Lions Eye Institute

Annual Report

Contents

Lions Eye Institute

2 Verdun Street, Nedlands WA 6009

Phone +61 8 9381 0777

Fax +61 8 9381 0700

Email enquiry@lei.org.au

ABN 48 106 521 439

Media Contact

Francesca Robb

Mobile 0409 102 556

francescarobb@lei.org.au

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www.lei.org.au

Vision

To prevent and cure blindness and eye disease

Mission

To achieve leadership in scientific research and clinical practice in the prevention of blindness and eye disease through:

- global leadership in scientific research
- translation of research into community outcomes
- a commitment to growing the reach of our research capabilities and clinical services
- development and training of outstanding eye care professionals and researchers
- community engagement and education to build awareness, maintain a high reputation and increase funding

Chairman's Report

It is an honour and a privilege to be appointed Chairman of the Lions Eye Institute (LEI) – a Western Australian institution that has done so much for the cause of saving sight through its commitment to teaching and training, medical research and clinical excellence.

I follow in the footsteps of former Chairs Dr Brian King AM MBE, who along with Professor Ian Constable was instrumental in establishing the LEI in 1983, David Eiszele and my predecessor Stephen Pearce.

I would like to acknowledge the excellent contribution of Stephen, who resigned as Chair on January 17, 2017 to take up a senior role with Anglo American in London. I was appointed his successor on the same date.

During 2016, Stephen initiated a major review – *Positioning LEI for the Future* – with a brief to ensure the organisation is able to actively respond to the challenges that the next 30 years will bring.

Among those challenges are: an ageing population, greater prevalence of chronic disease that affects sight such as Type 2 diabetes and extraordinary levels of competition in securing Federal government funding for Australian medical research.

The *Positioning LEI for the Future* review aims to ensure the LEI is structured to deliver upon its purpose as defined in our Constitution.

The review has been conducted by the specialist advisory firm, Mainsheet Capital. It has involved several months of detailed analysis including extensive consultations with our staff, our patients and our key stakeholders.

The process of implementing the review's recommendations will begin in 2017 and I would like to formally thank everyone who contributed.

Finally, I would also like to add my sincere thanks to everyone involved with the LEI. We have much to be proud of and we have a significant agenda of initiatives ahead of us. I believe we can look to the future with confidence.

Peter Forbes
Chairman

Strengthening links between research, clinic and community are a key focus of the *Positioning LEI for the Future* review

Managing Director's Report

2016 saw the LEI position itself for future growth in patient services, clinical trials and medical research.

The multi-million renovation of the ground floor clinic – a response to dramatically increased demand for patient services – was the most significant project of the year.

While the actual renovation took six months, the clinic project had been two years in the planning with staff, volunteers and patients all surveyed to ensure the end-result met expectations.

Architects Silver Thomas Hanley created an exceptional design while head contractor Ballpoint Construction Group delivered a high-quality fit-out on time and within budget, with the new clinic fully operational by December 5.

The 1300 m^2 project involved demolishing part of the ground floor, making better use of the space available with new administration, lobby and staircase, café and alfresco areas.

Additional consulting rooms, relocation of the Retina Clinic, consolidation of ancillary services, a separate injection suite, injection rooms and recovery bays rounded out the major project.

Crucially, the clinic renovation has supported the LEI's dynamic and growing Clinical Trials centre, now one of the largest eye trials units in the world, with dedicated rooms and a separate waiting area for patients who participate in research trials.

The LEI also attracted three new talented ophthalmologists with research interests in retina, Indigenous and paediatric eye health.

In May, the Lions Outback Vision Van was officially launched by Deputy Premier Liza Harvey and Federal Assistant Minister for Health and Aged Care Ken Wyatt.

The van is fitted with state-of-the-art equipment to deliver gold-standard ophthalmological care to people living in some of Western Australia's most remote communities.

The van completed its last circuit for 2016 in November. In its first year, it saw 1679 patients - 42 per cent of whom were Aboriginal or Torres Strait Islanders - and conducted 85 clinic days across 16 communities. The van travelled 19,748kms visiting Kalgoorlie, Leonora, Wiluna, Newman, Roebourne, Onlsow, Karratha, Port Hedland, Broome, Derby, Fitzroy Crossing, Halls Creek, Kununurra, Katanning, Esperance and Albany.

In October, WA Premier Colin Barnett formally announced the creation of the *Ian Constable Chair in Discovery and Translational Ophthalmic Science* at The University of Western Australia. The new Chair – with a brief to pursue the next treatments and cures for blinding eye disease - recognised Professor Constable's landmark contribution to ophthalmology.

A post-doctoral fellowship and continuous PhD program are expected to attract leading international research scientists.

The Chair is being established through donations, and we have been fortunate that the Trustees of the Australian Foundation for the Prevention of Blindness Trust made the decision to wind up the Trust in 2015 and use its funds to help endow the Chair. We continue to seek further donations so that the person appointed to the Chair in due course will have the resources needed to deliver world class medical research.

The LEI's financial operating surplus for the 2016 year was $4.4m, which includes $3.8m in donations towards the Chair as well as a generous bequest of $1.45m from the estate of the late George Church, which will be invested to support ongoing research. Unfortunately it was necessary to write down the value of our investment in a listed US biotechnology company at 31 December 2016 by $1.7m, so our overall reported result for the year is a net surplus of $2.7m.

During 2016, the LEI also partnered with St John of God Midland Public and Private Hospital to provide a comprehensive eye service to the local community, expanding our geographical footprint beyond Nedlands and Murdoch.

In August, the LEI held a public forum – Seeing Eye to Eye – as part of National Science Week events.

LEI researchers also continued to attracted major funding support in 2016.

The Genetics and Population Health group, with Dr Fred Chen and LEI collaborator Associate Professor Alex Hewitt, secured a $2.5 million Centres of Research Excellence grant for the program: *From discovery to therapy in genetic diseases*.

In September, the WA Health Department announced a Telethon Perth Children's Hospital Research Fund 2015 (Round 4) grant for the *WA ATOM pilot study: Atropine treatment of myopia*. This study is led by new LEI clinician scientist Antony Clark.

This two-year study will be the first to report on the response rates of myopia in Asian and Caucasian children living in Australia to low-dose atropine treatment.

Genetics and Population Health also secured an NHMRC Project Grant to examine *Young adult myopia: genetic and environmental associations*.

Immunology's Professor Mariapia Degli-Esposti secured a $1.1 million NHMRC grant for research to develop pre-clinical models on how to improve treatment of viruses that occur after transplantation and a research fellowship worth $765,000 to continue research in immuno-regulation and immunity to viral infection.

The awards ensure the continuation of a highly productive research program that over the last 15 years has made numerous seminal contributions to understanding the immune responses generated during viral infection.

Physiology and Pharmacology's Professor Dao-Yi Yu, Professor Steve Cringle and Professor Bill Morgan were also awarded an NHMRC Development Grant worth $565,893 to develop a novel glaucoma surgery for clinical use and commercialisation.

The Ocular Tissue Engineering Laboratory remained focused on a wide range of research projects during the year, including stem cell therapy for retinal degeneration, stem cell disease monitoring for inherited retinal diseases and clinical trials endpoint validation.

Continued professional development for practicing ophthalmologists and clinical training of junior doctors also continued to be an important function for the group in 2016.

Important LEI leaders were also recognised throughout the year.

Former Chairman Brian King AM MBE received an honorary Doctorate of Letters from The University of Western Australia for his outstanding contribution to the community while Chairman of the Lions Save-Sight Foundation (WA), Ambrose Depiazzi, was awarded an OAM in the 2016 Queen's Birthday Honours Award for his dedicated contribution to the community.

The Board of Directors continued to position the LEI to face major challenges from an ageing population, increased rates of chronic diseases that affect sight and fierce levels of competition for medical research funding.

Under the leadership of Chairman Stephen Pearce, the Board commissioned a *Positioning LEI for the Future Review*, which involved extensive consultation with staff.

Major recommendations about the future of the LEI are expected from the review and will become available in 2017.

Stephen Pearce resigned as Chairman in January 2017.

Stephen joined the LEI Board in 2012 and assumed the role of Chairman in 2014. I thank him for his strong leadership and stewardship of the Board during a period of significant growth and change. His impact as Chairman will be felt for many years to come because of his foresight in commissioning the *Future Review*.

I also thank Board member and incoming Chairman Peter Forbes for taking on the role. Peter brings strong financial and executive skills to the role and I look forward to working more closely with him.

