmic trials

Clinical Trials Centre

Providing patients with access to innovative treatments and technologies.

6 to 96	21	300+	1,000	1983
years old	**Multi-disciplinary and multi-functional team members**	**Number of clinical trials conducted**	**Participant trial visits per year**	**The year the first clinical trial was conducted**
The age of our youngest and oldest trial participants				

Over the past 40 years the Lions Eye Institute has conducted numerous clinical trials related to eye diseases, such as age-related macular degeneration, diabetic retinopathy and glaucoma.

These trials involve testing new drugs or treatments, evaluating the safety and efficacy of existing treatments, or exploring new diagnostic tools and technologies.

Clinical trials conducted at the Lions Eye Institute are composed of grant funded trials that are led by our ophthalmologists and scientists as well as global industry sponsored trials. We also collaborate with other local researchers by providing eye assessments for their non-ophthalmic clinical trials.

Leading global provider of ophthalmic trials

Access to a large patient population, a robust infrastructure with cutting-edge equipment, along with accomplished ophthalmologists and experienced clinical trials staff that can generate high-quality data, makes the Lions Eye Institute a highly sought after destination for clinical trials.

As a result, we receive numerous trial requests from countries around the world including the US and China.

Sight saving achievements

These trials have included some of our biggest scientific sight saving achievements, such as:

- The XEN® Gel Stent to treat glaucoma
- Gene therapy to treat wet age-related macular degeneration
- AlphaCor, the world's first soft artificial cornea
- Gene therapy to treat inherited retinal diseases
- The Perron Paediatric Retinopathy Initiative, preventing diabetes-related vision loss in children

The centre manages over 80 trials at any one time, exploring potential treatments and striving to improve patient outcomes.

Clinical trials overview 2023

16 non-ophthalmic studies being supported (i.e. cancer, neurology, respirology, gastroenterology, rheumatology, haematology)	**25** active sponsor-initiated or investigator-initiated clinical trials	**50** active external clinical trials

13 per cent of current studies are at Phase 1	**30** per cent of current studies are at Phase 2	**57** per cent of current studies are at Phase 3	**250+** patients currently in a clinical trial

The four phases of clinical trials

Clinical trials are research studies that involve human participants to test the safety and effectiveness of new medical treatments, drugs or interventions. Clinical trials are conducted to determine whether a particular treatment or intervention is safe, effective, and beneficial for patients with a specific medical condition.

Clinical trials follow a rigorous protocol that includes multiple phases to evaluate the safety and efficacy of a new treatment. These phases include:

Phase 1: This phase involves testing the treatment on a small group of people (usually 20-100) to evaluate the safety and dosage of the treatment.

Phase 2: In this phase, the treatment is tested on a larger group of people (usually hundreds) to evaluate its effectiveness and side effects.

Phase 3: This phase involves testing the treatment on a larger group of people (usually thousands) to confirm its effectiveness, monitor side effects, and compare it with existing treatments.

Phase 4: This phase involves post-marketing surveillance to monitor the long-term safety and effectiveness of the treatment.

Clinical trials are closely monitored by regulatory agencies to ensure the safety and wellbeing of participants.

Phase 1 Safety	Phase 2 Safety & Dosage	Phase 3 Safety & Efficacy	Phase 4 Post Approval
20-100	100-500	1,000-5,000	Real-life patients

Western Australia's first dedicated eye research laboratories and clinic

Nedlands research laboratories and clinic officially open

Nedlands Clinic at
2 Verdun Street
at the QEII
Medical Centre

In the mid 1980s, the Lions Eye Institute's research programs and patient care were being operated out of various locations across Sir Charles Gairdner Hospital. The programs were growing quickly and desperately needed their own home at the Queen Elizabeth II Medical Centre.

Government support

Professor Constable successfully secured $3 million in government funding towards a new dedicated building to conduct research and see patients.

He negotiated a 99 year lease at a peppercorn rent for a parcel of land on the corner of Verdun Street and Gairdner Drive in Nedlands.

Building campaign

The public appeal officially launched at an event held at UWA's Winthrop Hall in 1992 to help finance the construction of the new purpose-built clinic and laboratories. It was a huge success, with the foundation stone being laid for the building in 1994. In 1996 the new building was officially opened by the Premier, the Hon Richard Court AC.

Professor Constable rallied some of his patients, including Sir James McCusker, Stan Perron AC, Bill Wyllie and Sir James Cruthers AO to help fundraise for Western Australia's first dedicated purpose-built eye clinic and research facility.

The Nedlands clinic was only made possible due to philanthropic and government support.

Closing the gap in Aboriginal eye health

> I've visited the North West nearly every year for 40 years and there's been an enormous change during that time. In 1978 Aboriginal people had a blindness rate that was 12 times the rest of the community and the population generally in Western Australia. Now it is down to three times.
>
> **Professor Ian Constable AO**

Since the 1970s, Lions Eye Institute ophthalmologists have undertaken outreach work in Aboriginal and Torres Strait Islander communities throughout Western Australia treating common eye problems including cataract, diabetic retinopathy and trachoma.

"Accessibility to eye care is paramount. Being here and accessible as eye care professionals in the regions is essential."

Associate Professor Angus Turner

This work was accelerated through the establishment of Lions Outback Vision in 2010. Led by McCusker Director, Associate Professor Angus Turner, Lions Outback Vision has contributed to reducing the prevalence of vision impairment and blindness in Aboriginal and Torres Strait Islander people from six times the rate of non-Aboriginal and Torres Strait Islander Australians in 2011 to three times in 2016.

In the last 13 years Associate Professor Turner has pioneered efforts to increase accessibility to eye care throughout regional areas, including:

- Establishing the Lions Outback Vision Van
- Opening the Kimberley Eye Hub in Broome
- Pioneering telehealth
- Developing advanced technologies including artificial intelligence

Lions Outback Vision Van

A state-of-the-art mobile clinic delivering eye health services to 20 regional communities.

In 2015 Associate Professor Turner raised $5 million to build a custom designed 22 metre Vision Van. This state-of-the-art mobile eye health clinic provides diagnostic and therapeutic services, previously unavailable outside of Perth, and completes two circuits of Western Australia each year visiting 20 rural communities.

"If that Vision Van ever left it would have a huge impact."

Vision Van patient

"The idea of having an eye hub in a remote part of Australia is absolutely breathtaking."

Senator Patrick Dodson

Lions Outback Vision now has a home in the North West

In 2022, the Lions Eye Institute's new Kimberley Eye Hub officially opened its doors in Broome. It is the first dedicated eye clinic to service people in the northern remote areas of Western Australia. Previously, people living in the Pilbara and Kimberley regions would have to travel to Perth, more than 2,000 kilometres away, to receive treatment.

The Kimberley Eye Hub was made possible due to philanthropic and government support.

Telemedicine

The Lions Eye Institute and Lions Outback Vision are pioneers in telehealth. This has been recognised by leading global organisations:

- Google has joined Lions Outback Vision in a partnership that supports research into artificial intelligence innovation in telehealth and Indigenous populations.
- The World Health Organization's first global report on vision in 2019 featured Lions Outback Vision as a case study, "Engaging rural and remote communities through telehealth".

Teleophthalmology involves a real-time video consultation between the patient and an ophthalmologist, on the referral of a health care provider, conducted using computers, tablets or handheld devices. Consultations are typically 10 to 20 minutes and are much like face-to-face visits.

These are augmented by images of the eye and the results of diagnostic tests are sent by the referrer provider to aid the consult. A diagnosis and management plan are provided.

Teleophthalmology consultation process example:

- Due to a family history of glaucoma, a routine eye pressure test is performed. The test shows a raised visual measurement.
- A visual field test also demonstrates optic nerve damage in keeping with glaucoma.
- The next ophthalmologist outreach visit to the region is not scheduled for over two months.
- A telehealth consultation is held on the same day and the ophthalmologist prescribes medication to lower eye pressure.
- Follow-up will include the next outreach visit and subsequent telehealth consultations.

An Australian first: artificial intelligence proven to detect eye disease in Aboriginal Australians

To overcome the challenges associated with access to eye care, Lions Outback Vision, in collaboration with Google, undertook a four-year study validating an artificial intelligence tool for Aboriginal people. The landmark study was published in February 2023 demonstrating the device is better at detecting eye disease than retinal specialists.

Artificial intelligence will detect eye disease wherever patients live. The use of this novel tool, an Australian first, will provide real benefits for our regional and remote patients now and into the future.

The artificial intelligence algorithm has been fully integrated into retinal cameras and is ready to be deployed for the first time in Australia (subject to funding).

Helping our international neighbours

Glaucoma is the second most common cause of blindness in Indonesia. Six million of Indonesia's 270 million population have glaucoma – and one million of those are blind.

The Virna Glaucoma Drainage Device provides hope in Indonesia

The development of the XEN® Gel Stent set the foundation for Professor Dao-Yi Yu AM's colleague and XEN® Gel Stent co-inventor, Professor Bill Morgan, to develop a low-cost device to help the glaucoma epidemic in Indonesia.

Together with colleagues in Indonesia including Dr Virna Oktariana, Professor Morgan co-invented the Virna Glaucoma Drainage Device, a low-cost device now being manufactured and used in Indonesia. Over 1,500 have been implanted.

This device is the only one approved by the Indonesian Ministry of Health and is affordably priced (USD$100, being approximately one-tenth of the cost of commercial glaucoma drainage devices). It is having a major impact upon rates of blindness and is currently the only glaucoma drainage device available in Indonesia.

Developing cost effective eye screening

The Lions Eye Institute is developing low-cost screening devices that detect glaucoma and diabetes that are easily transportable to the remote islands of Indonesia.

The low-cost devices will help people living in remote areas of the country who are not easily able to access eye care.

This contribution will decrease the alarming rates of glaucoma in Indonesia.

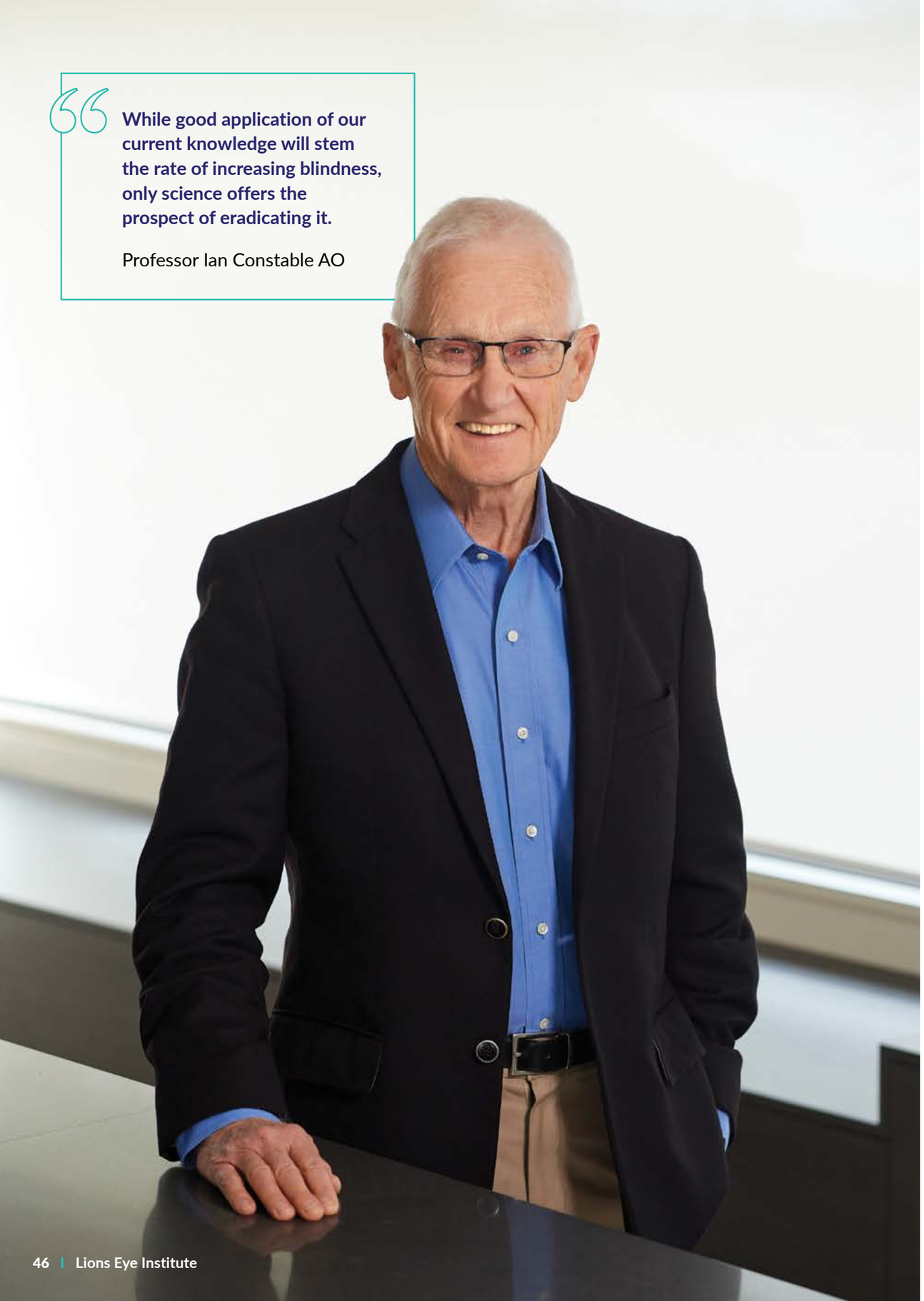
Trainee eye surgeon observership program

Thanks to philanthropic support from the Perth Eye Foundation, our trainee ophthalmologists will have the opportunity to travel to Indonesia to observe complex surgeries. This program provides an excellent training opportunity for our trainee eye surgeons, allows relationships to be formed, and skills to be developed and transferred.