The LEI also farewelled Paul Seats in 2016. Paul was the Director of Clinical Operations for the past five years and was devoted to his job, staff and patients. His legacy is a lasting one given his involvement in steering the clinic project through to completion.

I thank the many organisations and individuals - including the Lions Save-Sight Foundation, Australian Foundation for the Prevention of Blindness, donors, institutional partners, trusts, foundations and bequestors - who support the LEI and share our vision to prevent and cure blindness and eye disease.

Finally, our staff members are the heart of the LEI and we honour their dedication and commitment.

Professor David Mackey
Managing Director

Board of Directors

Peter Forbes joined the Board in 2014.

A chartered accountant, he is a former CEO of specialist medical indemnity provider MDA National and Managing Director of its wholly owned insurer, MDA National Insurance. He is a non executive director on the East Metropolitan Health Services Board and on the Local Government Insurance Scheme WA. Mr Forbes was a founding partner and former Managing Partner of the WA branch of HLB Mann Judd, chartered accountants. Previous non-executive director roles included Chair of Victorian health fund provider Transport Health and Law Cover Insurance, the NSW statutory insurer for NSW solicitors.

Professor David Mackey was appointed Managing Director of the LEI and Professor of Ophthalmology at UWA in March 2009.

He heads UWA's Centre for Ophthalmology and Visual Science. Professor Mackey studied medicine at the University of Tasmania and trained in ophthalmology at the Royal Victorian Eye and Ear Hospital in Melbourne, subsequently doing a fellowship in paediatric and genetic eye diseases at the Royal Children's Hospital in Melbourne. After fellowships at the Johns Hopkins Centre for Hereditary Eye Diseases in Baltimore and the Great Ormond Street Hospital for Sick Children in London, he returned to Australia to specialise in genetic eye diseases. He is past president of the International Society for Genetic Eye Disease and Retinoblastoma, a member of the Board of the Ophthalmic Research Institute of Australia and Chair of the ORIA Scientific Advisory Committee, Australian representative on the Council of the Asia Pacific Academy of Ophthalmology and an executive committee member of the Glaucoma Research Society. He is a fellow of the Australian Academy of Health and Medical Sciences and a fellow of the Association for Research in Vision and Ophthalmology. Professor Mackey is a member of the Board's Investment Committee.

Mr Rudolf Brunovs joined the Board in 2005.

He is a Fellow of the Institute of Chartered Accountants and the Australian Institute of Company Directors and holds a Masters of Business Administration. Mr Brunovs retired as a partner of the chartered accounting firm Ernst & Young after 27 years as a partner in a number of their offices. He is currently a Director and the Principal of Mainstay Consulting Pty Ltd and Chairman of Deep Yellow Limited.

Stephen Pearce joined the Board in 2012 and was appointed Chairman in 2014.

He was appointed to take up the role of finance director of Anglo American PLC based in London and therefore resigned as a Director of the LEI on January 17, 2017.

He previously held the position of Chief Financial Officer of Fortescue Metals Group Limited and has nearly 30 years experience in senior management roles in the mining, oil and gas and utilities industries.

In January 2017, he resigned from the Board following his appointment to the role with Anglo American.

Tony Joyner joined the Board in 2013.

He has 30 years' experience as a commercial and corporate lawyer. Mr Joyner is Managing Partner of the Perth office of the international law firm of Herbert Smith Freehills, and Head of the firm's Technology, Media and Telecommunications Practice. He sits on the firm's Board. He is also the Chair of Scitech, and a Board member of the WA Chamber of Commerce. He has a broad commercial practice, but has particular interest in the fields of technology, data, health and infrastructure.

Professor Ian McAllister joined the Board in 2011.

He studied medicine at UWA, completed his ophthalmological training in hospitals in Western Australia and a fellowship in vitreoretinal disorders at the Cleveland Clinic Foundation in Cleveland, Ohio. He has been with the LEI since 1988 providing vitreoretinal services to metropolitan hospitals and has also been involved in research into disorders affecting the retina. Professor McAllister holds a number of NHMRC grants as well as numerous minor grants and has published more than 120 papers in scientific journals. He has also been awarded an American Academy of Ophthalmology Achievement award for distinguished service to ophthalmology. He has recently been awarded a Doctorate in Medicine by UWA. Professor McAllister is the Director of Clinical Services at the LEI and has extensive experience in research and eye health care. He is a consultant ophthalmologist at Royal Perth Hospital.

Dr Margaret Crowley joined the Board of the LEI in 2016.

She is an experienced CEO and Board Director and a Graduate of the Australian Institute of Company Directors. She has held senior positions in State and National Governments and in Universities and the not-for-profit sector – most recently as CEO of the Association for the Blind WA Inc. for 15 years. Her PhD focused on the perceived role of professional women in the United States Secretariat in New York.

Mentor role for Scientific Advisory Committee

The Scientific Advisory Committee has assisted LEI Managing Director Professor David Mackey throughout 2016 in mentoring early career scientists with their grant applications.

Established in 2015, Committee members are Professor Lyn Beazley, Emeritus Professor Lawrie Beilin, Professor Shaun Collin, Professor Sarah Dunlop and Professor Peter Klinken.

The Scientific Advisory Committee was created to advise the Managing Director on the implementation of research strategy and to provide assistance in achieving external, State and Commonwealth support and collaboration.

Professor Lyn Beazley

Emeritus Professor Lawrie Beilin

Professor Shaun Collin

Professor Sarah Dunlop

Professor Peter Klinken

Ian Constable Chair pursues next generation treatments for eye disease

Professor Ian Constable's landmark contribution to saving sight was recognised during 2016 with the creation of the *Ian Constable Chair in Discovery and Translational Ophthalmic Science* at The University of Western Australia.

Announced by Premier Colin Barnett in October, the new Chair will pursue the next treatments and cures for blinding eye disease.

The new positions include a post-doctoral fellowship and continuous PhD program to attract leading international research scientists.

Professor Constable was appointed to the Foundation Lions Chair of Ophthalmology at UWA in 1975 at the age of just 32, having previously worked in retinal research at Harvard Medical School and the Massachusetts Eye and Ear Infirmary.

Within two years of his arrival in Western Australia, he had set up the State's first ophthalmic training program. He introduced new surgical procedures for the treatment of vitro-retinal disease and spearheaded vital outreach services to remote Aboriginal communities.

In 1983, he founded the LEI – now recognised internationally as both a centre for clinical excellence and a leader in scientific research.

The new Chair is being established with the financial support of the Australian Foundation for the Prevention of Blindness (AFPB) and private donations and will be based at the LEI.

During the year, the Lowy Foundation made a generous contribution towards research support for the Chair.

Indonesian eye specialist Dr Sjakon Tahija, who completed his vitreoretinal fellowship at the LEI in the early 1990s, is a generous supporter of the campaign and was named as International Ambassador for the new Chair in 2015.

UWA Vice-Chancellor Professor Paul Johnson, Professor Ian Constable and Premier Colin Barnett at the launch of the new Chair

Genetics and Population Health

2016 saw Genetics and Population Health continue to pursue a wide range of internationally-significant research projects and secure funding for important new objectives.

The group is conducting several studies examining the genetic and environmental associations of myopia, including the Twins Eye Study, the Busselton Healthy Ageing Study, the Raine eye health study, WA Eye Protection Study and the WA Kidskin study.

The group is also part of the international Consortium for Refractive Error and Myopia (CREAM) that has identified many genes associated with myopia. Its ongoing work is to find which genes are interacting with the outdoor environment to prevent myopia and by discovering the pathways involved, explore novel interventions to prevent myopia.

During 2016, a research team directed by Group Leader Professor David Mackey and including Dr Fred Chen and LEI collaborator Associate Professor Alex Hewitt won a $2.5 million National Health and Medical Research Excellence grant for the program: *From discovery to therapy in genetic diseases*.

Professor Mackey and Dr Anthony Clark also secured a Telethon Perth Children's Hospital Research Fund 2015 (Round 4) grant for the *WA ATOM pilot study: Atropine treatment of myopia*.

This two-year study will be the first to report on the response rates of myopia in Asian and Caucasian children living in Australia to low-dose atropine treatment. It will likely begin in 2017 with a study cohort of 75 children.

During 2016, Professor Mackey and Dr Seyhan Yazar gave a presentation for UWA Research Week called *Does university make you myopic?*

In February, Dr Yazar received her doctorate from UWA for her thesis *Exploring genetic and environmental influences on ocular biometry in healthy young adults*. She secured a 4-year NHMRC CJ Martin Postdoctoral Research Fellowship to further study at the bioinformatics laboratory of the Institute of Genetics and Molecular Medicine with the first two years at the University of Edinburgh.

Also in 2016, a group of four Chinese medical students were hosted by Genetics and Population Health as part of the 2016 Winter School Program.

The students recruited their peers to participate in the WA Eye Protection Study where they learned how to perform eye assessments and analyse data.

Professor David Mackey delivered a talk – Does university make you myopic? – during the 2016 UWA Research Week

Research projects

Translation of Genetic Eye Research

This NHMRC Centre of Research Excellence project is a five-year (2012-2016) $2.5 million national research effort to take the new discoveries in genetics of eye disease and translate them into improved patient care.

The Translation of Genetic Eye Research involves research teams from Western Australia, South Australia, Victoria and Tasmania.

As well as regular teleconference meetings, all the Chief Investigators, Associate Investigators and Scientific Advisory Group went to Melbourne in November to review the achievements over the past five years.

A study involved in this research is the Ophthalmic Western Australian Biobank (OWAB) study. This research study consists of a large collection of blood and DNA from people with eye diseases, as well as people with healthy eyes.

Comparing DNA between a large number of people with a specific eye disease such as glaucoma and a large number of people with healthy eyes will help us find out how your genes can influence your risk of eye disease.

The Raine eye health study

The Raine study is a longitudinal study that began in 1989, recruiting nearly 3000 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-old follow-up of 2000 cohort participants had a predominant focus on eye health – the Raine eye health study. This is one of the first studies of eye health and diseases in young adults, for which very little data exist as it is presumed that young adults have the best vision.

The West Australian Eye Protection Study

Outdoor sports involve exposure to sun, which has both beneficial and potentially harmful effects. For example, ultraviolet (UV) light helps us make Vitamin D, which is important for bone strength, but UV also increases the risk of skin cancer. Thus, a balance is important.

Similarly some outdoor exposure seems to protect adolescents from developing short-sightedness (myopia) but excess UV exposure increases the risk of UV damage to the front of the eye, causing pterygium.

Wearing hats and sunglasses is practical for some sports and outdoor activities but it is less so for others, such as surfing. There had been concern that goggles used in swimming, if worn too tightly, may be increasing the risk of the eye disease glaucoma that causes loss of side vision, however our research showed that this was not a major problem.

The main aims of this research are to:

- Evaluate the use of eye protection (e.g. sunglasses, goggles) by those involved in regular sports, outdoor activity or swimming
- Determine evidence of sun damage to the eye in these groups
- Assess levels of glaucoma damage to the eye in these groups

Participation involves attending the LEI for a free comprehensive eye examination and completing two questionnaires about general health and physical activity.

Our Eye Protection study aims to clarify which sports offer the least sun damage in combination with the lowest rates of myopia. At present we are tracking rowers who have a large amount of time outdoors, but often in the early morning.

Western Australian Strabismus Inheritance Study

Strabismus (misalignment of the eyes) affects three to five per cent of the general population. It is often associated with amblyopia, otherwise known as a lazy eye (failure of normal visual development) and reduced or absent binocular (stereoscopic) vision. Early diagnosis and treatment enables optimal visual outcomes. The associated poor cosmetic appearance may also interfere with social and psychological development.

Twin, population and family studies suggest there is a genetic component to strabismus. Research allows better understanding of the mechanism by which strabismus occurs, identifying those at higher risk and the potential to develop new treatments. Good vision in childhood is essential to the proper development of vision into adulthood.

Busselton Healthy Ageing Study

The Busselton Healthy Ageing Study is well known as a major population health study that has been ongoing since the 1960s.

In 2010, the Busselton Population Medical Research Foundation started a study – the Busselton Health Ageing Study - to explore why some people are able to remain healthy and active throughout their senior years, while others suffer ongoing illness and infirmity.

There is an eye component within this study, for which the LEI - through Professor David Mackey - is providing financial and equipment support.

Genetics and Population Health has evaluated members of the Busselton Healthy Aging Study who had skin cancer - a key marker of excessive time outdoors - and myopia compared to those without skin cancer. In 143 people aged 46-64 years, researchers found 11.9 per cent had myopia in contrast to 1718 people without skin cancer where 21.6 per cent had myopia.

Vision Regeneration Program: Eye Diseases in a Dish – Skin to Eye Cell Study

In an exciting breakthrough, we now have the technology to grow retinal cells in a laboratory from a small sample of skin. Through the regeneration of retinal cells from skin biopsies of people with and without eye disease, this study aims to:

- Further our understanding of how your genes can determine whether you develop an eye disease
- Enable the testing of new treatments on retinal cells without the need to obtain a specimen directly from the eye
- Identify suitable therapies for people with eye disease

Children's eye injuries

Eye injuries to children resulting in permanent vision loss have a devastating impact not only on their lives but also the people around them. Recognising the need to reduce children's eye injuries, Perth philanthropist Joyce Henderson made a bequest to support work into prevention of children's eye injuries. With funding from the Joyce Henderson Trust, the LEI is helping work toward this aim by researching the causes of these injuries and how best to prevent them.

A prospective study is being conducted at Princess Margaret Children's Hospital to determine in more detail the epidemiology of eye injuries in children.

Working with health care providers and the community, educational campaigns are being developed to help deliver this important message. Each year, an ophthalmology fellow is employed to conduct this very important work alongside key researchers at the LEI.

WA Kidskin Study

We have pilot work on the WA Kidskin study, which is evaluating the effect of keeping children out of the sun in the middle of the day during primary school and its effect on myopia in adulthood.

The study offers a unique opportunity to examine young adults who as primary school children were randomised to standard sun protection education or increased sun protection. This intervention lasted four years and should result in a difference in myopia between the two arms of the study.

A group of four Chinese medical students were hosted by the Genetics and Population Health group as part of the 2016 Winter School Program

Visiting Speakers

Professor Robyn Lucas

Professor Lyndon DaCruz

Governor Kerry Sanderson

Professor Stephanie Watson

Professor Glen Gole

Dr Christine A Curcio

Dr Robert J Zawadzki

Collaborations

State

Committee member, Western Australian Translational Health Network

Associate Professor Geoff Lam - Princess Margaret Hospital, Perth

Professor Liz Milne – UWA, Telethon Kids Institute

Associate Professor Craig Pennell - School of Women's and Infants' Health, UWA, Perth

National

Associate Professor Kathryn Burdon – University of Tasmania, Hobart

Professor Minas Coroneo - University of Sydney, Sydney

Professor Jamie Craig - Flinders University, Adelaide

Professor Jonathan Crowston - Centre for Eye Research Australia, University of Melbourne, Royal Victorian Eye and Ear Hospital, Melbourne

Professor John Grigg – University of Sydney

Professor Mingguang He – University of Melbourne

Associate Professor Alex Hewitt – University of Tasmania, Hobart

Professor Robyn Jamieson – University of Sydney

Professor Robyn Lucas – Australian National University

Associate Professor Stuart MacGregor – QIMR Berghofer, Brisbane

Professor Nick Martin - Queensland Institute of Medical Research, Brisbane

Professor Paul Mitchell - Centre for Vision Research, Department of Ophthalmology and Westmead Millennium Institute, University of Sydney, Sydney

Professor Grant Montgomery - Queensland Institute of Medical Research, Brisbane

Professor Margaret Otlowski – University of Tasmania

Professor Kathryn Rose – University of Technology Sydney

Professor Deb Schofield – University of Tasmania

Professor Ian Trounce - Centre for Eye Research Australia, University of Melbourne, Royal Victorian Eye and Ear Hospital, Melbourne

International

Dr Elizabeth Engle - Howard Hughes Medical Institute Engle Lab & Center for Strabismus Research, Children's Hospital, Boston USA

Associate Professor Jeremy (Jez) Guggenheim – Cardiff University (UK)

Professor Chris Hammond - King's College London School of Medicine, London UK

Dr Alison Hardcastle - UCL Institute of Ophthalmology, London UK

Dr Simon John - The Jackson laboratory, Bar Harbor, Maine USA

Professor Anthony (Tony) Moore - Institute of Ophthalmology, University College London UK

Professor Carmel Toomes - Leeds Institute of Molecular Medicine, Leeds University, Leeds UK

Dr Rohit Varma - Doheny Eye Centre, Los Angeles, California USA

Dr Cathy Williams - University of Bristol, Bristol UK

Dr Mary Wirtz - Oregon Health & Science University, Portland, Oregon USA

Professor Tien Wong - Singapore Eye Research Institute, Singapore

Dr Terri Young – University Wisconsin, Madison, Wisconsin

Staff

Professor David Mackey (Group Leader)

Tracey Dickens (Research Team Manager)

Lisa Booth (Research Assistant)

Julie Crewe (Research Assistant)

George Gooden (Research Assistant)

Kashif Syed (Data Management Officer)

Kate Hanman (Research Assistant)

Alex Burton (Research Assistant)

Annette Clayfield-Hoskin (Research Fellow)

Dr Alex Hewitt PhD (NHMRC Research Fellow)

Dr Livia Carvelho (Visiting Research Fellow)

Dr Swati Sinkar (Joyce Henderson Research Fellow)

Dr Antony Clark (Senior Lecturer)

Immunology

The Division of Immunology comprises four research groups: Ocular Immunology and Autoimmunity led by Professor John Forrester, Cell Signalling and Apoptosis led by Assistant Professor Chris Andoniou, Viral Immunology led by Dr Jerome Coudert and Experimental Immunology led by Professor Mariapia Degli-Esposti.