Observerships are undertaken in either Jakarta or Bali.

Thank you to the Perth Eye Foundation for making this opportunity possible for our young eye surgeons.

Professor Bill Morgan conducting a post op examination on a patient who had the Virna Glaucoma Drainage Device surgically implanted



> **While good application of our current knowledge will stem the rate of increasing blindness, only science offers the prospect of eradicating it.**
>
> Professor Ian Constable AO

Strongly positioned for the next forty years

Western Australia is positioned to meet the eye health needs of the future

Our aspiration is better vision for all. To achieve this ambitious goal Professor Bill Morgan aims to position Western Australia strongly to meet the eye health needs of the future.

With an ageing and growing population, eye disease is on the increase, and it is imperative to provide education and training for the eye health care professionals of the future.

This investment will ensure quality eye care is accessible to the entire population of Western Australia, no matter where they live.

Research capacity into blinding conditions is also being bolstered to cater for the eye care needs of the future.

To position Western Australia strongly, the Lions Eye Institute has recently:

- **Partnered with UWA to establish the state's first optometry degree**
- **Appointed two new Professorial Chairs to expand research into blinding conditions**
- **Opened a dedicated clinic in Midland**
- **Opened a dedicated clinic in Broome**

Eye disease is the most common chronic health condition in Australia, with more than 13 million Australians (55%) reported to have long-term eye conditions in 2017 to 2018. These numbers are set to double by 2050.

Australian Institute of Health and Welfare 2018

Addressing the undersupply of eye care professionals

The University of Western Australia Doctor of Optometry

The Lions Eye Institute has partnered with UWA and optometry industry leaders to launch Western Australia's first Doctor of Optometry degree. The degree will help address a chronic shortage of eye care professionals in Australia.

> **Graduates of the new degree will become the next generation of highly innovative optometric practitioners and will be highly sought after by employers.**
>
> **Professor Bill Morgan**

Eye disease is the most common chronic condition in Australia, with more than 13 million Australians reported to have long-term eye conditions, although more than 90 per cent of all vision impairment is preventable or treatable.

Eye disease is projected to increase significantly over the next three decades, primarily due to our ageing population, and this is expected to increase demand for quality eye health care in Australia. Western Australia's first and only optometry school will help to increase quality eye health outcomes by training world-class optometry graduates in primary and secondary eye health care.

The inaugural student cohort commenced in 2021 and will graduate with a Doctor in Optometry in December 2023. Increasing the pool of optometrists will help ensure Western Australia is positioned to meet the projected demand for eye health care professionals by 2050.

There is increasing demand for eye care services and an undersupply of eye care professionals. The new degree will help address the undersupply of eye care professionals in Western Australia, while helping with the distribution of practitioners in regional and remote parts of the state.

Professor Garry Fitzpatrick leads the new Doctor of Optometry course, contributing decades of industry and clinical experience to ensure its success. Professor Fitzpatrick said the importance of culturally aware eye care professionals continues to grow, with the rate of blindness among Aboriginal and Torres Strait Islanders three times higher than non-Aboriginal Australians.