One of the Division's main research projects focuses on understanding how a common viral infection affects vision. The viral pathogen of interest is cytomegalovirus (CMV). This virus causes a persisting infection that can lead to significant systemic disease, as well as severe ocular complications, especially in individuals whose immune systems are compromised or not fully functional. One such group are babies.

CMV is the most common cause of congenital infection, occurring in 0.2 per cent to 2.4 per cent of all live births. Five to 10 per cent of babies with congenital CMV infection are symptomatic. Babies with symptomatic CMV infection at birth have a wide spectrum of clinical disease, including visual impairment and hearing loss.

These problems most often occur as part of a more general sensorineural loss, with other symptoms comprising microcephaly, motor defects and mental retardation. Indeed, visual problems caused by congenital CMV infection can be due to either cortical visual impairment and/or optical visual impairment. Ophthalmological abnormalities are reported in a high percentage of babies with symptomatic congenital CMV, and include chorioretinitis, strabismus and optic atrophy. Up to one third of babies born with symptomatic congenital CMV infection develop strabismus. In addition, macular scars may lead to loss of vision.

Understanding how CMV causes disease, how the immune system responds to this infection and why the virus is not completely cleared is essential to designing preventative and curative therapies for this infection. Using a model of human cytomegalovirus (HCMV) infection in the mouse, the Immunology division is addressing these questions.

During 2016 many advances have been made using our new in vivo models of viral infections that affect the eye. In these physiological models of viral eye infection we found that infection causes long-term changes in various eye compartments, including pathologies that have been described in patients but whose etiology has so far been poorly understood.

An additional focus of our immunology research is inflammatory ocular disease or uveitis.

Uveitis is an inflammatory disease that affects the eye, damaging the retina and causing blindness. Uveitis mainly occurs in the 20-50 year age group, and can affect one or both eyes. Uveitis is an important problem and accounts for 10 per cent of blindness in people of working age in the western world. Little is known about the cause of uveitis and it remains one of the most important unsolved problems in ophthalmology. Professor John Forrester and Dr Valentina Voigt are investigating the development of uveitis, both in the setting of infection and autoimmunity.

Dr Iona Schuster, Assistant Professor Chris Andoniou and Professor Degli-Esposti are furthering their work assessing the impact of viral infections on the development and progression of autoimmune diseases. The Immunology division's work has revealed the link between chronic viral infection and the development of the second most common autoimmune disease – Sjogren's Syndrome (SS). SS affects up to three per cent of the population or three quarter of a million people in Australia. In its "mildest" form the disease affects the production of tears and saliva, so people with the disease have constantly dry eyes which are sore and sensitive to light. SS is a chronic condition and the limited treatments available barely deal with the symptoms, but there are no effective treatments or a cure. The team is continuing their research to identify and target the pathways that lead to SS, with the aim to develop treatments for this common and debilitating condition.

Assistant Professor Chris Andoniou and Peter Fleming have made significant discoveries in the area of programmed cell death or apoptosis. Apoptosis is an important physiological process and dysregulation in apoptotic pathways can lead to a number of degenerative disorders, including many which affect the eye. Therefore, a better understanding of the processes that regulate apoptosis is critical to improve the treatment of these diseases, including for example retinal degenerative disorders. Ongoing studies are dissecting the interactions between viral and host proteins which regulate the sensitivity of specific cell populations to apoptotic death.

With our collaborators at the QIMR Berghofer Medical Research Institute, we have established a program to investigate complications that occur during bone marrow transplantation (BMT) and have developed unique mouse models. Allogeneic bone marrow transplantation is the principal curative treatment for the majority of blood cancers. The two major limitations of allogeneic bone marrow transplantation are graft versus host disease (GVHD) and opportunistic infections. CMV represents the most problematic and predictable life-threatening infection in the ever-expanding transplant community.

Advances in our immunology research in 2016 have been supported by generous donations from:

Stan Perron Charitable Foundation Ltd.

Hardie Foundation Pty Ltd.

Our research has provided important insights into the immunological defects that compromise anti-viral immunity and has defined strategies to improve these responses in pre-clinical animal models.

One common complication following BMT is ocular graft versus host disease (ocular GVHD). Symptoms of ocular GVHD include blurry vision, severe light sensitivity, chronic conjunctivitis (pink eye), dry eyes, burning sensation and general eye pain. In severe cases, ocular surface disease with corneal perforation can ensue. Our studies are addressing whether immune-mediated mechanisms participate in the pathology of ocular GVHD, and whether this complication is exacerbated by concomitant viral infection. Ultimately, we aim to develop improved therapies for this important ocular condition.

Immunology Division

Head of Division:
Professor Mariapia Degli-Esposti

Group Leaders

Professor Mariapia Degli-Esposti

Professor John Forrester

Assistant Professor Christopher Andoniou

Dr Jerome Coudert

Research Staff

Dr Valentina Voigt

Dr Iona Schuster

Dr Anna Oszmiana

Dr Monique Ong

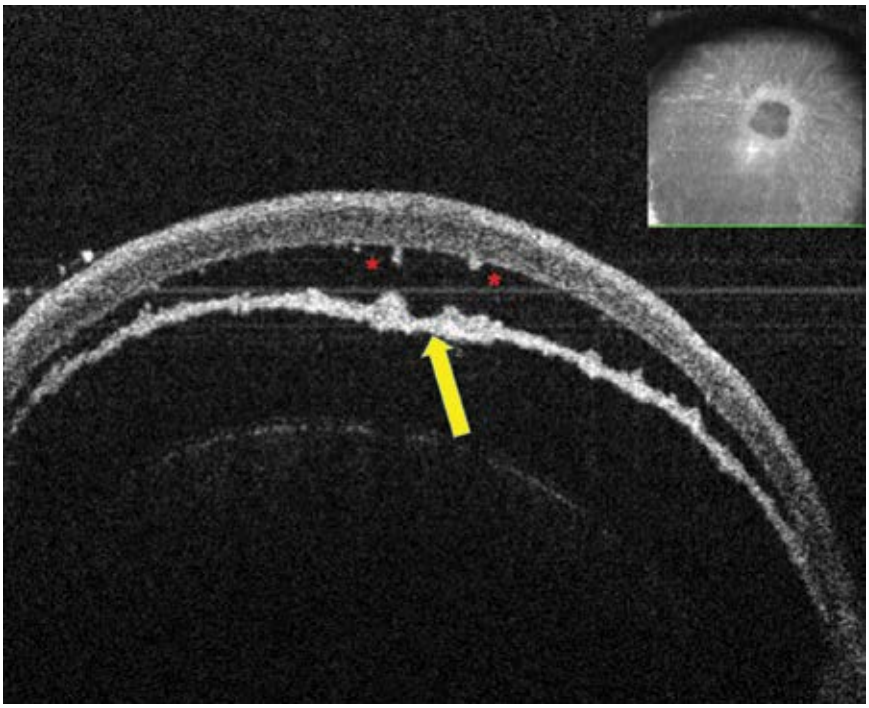
Dr Serani van Dommelen

Dr Andrew Lucas

Peter Fleming

Slavica Pervan

Tom Casey



An example of the pathology caused by viral infection in the eye

Molecular Ophthalmology

During 2016, Molecular Ophthalmology continued work on the Phase 2a gene therapy clinical trial for wet Age-related Macular Degeneration (wet AMD).

There are 32 patients in the Phase 2a study that had samples collected and analysed as part of the three year trial. One year data analysis of these 32 patients was completed and results of the Phase 2a study supported the findings of the Phase 1 study of eight patients that the approach of using gene therapy for the treatment of a complex disease was safe and well tolerated.