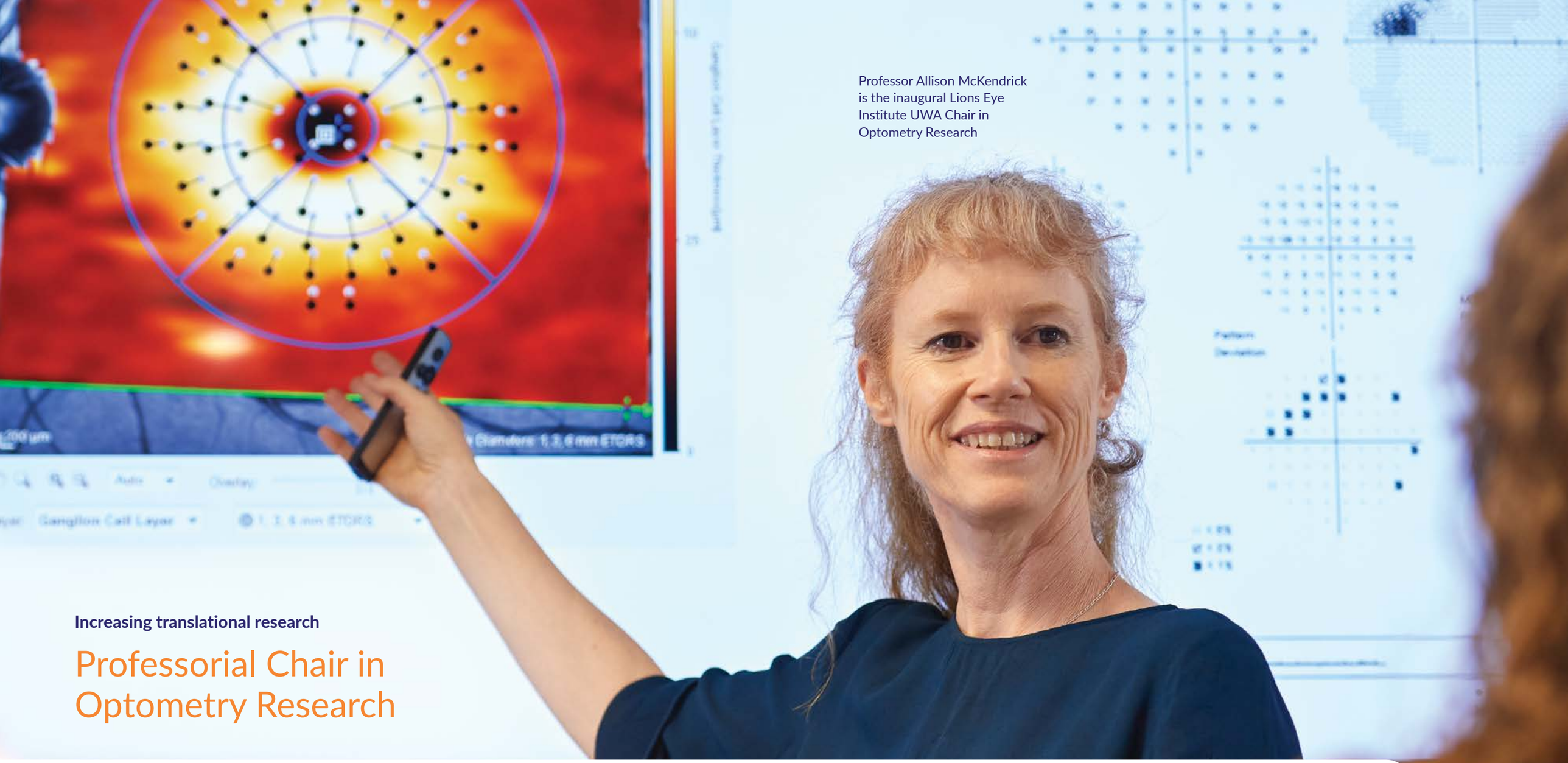
UWA Doctor of Optometry Program

The Doctor of Optometry postgraduate three-year degree combines collaborative academic teaching with research. Students will have exposure to researchers and clinicians at the Lions Eye Institute, and to assessment of patients by working directly with optometrists and ophthalmologists in Western Australia's biggest hospitals.

Entry is competitive, with up to 55 domestic and five international places offered per year. The program is supported by Specsavers and EssilorLuxottica.

> **UWA, through this partnership with the Lions Eye Institute and key industry partners, is taking the lead in tackling a growing problem by delivering an optometry course with a focus beyond best practice eye care to develop socially and culturally aware optometry leaders.**
>
> **Professor Garry Fitzpatrick**

Optometry students attending clinical laboratory



Professor Allison McKendrick is the inaugural Lions Eye Institute UWA Chair in Optometry Research

Increasing translational research

Professorial Chair in Optometry Research

The Lions Eye Institute and The University of Western Australia (UWA) appointed Professor Allison McKendrick as the inaugural Lions Eye Institute UWA Chair in Optometry Research.

This appointment will put the Lions Eye Institute and UWA at the forefront of vision research outcomes and translational research worldwide, bolstering the research capacity of UWA's optometry program and the Lions Eye Institute's translational research.

Professor McKendrick will provide a key link between ophthalmology, optometry and research, which we know will have a significant impact on addressing eye disease and vision loss.

Professor McKendrick and her team will greatly expand our capacity to drive sight saving medical research into blinding eye diseases in 2023 and beyond. Professor McKendrick's research will delve into:

- Glaucoma
- Ageing effects on vision
- Neurological diseases
- Using technology in novel ways to assist in the detection and management of eye disease

In addition, Professor McKendrick will work closely with the UWA Optometry School and mentor academics and postgraduate students to build best practice education and research.

Big data preventing blindness

Professorial Chair in Ophthalmic Big Data

Global leader in big data appointed to predict vision loss in patients.

Professor Andrew Turpin is the inaugural Lions Curtin Chair in Ophthalmic Big Data. This appointment will be a game changer and significantly contribute to Western Australia's burgeoning reputation as a centre for research excellence in ocular disease. Professor Turpin's extensive academic leadership experience will be critical for lifting data science research in the state, with a focus on eye health, an area of significant need here in Western Australia. The combined resources of the Lions Eye Institute and Curtin University will improve patient outcomes.

Professor Turpin's deep expertise will further develop the Lions Eye Institute's and Curtin University's work in artificial intelligence, image analysis, Aboriginal, rural and remote eye health and data linkage. He will help to drive the research agenda and facilitate the translation of research knowledge into policy and practice.

Professor Turpin's research interests include:

- Computational problems in human vision, such as developing new techniques for diagnosing and monitoring glaucoma
- Building new capacity in analytics across optometry and ophthalmology
- Supporting research and eye care systems development involving large and continuous related datasets

The Lions Curtin Chair in Ophthalmic Big Data, established by the Lions Eye Institute and Curtin University, with support from the Lions Save-Sight Foundation, will enhance leadership and research in ophthalmic big data.

Professor Andrew Turpin is the inaugural Lions Curtin Chair in Ophthalmic Big Data

Focus on the future

Research

We are known for our '**can do**' translational ability.

Brightest minds in eye research

The Lions Eye Institute has a solid track record of research projects translating into treatments, inventions and cures for eye diseases causing vision loss and blindness.

We target research relevant to the context of the Western Australian population and attract the brightest minds across nine research focus areas.

Our research groups

- Physiology and Pharmacology
- Genetics and Epidemiology
- Experimental Immunology
- Ocular Tissue Engineering Laboratory
- Retinal Genomics and Therapy
- Functional Molecular Vision Laboratory
- Visual Function
- Data Analytics
- Corneal and Ocular Surface

> **With a strong focus on the future eye health care needs of Western Australians, I am committed to increasing our translational research output to help more people everywhere.**
>
> **Professor Bill Morgan**

Our research focus areas

The Lions Eye Institute is a highly respected medical research institute and its unique "bench to bedside" structure gives it an enviable ability to undertake groundbreaking translational research. It collaborates with individuals and organisations from all over the world and has a strong track record in developing drugs, therapies and devices for saving people's sight. The Lions Eye Institute's research-specific vision has identified six priority areas of translational research which cover:

Glaucoma: to identify the underlying physiology of glaucoma including pressures in and around the eye, to develop new treatments, using drugs, laser surgery and diagnostics with novel image analysis to save sight.

Diabetic and vascular retinopathies: to develop new techniques for the detection and monitoring of early to late changes in diabetic and other retinal blood vessel disorders, and treatments to prevent vision loss in patients with these conditions.

Indigenous and community eye research: to more effectively detect and treat common non-reversible diseases such as diabetic retinopathy and glaucoma in remote, rural and Aboriginal and Torres Strait Islander communities in Australia and developing countries, through better screening, access to care and rapid implementation of new treatments.

Genetic eye disease, gene therapies and macular degeneration: to reduce blindness due to conditions of singular genetic eye diseases, through a greater understanding of genetic causes of eye disease, leading to treatments and therapies with novel gene enhancement and replacement therapies.

Cornea, ocular surface and ocular immunology: to improve the understanding and treatments for common conditions affecting the normal clear surface of the eye, including viral infections using treatments that modify the body's immune system reactions.

Myopia: or short-sightedness is predicted to affect half the world's population by 2050. High myopia increases the risk of developing retinal detachment, macular disease and glaucoma. Our research studies show environmental factors and genetics interact and contribute to the development of childhood myopia.

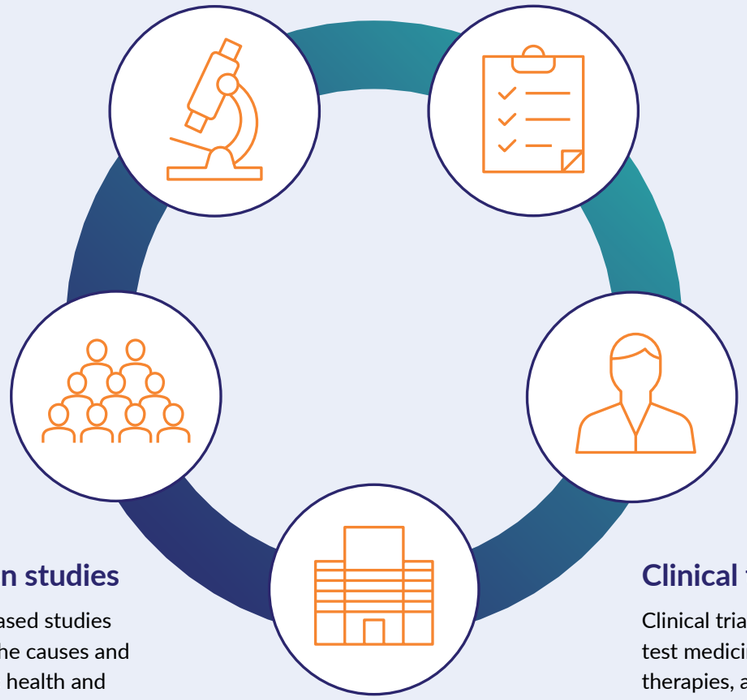
Our translational research framework

Discovery research

Discovery research refers to scientific investigations conducted to gain a deeper understanding of the natural world, explore new phenomena, and generate new knowledge. This type of research is typically driven by the desire to advance scientific understanding.

Proof of concept

Proof of concept refers to a demonstration or evidence that a particular idea, method, or technology is feasible and can work as intended. It is often used to validate the viability and potential success of a concept before allocating significant resources to its full-scale implementation.



Population studies

Population-based studies can identify the causes and impact of eye health and diseases in the community, which can drive future discovery research.

Putting into practice

Adoption of research into clinical practice is led by our clinicians and clinician researchers.

Clinical trials

Clinical trials aim to test medicines and new therapies, and confirm their safety and efficacy. We conduct both pharmaceutical-sponsored and investigator-led clinical trials.

Increasing accessibility to eye care

A new clinic to service Perth's eastern corridor

Perth's eastern metropolitan corridor is home to the fastest growing population in Perth.

The establishment of a new Lions Eye Institute private clinic in Midland is great news for patients in Perth's eastern suburbs. The clinic officially opened in 2022 and provides access to high-quality eye care services, including diagnosis, treatment, and management of a range of eye diseases and conditions. The clinic also includes facilities for teaching and training of optometry students, and a new pilot program to assess optimal pathways for provision of care to disadvantaged patients in the area.

A scoping exercise is currently being undertaken to understand the scale of unmet need for eye care services in the eastern metropolitan area.

There are no public eye care services east of the city, and yet this area has the largest proportion of Aboriginal people living in the metropolitan area, along with a large number of disadvantaged Western Australians who traditionally do not access eye care.

The Lions Eye Institute is forming relationships and information transfer systems with government teaching hospitals to facilitate improved care of patients in the area, however it is highly likely that a much larger facility will be required for the treatment of public patients. The Lions Eye Institute looks forward to expanding this service.

The new Midland private clinic is a significant development for eye care services in Perth's eastern suburbs and under the leadership of Dr Hessom Razavi, will undoubtedly improve the lives of many patients in the region.

> **We have been working in the area for more than six years, but this new purpose-built facility will provide us with the opportunity to expand our service offering and work even more closely with the local community, ensuring they have access to the best possible eye care.**
>
> **Dr Hessom Razavi**

Closing the Gap

The Kimberley Eye Hub officially opened

New eye hub a game-changer in health services delivery in the North West.

The Lions Outback Vision Kimberley Eye Hub in Broome was officially opened in October 2022 by Senator Patrick Dodson and Ms Divina D'Anna MLA. The Hub opening marks an exciting new era of providing greater equity of eye health services and transforming patient care in regional and remote Aboriginal communities across the North West.

The Hub, which was formerly the Kimberley Klub backpacker hostel, was donated to Lions Outback Vision by the Wen Giving and Hawaiian Group. It has since undergone a significant transformation, while retaining the distinctive façade of the hostel.

The Hub provides permanent specialised eye health services in Broome and outreach to 20 communities and five regional towns across the Kimberley. It includes a full-service eye clinic with state-of-the-art diagnostic equipment, education and training spaces, a café and facilities for multi-disciplinary use by visiting specialists. There are three resident Lions Outback Vision doctors, two resident optometrists and a number of liaison officers and administrative staff to deliver a fully functioning service.

> **The Hub enables us to treat patients closer to home, and this accessibility is crucial in dealing with the challenges of remote eye health. People in isolated places like the North West have more blindness and complications from eye disease than in other places.**
>
> **McCusker Director, Lions Outback Vision, Associate Professor Angus Turner**

The Hub bridges geographical barriers

Aboriginal and Torres Strait Islander people have more than three times the rates of blindness and 14 times the rates of vision loss from diabetes. Approximately 11 per cent of the North West Aboriginal population are vision impaired or blind, and 35 per cent of this population have never had an eye exam.

Professor Nitin Verma AM, President of the Royal Australian and New Zealand College of Ophthalmologists described the service as an exemplar of what can be achieved with vision, pragmatism and collaboration. "I had the pleasure of visiting Angus in May 2021. It is amazing to see the progress he has made in such a short amount of time. The service brings the concept of equity of access to life – creating a hub for a population dispersed over our vast and sunburnt country," Professor Verma said.

The development of the Hub had enabled the Lions Outback Vision team to put resources into prevention and education activities in communities. He said the next goal was to develop a day surgery in Broome, which would alleviate pressure on the Broome Hospital and enable more timely surgical and treatment interventions.

Thank you to our supporters

The Kimberley Eye Hub was made possible due to philanthropic support from Wen Giving, Hawaiian, Kerry Stokes AC, Christine Simpson Stokes AM, McCusker Charitable Foundation, Channel 7 Telethon Trust, The Fred Hollows Foundation, the Australian Federal Government, the Western Australian State Government, Rural Health West, Zeiss, Alcon, TopCon, and other patient and industry supporters.

40 years of making scientific breakthroughs possible

Philanthropic impact

Our loyal supporters and the power of philanthropy.

Our supporters have made a significant impact over the past 40 years. We are fortunate to have many supporters who make an annual donation year after year. This support provides our researchers with much encouragement and fuels them on in their quest to find groundbreaking discoveries.