The results showed that gene therapy was equivalent to presently used treatments for wet AMD and patients treated with gene therapy required less injections. These findings were published in the journal eBiomedicine.

In addition to conducting the laboratory data collection and analysis for the trial, the group conducted research related to the better understanding of wet AMD.

Data from the Phase 2a study was suggestive of a bimodal response to gene therapy based on a patient's antibody status. The group has begun to develop cell and animal models to further explore these findings.

Molecular Ophthalmology also conducted research examining the development of wet AMD.

In the normal adult eye there is a fine balance between the presence of angiogenic molecules - responsible for maintaining neural retinal health in the adult eye - and antiangiogenic molecules, ensuring that blood vessel growth is well regulated.

Wet AMD can be described as a disease where this balance of molecules becomes lopsided with angiogenic agents outstripping their counterparts.

Members of the Molecular Ophthalmology team Professor Elizabeth Rakoczy, Dr Aaron Magno and Associate Professor May Lai

A systemic review of the literature relating to eye disease, conducted by Dr Aaron Magno, demonstrated there was indeed a difference in eye diseases with no neovascular component present, where the anti-angiogenic molecules were in dominance and diseases like wet-AMD and diabetic retinopathy, in which the balance was disturbed.

However, this is only part of the story as the measurement of angiogenic and antiangiogenic molecules does not relate to their functional activity.

As such, scientists in Molecular Ophthalmology have developed a new patentable assay to differentiate between antiangiogenic molecules present in a complex or free form.

Staff

Professor P. Elizabeth Rakoczy

Associate Professor May Lai

Dr Aaron Magno

Physiology and Pharmacology

During 2016 the new surgical therapy for glaucoma invented by the Physiology and Pharmacology team received FDA approval in the USA, meaning that this new "microfistula" based technology is now available in the major population centres in the USA, Canada and most of Europe.

On the basic research front, the Physiology team have continued with their collaborative studies of new imaging technologies in ophthalmology.

Together with collaborators from Canada headed by Professor Marinko Sarunic, and a local team of engineers at UWA headed by Professor David Sampson, we are developing non-invasive systems for examining the tiny blood vessels in the retina, and we are also looking at the lymphatic vessels in the conjunctiva covering the white part of the outside of the eye.

Recent discoveries from our research laboratories have demonstrated that these lymphatic vessels are key to the successful outcome of glaucoma filtration surgery.

Currently there are no clinically useful techniques for studying the lymphatic vessels in a clinical setting, so this is a completely new area of research.

The Physiology group hosted many visitors throughout the year, including Professor Mark Humayun, with whom we are examining novel methods for supplying additional oxygen to the inside of the eye as a possible therapy for a range of diseases in which retinal blood supply is compromised. This work is supported by a very prestigious USA National Institutes of Health (NIH) grant, on which Professors Dao-Yi Yu and Steve Cringle are co-investigators.

It is very rare for NIH grants to be shared with researchers outside the USA, and reflects our unique capabilities in the field of oxygen measurements in the eye. A longer term visitor was a graduate student, Morgan Heisler, from Canada for a period of three months on secondment from our Canadian collaborators on the imaging projects.

Major funding by way of an NHMRC Development grant was secured to support our work in developing new ultra violet laser based treatments for intraocular surgery. These techniques are aimed at developing new methods for drainage surgery

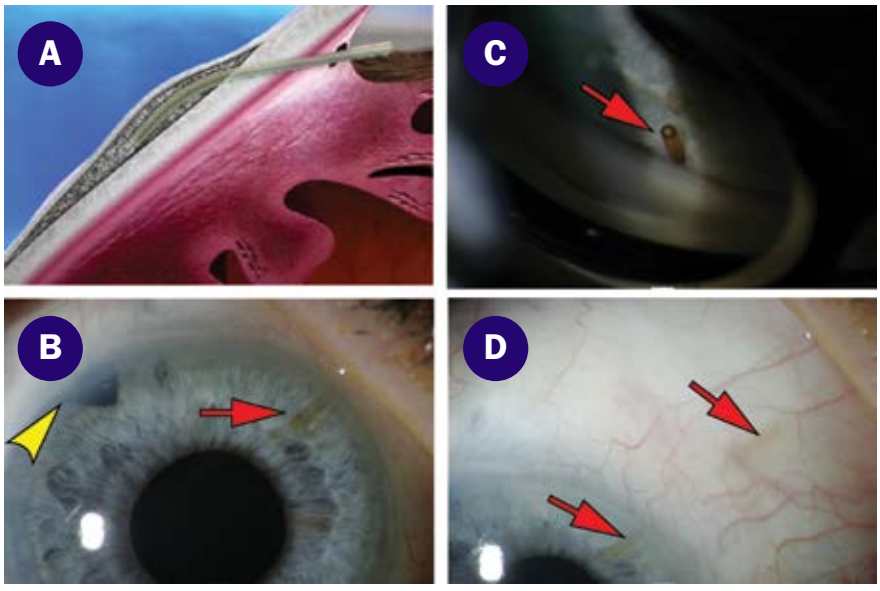


Figure A shows a schematic representation of an implanted microfistula tube. The tube is designed to drain excess fluid to lower the pressure inside the eye. Figure B shows the tube (red arrow) implanted in a patient that had had a previous failure of conventional glaucoma surgery (Yellow arrowhead). Figures C and D show the open end of a microfistula tube (C) and how little surgical damage there is to the implant site (D)

in glaucoma, and in the precise dissection of intraocular tissue in a range of retinal diseases.

State Government funding was obtained to support a project looking at reducing the cost of glaucoma filtration surgery in Western Australia. The project is looking at the benefits of adopting the new microfistula technology for glaucoma filtration surgery and applying the new lymphatic vessel imaging technology to further improve the success rates for the procedure.

The Physiology team and collaborating clinicians also published 16 papers in the ophthalmic literature during 2016.

Staff

Professor Dao-Yi Yu - Director
Professor Ian McAllister
Professor Stephen Cringle
Professor William Morgan
Associate Professor Er-Ning-Su
Associate Professor Paula Yu
Associate Professor Sarojini Vijayasekaran
Dean Darcey
Kathryn Morgan
Dr Chandra Balaratnasingam
Fraser Cringle

Affordable glaucoma tube within reach

Professor Bill Morgan, a senior member of the Physiology and Pharmacology research group, continued his collaboration with Jakarta eye doctor Virna Oktariana in 2016.

They are developing an affordable tube solution for glaucoma that will help more Indonesians access sight-saving surgery.

The incidence of glaucoma in Indonesia is like that of 1950s Australia. But with tubes costing between $800 and $1000 Australian dollars, surgery is out of financial reach for many Indonesians.

Glaucoma is the second-commonest cause of blindness and in Indonesia, is frequently worse that that seen in Australia.

Dr Oktariana saw the need for a cheaper tube option and together she and Professor Morgan worked to develop a prototype that can be manufactured in Indonesia for around $100.

After testing on animals, human trials began in August 2015. Early results are very promising and offer hope to the huge number of Indonesians with glaucoma.

Dr Oktariana's association with Western Australia and the LEI began in 2011, when she spent two months at Royal Perth Hospital and the LEI on a fellowship.

Currently completing her PhD under Professor Morgan, she also works with Dr Widya Artini at RSCM Kirana attached to the University of Indonesia.

Dr Artini completed a fellowship with Professor Morgan 20 years ago and returned to Indonesia to set up RSCM Kirana (a large five-storey public eye hospital) in Jakarta.

It is fully equipped with modern equipment and currently trains 70 young eye doctors. These local Indonesian ophthalmologists are transforming eye care in Indonesia by training many young doctors who can work across the country.

Professor Morgan and Dr Oktariana continued their collaboration on an affordable glaucoma tube during 2016

Ocular Tissue Engineering Laboratory

Overview

The LEI's Ocular Tissue Engineering Laboratory (OTEL) was established in 2011 by Dr Fred Chen and his group's work has been focused on teaching and research. His team conducts translational research in stem cells, disease modelling, novel therapy development, clinical trial endpoint validation and natural history progression of retinal degenerations. Another major contribution from Dr Chen's team in 2016 is teaching and training of medical and postgraduate students, junior doctors and scientists, and continued professional development of ophthalmologists in WA and overseas. His team is also actively involved in community engagement in raising public awareness of retinal degenerative diseases. The first Miocevich Retina Fellow joined the team in 2016 and the OTEL's national and international research collaboration continued to grow.