The combined support of our donors has accelerated the Institute's mission and collectively multiplied our efforts across the following key areas:

- **Groundbreaking research**
- **The younger generation: WA children**
- **Advanced technological equipment**
- **Innovative laboratories**
- **Building academic capacity**

Your support has been pivotal

Thank you

Professors Circle

- Channel 7 Telethon Trust
- Estate of the Late George Church
- Estate of the Late Elsie Gadd
- Hawaiian
- Lions Save-Sight Foundation
- McCusker Charitable Foundation
- Stan Perron Charitable Foundation
- Dr Sjakon Tahija
- The Joyce Henderson Trust Fund
- The Patrick Foundation
- Wen Giving
- Wesfarmers
- Rhonda Wyllie

Inventors Society

- Estate of the Late Lance E Rann
- Lowy Foundation
- Brad and Carolyn Miocevich
- John and Lee Saleeba

Ground Breakers

- Bowen Foundation
- Professor Ian Constable AO and Dr Elizabeth Constable AM
- Constantine Family Foundation
- Estate of the Late Maxwell Bailey
- Estate of the Late Odna Borlaug
- Estate of the Late Daphne Mauryeen D'Alton
- Estate of the Late Dr Zena Barber Lowe
- Estate of the Late Pamela Sawyer
- Estate of the Late Henrietta Ivy Sharpe
- Estate of the Late Miriam Stannage
- Estate of the Late Maybelle Willis
- Harry and Margaret Kerman Trust Fund
- Ian Potter Foundation
- Professor Ian McAllister
- Kerry Stokes AC and Christine Simpson Stokes AM
- The Alan and Lilian Cameron Charitable Endowment
- The Lindsay and Heather Payne Medical Research Charitable Foundation

Scholars Society

- Bill and Jean Henson Trust
- Carcione Foundation
- Content Living
- Estate of the Late Anthony Carson
- Estate of the Late Jessie Gibbs
- Estate of the Late Miss Jean Gilbert
- Estate of the Late Wilma Harris
- Estate of the Late Dorothy and William Hill
- Estate of the Late Wilhemina Pennenburg
- Estate of the Late Elizabeth Purnell
- Estate of the Late Pamela Rowlands
- Estate of the Late James Strang
- Genetic Cures Australia
- John Giles
- Joyce Reay Girdlestone
- Norman and Freda Hogg
- Idle Acres Foundation
- Louise Law
- Kim and Anaza Linton
- Mandurah Murray Mayday
- Walter Millstead
- Perth Eye Foundation
- QEII Medical Centre Chemist
- Quality of Life Foundation
- Oxford Compounding
- Specsavers
- Wheatley Family Foundation

Special mention must be made to the above donors who have provided significant funding, often over many years and some decades, as well as at pivotal points in time. This support has enabled the Institute to make significant impact in medical research, provide world-class equipment, support academic positions and implement community and outback programs.

Philanthropic impact

Lions Save-Sight Foundation (WA) Inc

Lions Clubs WA, through Lions Save-Sight Foundation, were the pioneers in eye health in Western Australia in the 1960s and 1970s.

Lions Clubs throughout Western Australia rallied together to implement eye screening programs for glaucoma, amblyopia and diabetic retinopathy. Back then rates of blindness due to glaucoma and diabetic retinopathy were quite high and access to ophthalmologists and optometrists was limited.

Realising more needed to be done, they fundraised for the state's first chair in ophthalmology at UWA.

In 1983, the eye programs had expanded rapidly, and it became obvious that greater medical and scientific leadership was required. With the inaugural chair in place, it was decided to establish the Lions Eye Institute under the leadership of Professor Ian Constable AO.

Lions Save-Sight Foundation continues to support the vision of the Institute and provides funding for:

- Brian King Fellowship
- Dr Jack Hoffman Scholarship
- The Lions Curtin Chair in Ophthalmic Big Data
- Medical research conducted by Dr Danial Roshandel

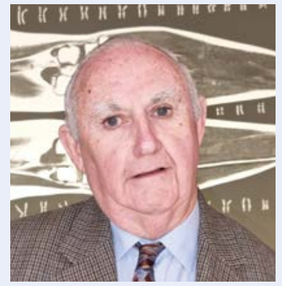
Thank you to the Lions Clubs of WA and Lions Save-Sight Foundation.

Dr Robert Linton AM

Dr Linton is regarded as the father of modern ophthalmology in Western Australia. He was an inaugural Director of Lions Save-Sight Foundation

Dr Brian King AM MBE

Past District Governor of Lions, past Chair of Lions Save-Sight Foundation and inaugural Chair of the Lions Eye Institute



Mr Ambrose Depiazzi OAM

Past District Governor of Lions, past National Chair and current Chair of Lions Save-Sight Foundation

Philanthropic impact

McCusker Charitable Foundation

Since 1985, the McCusker family has provided advocacy and philanthropic support at each of the Lions Eye Institute's key milestones.

Thank you!

Thank you to the McCusker Charitable Foundation.

Sir James McCusker and The Hon Malcolm McCusker AC KC

The McCusker Charitable Foundation has provided support towards:

- McCusker Glaucoma Centre
- Nedlands building
- Research laboratories
- Lions Outback Vision
- Medical research

Impact

- Researchers at the **McCusker Glaucoma Centre** invented the XEN® Gel Stent.
- The Nedlands **clinic building** helps tens of thousands of patients that visit each year.
- The **research laboratory installation** provides the optimal environment for scientists to fast track their research to find cures, treatments and gene therapies.
- **Lions Outback Vision** helps thousands of people each year living in rural and remote areas of Western Australia.
- **Research into inherited retinal diseases** has resulted in the pre-clinical development of two highly promising drugs.

The Hon Malcolm McCusker AC KC, Mrs Tonya McCusker AM and Professor Bill Morgan, Managing Director, Lions Eye Institute

Fat Cat, Mrs Tonya McCusker AM and 2020 Little Telethon Star and patient of the Lions Eye Institute, Eamon

Philanthropic impact

Stan Perron Charitable Foundation

The Perron family's enduring relationship with the Lions Eye Institute has been, and continues to be, pivotal to the Lions Eye Institute's ability to provide high quality eye care for Western Australians.

The Perron family has provided advocacy and philanthropic support towards:

- The Nedlands building
- Research laboratories
- Ian Constable Chair in Discovery and Translational Ophthalmic Science
- Areas of greatest need
- Medical research

Left to right: Perron Paediatric Retinopathy Initiative clinician researchers Dr Antony Clark and Professor Chandra Balaratnasingam with Professor Bill Morgan, Managing Director, Lions Eye Institute and Ms Elizabeth Perron, Chair, Stan Perron Charitable Foundation

Stan Perron AC

Impact

- The **research laboratory installation** provides the optimal environment for scientists to fast track their research to find cures, treatments and gene therapies.
- The endowed **Ian Constable Chair** at UWA is in honour of the Lions Eye Institute's founder, Professor Ian Constable AO.
- Medical research projects including the Perron Paediatric Retinopathy Initiative and Dr Livia Carvalho's research into novel treatment approaches for childhood inherited retinal diseases.
- The Nedlands **clinic building** helps tens of thousands of patients that visit each year.
- The Foundation has supported the area of greatest need at the Lions Eye Institute for over 25 years.

Thank you!

Thank you to the Stan Perron Charitable Foundation.

Philanthropic impact

Wen Giving

Mei and Chiu Chi Wen were instrumental in making the Lions Outback Vision Kimberley Eye Hub a reality.

Wen Giving has provided substantial support to Lions Outback Vision including:

- The property on which the Kimberley Eye Hub is situated
- Vehicles for patient transport
- Lions Outback Vision Van

Impact

- Delivered the first eye clinic in the North West to service the residents of the Kimberley and Pilbara.
- Patients now have access to transportation, empowering them to attend their appointments at the Hub.
- The Vision Van visits over 20 locations and sees over 3,000 patients in regional and remote Western Australia each year.

Thank you to Wen Giving.

wen giving & hawaiian

Philanthropic impact

Telethon

Channel 7 Telethon Trust

A stem cell robot, paediatric ophthalmology service in the North West, medical research targeting childhood blindness and more!

Telethon's support allows the Institute to focus on childhood blinding conditions.

Projects include:

- Novel nanotechnology-based gene therapies to cure vision loss in children with Usher syndrome
- Investigating the progression of early-onset myopia
- Research into inherited retinal diseases
- Research into a novel non-invasive approach to reducing the rate of blindness and kidney failure in children with diabetes
- Determining the prevalence of infection from common currently unvaccinated infectious diseases that cause blindness
- Improving outcomes for children with glaucoma
- Paediatric ophthalmology outreach services in the North West
- State-of-the-art equipment

Impact

Telethon is supporting children like 2020 Telethon Little Star and patient of Associate Professor Fred Chen, Eamon.

Thank you to the Channel 7 Telethon Trust and the Western Australian community.

Associate Professor Fred Chen and his patient 2020 Little Telethon Star, Eamon

Philanthropic impact

Telethon and Mrs Rhonda Wyllie

Western Australia's first stem cell robot

At the 2021 Leeuwin Lunch for Telethon Mrs Rhonda Wyllie donated $750,000 to the Lions Eye Institute to purchase a stem cell robot.

This advanced technology is the only hope of saving Eamon's sight.

This state-of-the-art bespoke machine will accelerate Associate Professor Chen and his team's ability to find a cure for Eamon.

Once Eamon loses his sight it is not able to be restored.

In this fight against time, Mrs Wyllie came to the rescue by providing the funds necessary to purchase the robot. Eamon and his younger brother Kealan both have Usher syndrome.

Usher syndrome

Usher syndrome is exceptionally rare and cruel. Babies are born deaf, and towards their teens they become affected by an inherited retinal disorder called retinitis pigmentosa that causes gradual loss of vision and eventually blindness.

Researchers at the Institute are working around the clock to find a cure for Eamon and his younger brother Kealan. They have recently had success with a drug to treat retinitis pigmentosa gene 11. With this latest discovery together with the stem cell robot – there is hope!

Thank you!

Thank you to Mrs Rhonda Wyllie and her family and to Telethon for making all of this possible.

Eamon's mum, Bronwyn, thanking Rhonda Wyllie at the Leeuwin Lunch for Telethon

Dr Livia Carvalho, Head of Retinal Genomics and Therapy, with PhD student Xiaotian Jiang using the confocal microscope

Philanthropic impact

Telethon and the Ian Potter Foundation

State-of-the-art medical equipment accelerating cures for childhood blinding diseases.

The Nikon AX-R Confocal Microscope, co-funded by Telethon and the Ian Potter Foundation, is the latest in imaging technology. This piece of equipment will accelerate research into blinding eye conditions.

The machine will be utilised 70 per cent of the time on childhood eye diseases. It will expedite progress towards finding cures for children with:

- Inherited retinal diseases
- Diabetic retinopathy
- Myopia

Thank you to Telethon and the Ian Potter Foundation.

telethon 7

The Ian Potter Foundation

Gordon and Jean Patrick

Philanthropic impact

The Patrick Family Foundation

Gordon and Jean Patrick are loyal Lions Club members and have been supporters of the Lions Eye Institute for more than 20 years.

Their support is building research capacity to ensure the Lions Eye Institute is ready and strongly positioned to tackle the eye health needs of the future.

The Patrick Family Foundation supports:

- Ian Constable Chair in Discovery and Translational Ophthalmic Science
- PhD scholarships
- Area of greatest need

Impact

- The endowed **Ian Constable Chair** at UWA is in honour of the Lions Eye Institute's Founder, Professor Ian Constable AO.
- **Building our talent pipeline** to support rising stars with scholarships and fellowships under the supervision of the Ian Constable Chair.

Thank you!

Thank you to the Patrick Family Foundation.

Patient impact

Kimberley Eye Hub

Stuart Aamodt, Optometrist, and Janet Richardson, Aboriginal Liaison Officer, Lions Outback Vision with patient Bruce Wiggan at Cygnet Bay

Bruce, patient of Lions Outback Vision

Blindness is three times higher in Aboriginal Australians.

Bruce is a senior Bardi man and artist in residence at the Cygnet Bay Pearl Farm. He is a traditional pearl shell carver and a cultural guide. Good vision is imperative to Bruce for his craft, and he shows no signs of wanting to slow down.

Bruce lives remotely from Broome and his cataracts were affecting his vision. Thanks to the Lions Outback Vision Kimberley Eye Hub, he was able to access cataract surgery in his left eye without having to make the trip to Perth, some 2,200 km away. He was able to have his pre and post operation visits close to home as well.

It is not feasible for most residents living in regional and remote Western Australia to make the trip to Perth as it often includes a lengthy stay and is costly.

Patient impact

Jill's journey

75-year-old patient of the Lions Eye Institute

The XEN® Gel Stent changed my life.

Glaucoma is the most common cause of irreversible blindness.

"In 2002, when I was in Oxford researching my next book, I saw a private ophthalmologist in a leading eye hospital. He confirmed I had glaucoma and advised me to see Professor Bill Morgan at Perth's Lions Eye Institute as he was the best ophthalmologist specialising in glaucoma in Western Australia. When I saw Bill three months later, he confirmed my glaucoma diagnosis and began treating me with drops, but they didn't work.

I was 54 years old at the time and worried I might have to retire early. The glaucoma drops stained the skin below my eyes bright purple. It was quite noticeable and complete strangers would ask if I was okay.

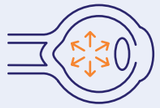
In 2009 I learned that Professor Morgan had co-invented a microfistula tube, which required minimally invasive surgery. When asked if I would like to be involved in the clinical trials, I jumped at the chance. A microfistula tube, now called a XEN® Gel Stent, was implanted in my left eye in 2009, and another was implanted in my right eye in 2011.