Research

Stem cell therapy for retinal degeneration

Age-related macular degeneration (AMD) and inherited retinal diseases (IRD) are the most common causes of blindness in the Western world. The common final pathway in these two conditions leading to blindness is the degeneration of the light sensing retinal photoreceptor cells. OTEL's current work aims to use neural stem cells to replace or preserve existing photoreceptor cells thereby preserving vision in patients with retinal degeneration.

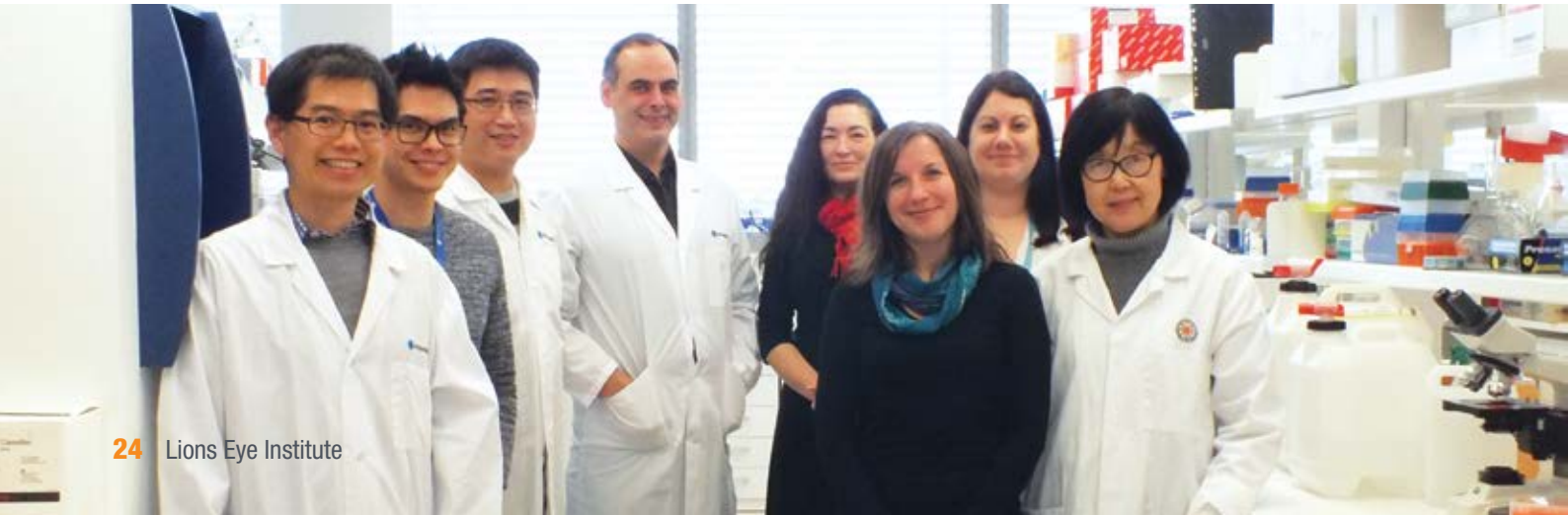
Dr Chen's group has demonstrated the proof of principle in this approach using human corneal limbal derived neural stem cells. The major advantage of this approach is that autologous cells can be used without harm to the cornea and there is no danger of transplanting pluripotent or embryonic stem cells into the eye which has the potential of turning into cancer cells.

The OTEL received funding in 2016 from the Health Department of WA and Ophthalmic Research Institute of Australia for further work in this area. They continued the close collaboration with Professor Harkins' group at the Queensland Eye Institute in examining silk fibroin as a carrier substrate for retinal cell transplantation (NH&MRC APP1080302).

Stem cell disease modelling of inherited retinal diseases

Inherited retinal diseases (IRDs), such as retinitis pigmentosa and Stargardts disease, are the most common cause of blindness in the working age group in Australia. The OTEL started a prospective clinical trial - Western Australia Retinal Degeneration Study - to investigate the use of patient skin cells to develop a model of these eye diseases in the petri dish. They have grown pluripotent stem cells from some of these skin cells in preparation of cultivating these into patient specific retinal cells for testing novel therapies.

Members of the OTEL team



Personalised treatment can be developed by using these cells to screen for potentially effective drugs and test the new gene editing technology that can remove the mutation from retinal cells. Some of these treatments may be generic and applied to several different genetic eye diseases whilst many will be personalised for each patient as there are over 4000 different types of mutations in 280 genes that cause IRD. In 2016, the OTEL committed to study the following IRD-causing genes: *RP1, CLN3, CRB1, PRPF31, ABCA4* and *USH2A* using stem cell disease modelling.

Dr Chen has continued his collaboration with the Ear Science Institute Australia in studying Usher disease which causes blindness and deafness. He has also begun a new collaboration with Professor Wilton and Professor Fletcher from Murdoch University in exploring opportunities for developing gene based therapies for IRDs.

Clinical trials endpoint validation

The effectiveness of a new treatment in retinal disease has often relied on the demonstration of visual acuity preservation or improvement. However, Dr Chen's previous work on visual acuity as a measurement taken within a rigorous clinical trial protocol or during routine clinics showed large test-retest variability and discrepancy between the different testing distances. Therefore, a more robust clinical trials endpoint in retinal therapy is urgently needed to allow clinicians to reliably measure treatment benefit or disease progression.

The OTEL has invested extensive research efforts in validating various modern imaging and functional test endpoints including optical coherence tomography (OCT), fundus autofluorescence, adaptive optics retinal photography and microperimetry. In 2016, Dr Chen's group published on the test-retest variability of microperimetry and OCT retinal volume and thickness measurements. His group also described the unique retinal features related to congenital rubella and retinal artery macroaneurysm causing retinal vein occlusion.

Dr Chen's group began a new collaboration with Dr David Alonso-Caneiro from Queensland University of Technology in new image visualisation methods in creating en face images from transverse scans of the retina. The OTEL's collaboration with Professor Robyn Guymer from University of Melbourne in nanosecond laser treatment for drusen (LEAD trial) continued in 2016 with approximately 50 patients still participating in the study.

Natural history progression of retinal degeneration

Over 300 patients are currently participating in OTEL's Western Australia Retinal Degeneration natural history study in which we photograph the retina once every six months for five years. The measurements derived from this large set of retinal images is extremely invaluable for informing clinicians on the biomarkers that may predict which eyes will progress slower and faster. OTEL will also use the clinical information to determine which type of retinal photography is most suitable and sensitive in picking up whether retinal disease is progressing.

The OTEL is also part of a national Centre of Research Excellence in monitoring disease progression of retinal degenerations and prioritising development of treatments for those patients who are progressing rapidly in natural history study (NH&MRC1116360).

Dr Chen's group continued to work in close collaboration with Associate Professor John De Roach and his team at the Australian Inherited Disease Registry and DNA bank in genotype and phenotype correlations in a range of IRDs such as Stargardts disease, rod cone dystrophy, cone rod dystrophy, cone dystrophy, pattern dystrophy, occult macular dystrophy, achromatopsia and congenital stationery night blindness.

Teaching

Continued professional development for practicing ophthalmologists and clinical training of junior doctors are also important functions of the OTEL.

2016 is the fourth year that Dr Chen has organised the LEI Retina Case Conference and the third year that he is responsible for the RANZCO Ophthalmological Colloquium. Each year, Dr Chen organises 12 Retina Case Conference sessions in which a trainee doctor is paired with an ophthalmologist to present challenging cases in retina for discussion and learning. The RANZCO Ophthalmological Colloquium is also held once a month and this brings together ophthalmologists in WA to a seminar in which a guest speaker will provide updates in ophthalmic research or specific eye condition for the continued professional development. Dr Chen also visited the ophthalmology department at the People's Hospital of Xing'anmeng, Wulanhaote City, Inner Mongolia, China, to teach medical and surgical retina to the local ophthalmologists as part of the Lifeline Express.

A new medical retina fellowship was established in 2016 by the Miocevich Family. The inaugural fellow was Dr Yi (Cheryl) Chen originally trained in China as an ophthalmologist. This position provides medical retina and research training in retinal conditions such as macular degeneration and inherited retinal diseases. The fellow is closely involved with the laboratory science aspects of OTEL to enrich their clinical experience. The inaugural Miocevich Lecture was delivered by Professor Lyndon Da Cruz who is a world renowned expert in bionic eye surgery and stem cell transplantation for retinal diseases. He graduated from UWA and University of Oxford and currently is a consultant ophthalmologist at Moorfields Eye Hospital in London and Professor of Retinal Transplantation Surgery at the University College of London.

Invited lectures, teaching seminars and poster presentations

Invited Lectures

Queensland University of Technology, Brisbane Dec 2016

Higgan Ophthalmological Society, China Oct 2016

RANZCO Annual Congress, Melbourne Nov 2016

Science on the Swan, Perth May 2016

ANZSRS Congress, Sydney May 2016

Victorian RANZCO Branch, Melbourne Mar 2016

Western Australian RANZCO Branch, Rottnest Mar 2016

The Royal Society of Western Australia Mar 2016

Teaching Seminars

Multi-disciplinary approaches for biomedical research workshop Dec 2016

Ozurdex in DME: VIP Patient Cases Seminar, Allergan Nov 2016

Lifeline Express Teaching Trip, Inner Mongolia, China Oct 2016

WA Inter-hospital Pathology and Imaging Clinical Meeting Sep 2016

Australian Ophthalmic Nurses Association Symposium Sep 2016

Steroids and Inflammation, the Enligten Conference, Sydney Jun 2016

Optomax Conference May 2016

4th Centre for Cell Therapy and Regenerative Medicine Symposium Apr 2016

LEI Morning Research Seminar Feb 2016

Gene Editing and Induced Pluripotent Stem Cells Interest Group Jan 2016

RANZCO Ophthalmological Colloquium Jan 2016

Conference and poster presentations

Photonics Europe, Brussel Belgium Apr 2016

Science on the Swan, Perth May 2016

The Australian Society for Stem Cell Research Scientific Meeting, Perth Dec 2016

Research Team:

Staff

Dr Fred Chen (Director)

Dr Yi Chen
(Miocevich Retina Fellow)

Dr Danuta Sampson
(Imaging Research Fellow)

Dr Samuel McLenachan
(Laboratory Senior Scientist)

Dr Dana Zhang
(Laboratory Senior Scientist)

Mr Shang-Chih Chen
(Laboratory Research Assistant)

Ms Xiao Zhang
(Laboratory Research Assistant)

Ms Jade Knapp
(Research Administrator)

Students

Dr Evan Wong (Masters, UWA)

Dr Avenell Chew (Masters, UWA)

Dr Erandi Chandrasekera
(Masters, University of Sydney)

Dr Irwin Kashani
(Masters, University of Sydney)

Mr Jeffrey Mak
(MD Scholarly Activity, UWA)

Ms Elaine Ong
(Research project, UWA)

Mr Jonathan La
(Research project, UWA)

Mr Lawrence Wong
(Research project, UWA)

Mr Joel Mudri
(MD Scholarly Activity, UWA)

Visiting Professor

Professor Lyndon Da Cruz, Moorfields Eye Hospital, London

Professor Robert Zawadzki, University of California, Davis

Research collaborators

International

Professor Lyndon Da Cruz, Moorfields Eye Hospital, London, UK

Professor Homa Tajsharghi, University of Skovde, Sweden

Dr Michael Edel, Research Institute of Hospital Val d Hebron, Barcelona, Spain

Dr Yannuzzi, New York University Langone Medical Centre, New York, US

Local/national

Professor Damien Harkin, Queensland University of Technology, Brisbane

Professor Robyn Guymer, University of Melbourne, Melbourne

Professor Mark Gillies, University of Sydney, Sydney

Professor James Semmens, Curtin University of Technology, Perth

Professor David Preen, The University of Western Australia, Perth

Professor Sue Fletcher, Murdoch University, Perth

Professor Mel Ziman, Edith Cowan University, Perth

Professor Steve Wilton, Perron Institute for Neurological and Translational Science

Professor Rodney Dilley, Ear Science Institute Australia, Perth

Professor Gary Lee, Respiratory, Sir Charles Gairdner Hospital, Perth

A/Prof Samantha Fraser-Bell, University of Sydney, Sydney

A/Prof Aron Chakera, Nephrology, Sir Charles Gairdner Hospital, Perth

A/Prof John De Roach, Australian Inherited Retinal Disease Registry, Perth

A/Prof Seng Khee Gan, Endocrinology, Royal Perth Hospital, Perth

Dr David Alonso-Caneiro, Queensland University of Technology, Brisbane

Dr Elin Gray, Edith Cowan University, Perth

Dr Kristen Nowak, Harry Perkins Institute, Perth

Dr Claire Phillips, Peter McCallum Cancer Centre, Melbourne

Competitive research funding in 2016

NH&MRC Project Grant: Young adult myopia: genetic and environmental associations (APP1121979, CIH Chen, 2017-2020)

NH&MRC Centre of Research Excellence: From discovery to therapy in genetic eye disease (APP1116360, CIH Chen, 2016-2021)

NH&MRC Project Grant: A fibroin-based prosthetic Bruch's membrane for the treatment of age-related macular degeneration (APP1080302, CIB Chen, 2015-2017)

Department of Health, Western Australia, Merit Award: Stem cell transplantation for macular degeneration (CIA Chen, 2016)

Retina Australia WA Research Grant: Cone photoreceptor development during retinal degeneration in mouse models of achromatopsia (CIC Chen, 2016)

Ophthalmic Research Institute of Australia: Developing personalised disease modelling for testing novel treatment in RP1 mutation (CIA McLenachan, 2016)

Ophthalmic Research Institute of Australia: Structure and function correlation in human retina (CIA Sampson, 2016)

Major donations in 2016

The Saleeba Family, Disease modelling using iPSC and CRISPR technology

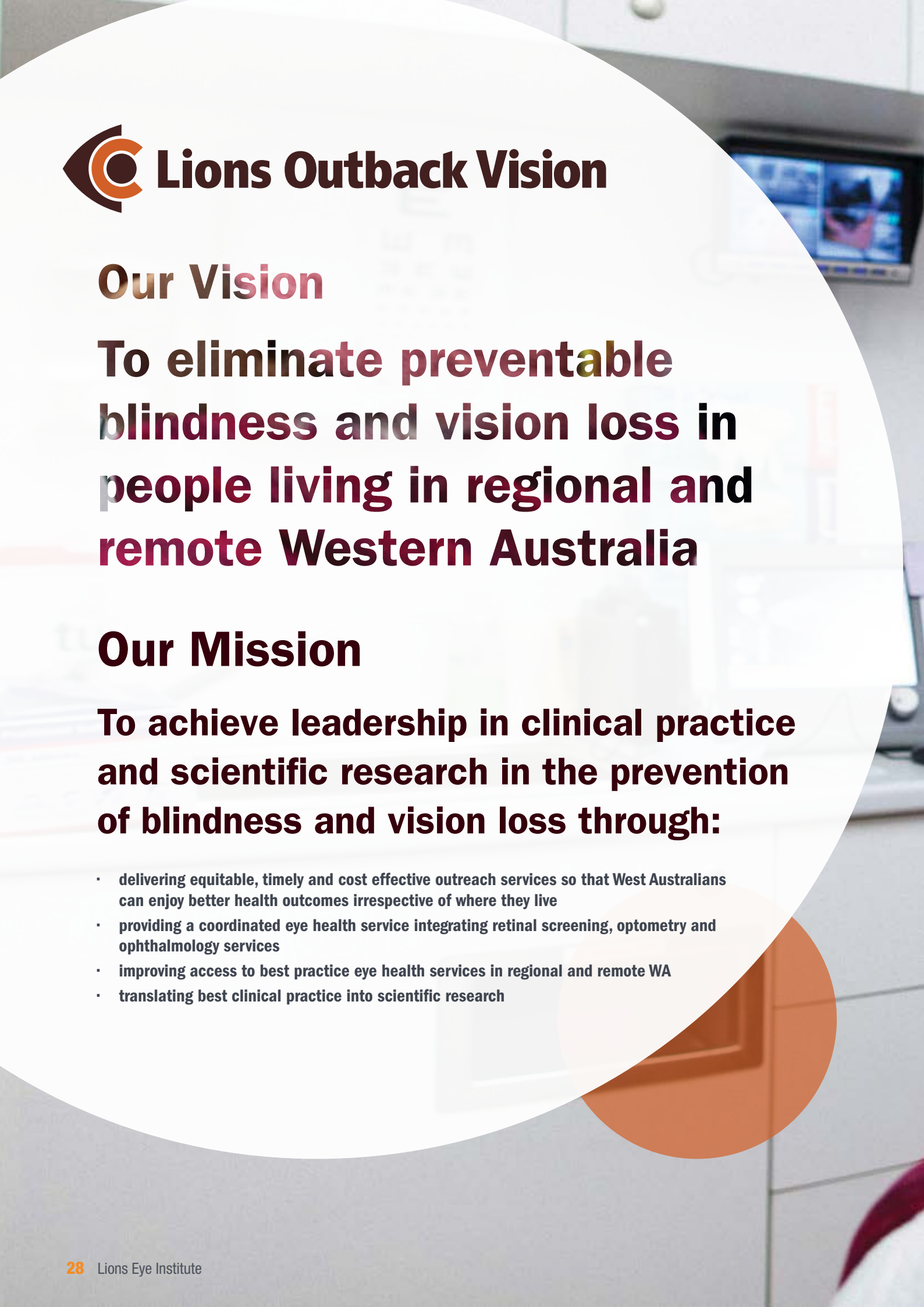
The Miocevich Family, Miocevich Fellowship and Miocevich Lecture