I have felt so much better since having the XEN® Gel Stents. They cannot restore my lost vision, but they retain existing vision. This means I can still do my research and can still drive during the day. I cannot help reflecting on how things might have been if I had not had the benefit of the XEN® Gel Stent.

Jill Durey, patient of Professor Bill Morgan, at her home. Jill is able to play the piano and write her books thanks to the XEN® Gel Stent. "The XEN® Gel Stents changed my life," Jill says.

As Professor Morgan will tell you, there are young patients in their twenties, thirties and forties as well as babies and children with glaucoma, so research in this field is vital.

I am so grateful to the Lions Eye Institute and cannot thank Professor Morgan enough for his brilliance as a researcher, co-inventor and gentle surgeon. His XEN® Gel Stents have changed my life.



More than
300,000 Australians
have glaucoma

Patient impact

The fight to save Eamon's sight

Looking through the eyes, as time progresses, of someone living with inherited retinal disease Usher syndrome

Eamon 10-year-old patient of the Lions Eye Institute.

Usher syndrome

Usher syndrome is exceptionally rare and cruel. Babies are born deaf, and towards their teens they become affected by an inherited retinal disease called retinitis pigmentosa that causes night blindness, loss of peripheral vision (or tunnel vision) and eventually, blindness.

Eamon and Kealan

Eamon and his younger brother Kealan, from Perth's northern suburbs, were diagnosed with Usher syndrome at the ages of five and three in 2018 consecutively. Fortunately, both have managed to have their deafness corrected by cochlear implants, but they will gradually lose their eyesight to retinitis pigmentosa.

Their disease is caused by two different mutations, one inherited from the mother and one from the father. With both genes mutated, cells in the ear and eye are unable to produce an essential cellular component, causing them to degenerate. "To stop this degeneration, we need to find a way to restore the mutated gene's message," says Associate Professor Fred Chen.

Associate Professor Fred Chen

Eamon and Kealan, now ten and eight, are regularly monitored by Associate Professor Chen using the latest multimodal imaging techniques, allowing their vision loss to be tracked and measured over time. The clinical data acquired from this regular monitoring could be used as a baseline for measuring the effectiveness of potential future clinical trials.

Associate Professor Chen's team are developing new gene editing techniques for correcting errors in this gene. "Our team is adapting techniques to fix the mutations in our patients with inherited retinal diseases. So far, we have used gene editing to rewrite the genetic code in two of our inherited retinal disease patient-derived cell models and are now in the process of applying these techniques to other patients. Gene editing therapies could potentially be used to treat all of our patients with Usher syndrome but will have to be tailored to the specific mutations present in each patient."

To test the new therapies being developed in his laboratory, Associate Professor Chen has established Western Australia's premier retinal disease modelling facility at the Lions Eye Institute. Associate Professor Chen and his team are currently working on a therapy for the boys with the skin biopsies provided by their father.

An inspiring young Western Australian

Eamon was selected to represent the children of Western Australia and be one of the 2020 Telethon Little Stars due to the adversity he has faced from a young age.

In 2019, Eamon was selected as one of six inspiring children (aged six to eight) with hearing loss to take the floor at Parliament House and address some of Australia's most powerful politicians at the Power of Speech event sponsored by Cochlear Limited.

Eamon's dream is to become a pilot one day

Patient impact

Providing hope for Yelaina

> To be given a diagnosis that could be scary and life-changing, and then to be told that in a couple of months Yelaina would be able to be part of a trial, we are filled with hope. But without people's generosity, the work couldn't continue. Research is expensive.
>
> **Yelaina's mum, Sarah**

Yelaina is a 15-year-old patient of the Lions Eye Institute.

Yelaina, from Perth's northern suburbs, was diagnosed with Stargardt disease in May 2020 when she was 12 years old. Her family had recently relocated to Perth, Western Australia from South Africa when she experienced a dramatic loss in her eyesight and was referred to Associate Professor Fred Chen by another eye specialist. A DNA analysis confirmed in October of the same year that Yelaina had an inherited retinal disease called Stargardt disease.

"At least I knew what was happening," says Yelaina of hearing the news. "But it's kind of scary. I found it frightening and upsetting."

Clinical trials at the Lions Eye Institute

Yelaina is regularly monitored by Associate Professor Chen via her participation in the only trial currently available for her, the Belite Study. Once a month Yelaina has been attending the Lions Eye Institute Clinical Trials Centre which is in the early-phase human testing of a drug, called tinlarebant, to treat Stargardt disease. Yelaina takes this drug on a daily basis. The trial commenced in June 2021 and results will only be available after a year and half of treatment testing.

This two-and-a-half-year clinical trial recruited 15 children aged 12 to 15 years old from Australia and Taiwan. Currently, this is the only hope Yelaina has to save her eyesight.

Yelaina, 15-year-old clinical trial participant

Professor Ian Constable AO with rising star, Dr Jessica Mountford, who hopes to find a cure for early onset myopia. Dr Mountford's research is supported by Telethon

Attracting the brightest minds to take the Lions Eye Institute into the next 40 years

The future is bright

Translational research and scientific breakthroughs leading to treatments, cures and inventions for patients.

With a commitment to improving the lives of patients, the Lions Eye Institute is poised to lead the way in the research, development and implementation of cutting-edge eye care technologies. This ensures the provision of accessible eye care for the Western Australian community.

Big data and machine learning

By leveraging machine learning and artificial intelligence, the Lions Eye Institute is identifying patterns and trends in large data sets that would otherwise be difficult for human ophthalmologists to detect. This allows for earlier detection of eye diseases wherever patients live (metropolitan, regional or remote areas) and more effective treatment plans.

The Lions Eye Institute has brought optometry and ophthalmology together creating a single research hub in vision science and together with our highly sophisticated equipment and talented researchers we are achieving our purpose of better vision for all.

The Lions Eye Institute is in very good hands.

Next generation of talented scientists

Professor Bill Morgan is focused on developing the next generation of scientists to meet the eye care needs of the future.

The Lions Eye Institute's emerging scientists including Professor Allison McKendrick, Professor Andrew Turpin, Professor Chandra Balaratnasingam, Associate Professor Fred Chen, Associate Professor Angus Turner, Associate Professor Hessom Razavi, Dr Livia Carvalho, Dr Sam McLenachan and rising stars like Dr Jessica Mountford, Dr Danial Roshandel, Dr Evan Wong and Dr Geoff Chan, ensure the Lions Eye Institute is in very good hands.

Helping people of all ages achieve better eye health and lifelong vision.

Lions Eye Institute

Better vision for all

Glaucoma screening van

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