The Constantine Family, Inherited retinal disease research

The Rockingham Uniting Church, retinal diseases research

Dr Fred Chen with Professor Lyndon da Cruz, who delivered the inaugural Miocevich Lecture on May 4, 2016

Science on the Swan poster winners Danuta Sampson, Avenell Chew and Sam McLenachan



Lions Outback Vision

Our Vision

To eliminate preventable blindness and vision loss in people living in regional and remote Western Australia

Our Mission

To achieve leadership in clinical practice and scientific research in the prevention of blindness and vision loss through:

- delivering equitable, timely and cost effective outreach services so that West Australians can enjoy better health outcomes irrespective of where they live
- providing a coordinated eye health service integrating retinal screening, optometry and ophthalmology services
- improving access to best practice eye health services in regional and remote WA
- translating best clinical practice into scientific research

Fred Hollows Foundation Fellow Xai Ni Wu examines a patient on the LOV Van

The Lions Outback Vision Van was launched on March 19, 2016, by WA Deputy Premier Liza Harvey and Federal Assistant Minister for Health and Aged Care Ken Wyatt, pictured here with McCusker Director Associate Professor Angus Turner

Activities

Lions Outback Vision continues to grow and adapt its services to meet the needs of patients living in regional and remote communities. Lions Outback Vision was officially launched in March 2016 and treated 6949 patients during the year.

Changes to services include the introduction of the Lions Outback Vision Van and the completion of the Statewide Telehealth Coordination Project in June 2016 and the Diabetic Screening program in December 2016.

Highlights

- In March 2016 the Lions Outback Vision Van was officially launched by the then Assistant Health Minister the Hon. Ken Wyatt and the WA Deputy Premier Liza Harvey. The welcome to country was performed by Noongar elder May Maguire with music by Gina Williams.
- The van completed its inaugural circuit in November, during which time 1679 patients (42 per cent of which were Aboriginal or Torres Strait Islanders) were seen during 85 clinic days across 16 communities. The van travelled 19,748kms visiting Kalgoorlie, Leonora, Wiluna, Newman, Roebourne, Onlsow, Karratha, Port Hedland, Broome, Derby, Fitzroy Crossing, Halls Creek, Kununurra, Katanning, Esperance and Albany.
- An independent evaluation of the Lions Outback Vision Van; Evaluation of the Pilot Implementation of the Principles and Protocols for the Delivery of External Health Services to Rural and Remote Communities in Western Australia was completed by Dr Clair Scrine-Bradfield, showcasing the protocols and principles developed by the Aboriginal Health Council of Western Australia for outback service delivery.
- The Visiting Optometry Service dispensed 1082 spectacles over 152 clinic days to 30 locations across three regions.
- The implementation of tele-health using video conferencing services to establish a model for patient consultations has provided increased access to ophthalmology and efficiency of outreach services. Advocacy efforts resulted in the introduction of new Medicare benefits for optometrists conducting telehealth. A Store-and-Forward model was also used to transmit diabetic retinopathy screening images to the LEI for grading.
- In November, an Aboriginal Eye Health Coordinator was appointed to support Lions Outback Vision to improve access to eye care for Aboriginal patients through improved access to services, attendance at consultations, pathways to treatment, referrals and follow up care. The position liaises closely with the visiting optometry program, outreach ophthalmology services, regional eye health coordinators and supports Aboriginal patients' access to Perth based eye clinics. This includes assisting those patients who travel to Perth from regional and remote WA.

Optometrist Stephen Copeland supports an LOV patient during a tele-health consultation

New projects in 2017

- Meekatharra, Wyndham and Warmun included in the Vision Van service.
- New Lions Outback Vision webpage

Grants and Funding

Allergan
Devil Creek Joint Venture
Lotterywest
Lions Eye Institute
McCusker Charitable Foundation
Newman's Own Foundation Fund
Rural Health West
Telstra
The Fred Hollows Foundation
The RANZCO Eye Surgeon's Foundation
The Royal Australian College of Medical Administrators
WA Department of Health
WA Country Health Services

Staff

McCusker Director Associate Professor Angus Turner
Christine Stott – LOV Manager
Josephine Muir – Research Manager
Xai Ni Wu – Fred Hollows Foundation Fellow (January to August)
Simone Beheregaray – Fred Hollows Foundation Fellow (August to December)
Hessom Razavi – Research Fellow
Lucy Dobson – Resident
Irene Tan – Resident
Stephen Copeland – Optometrist
Angela Aicken – Statewide Telehealth Manager
Helen Wright – Optometry Coordinator
Julie Maiolo – Clinical Services Coordinator
Sharon Brown – Vision Van Coordinator/Driver
Alex Ramirez – Pilbara Diabetic Eye Health Coordinator
Rianda Kock – Clinical Administrator
Verity Moynihan – DR Screening
Richard O'Halloran – DR Screening

Students

Shiwan Fu
Annapurna Jagadish
Ben Host

Lions Outback Vision delivered in 2016:

1,015 patients retinal screened

1,871 optometry appointments

3,255 ophthalmology consults

808 telehealth consultations

6,949 patient consults

Professor Hunt and Dr Carvalho in the LEI laboratory

Retinal Genomics and Therapy

Overview

In April 2016, UWA Emeritus Honorary Professor David Hunt and UWA Research Fellow Dr Livia Carvalho joined the LEI Research team and formed the Retinal Genomics and Therapy group.

Professor Hunt had been based at the UWA School of Animal Biology for the last seven years, having transferred from the Institute of Ophthalmology at University College London (UCL) in London, UK, in 2010.

Dr Livia Carvalho relocated to Australia in September 2015 after receiving a Discovery Early Career Researcher Award (DECRA) from the Australian Research Council in 2014.

Building on over 10 years of collaborative research that started when Dr Carvalho pursed her PhD studies in Professor Hunt's lab at the UCL Institute of Ophthalmology in London, they are now working towards creating novel research platforms within the LEI to study inherited retinal degeneration, gene therapy and neuroprotective treatment approaches and photoreceptor cell death mechanisms.

During 2016, they have successfully established a working lab at the LEI and started working in new and ongoing projects. They were both involved in the application and award of a NHMRC equipment grant for an electroretinogram (ERG) equipment especially designed for use in laboratory rodent models.

This new equipment will assist LEI researchers in measuring visual function in animal models of visual disorders, important in the assessment and validation of novel treatment strategies and in the determination of disease progression. Dr Carvalho was directly responsible for the setup, installation and training of the new ERG which will be heavily used in her research projects.

The group currently holds six mouse lines that comprise four models of achromatopsia, an inherited retinal disorder that causes complete loss of colour vision, and two lines with targeted knock-out of voltage-gated potassium channel genes. For five of these lines, they are the sole holders in the world.

Also during 2016, Dr Carvalho was awarded a UWA Research Collaboration Award together with international collaborators from the University of Tubingen in Germany to study the effect of neuroprotective drug compounds for preserving cone photoreceptors. She is also a co-investigator on a four-year NHMRC project grant, funded in 2016, with Dr Alex Hewitt and Dr Rick Liu at the University of Melbourne.

In January 2016, Dr Carvalho was selected for the New Investigator of the Month Award from the American Society for Gene and Cell Therapy (ASGCT).

Publications for 2016 include a chapter in a book on Human Color Vision (Springer, USA) titled "The genetics of color vision and congenital color deficiencies", co-authored by Professor Hunt and Dr Carvalho; a review about cone photoreceptor cell death mechanisms in achromatopsia in Advances in Experimental Medicine and Biology authored by Dr Carvalho; two papers on the visual opsins and the concept of transmutations of rods and cones in snakes published in Proceedings of the Royal Society and Molecular Biology and Evolution; a paper on the visual sensitivity of the emu, with an emphasis on the presence of vision into the ultraviolet published in Proceedings of the Royal Society, and a paper on the evolution of phototransduction in vertebrates published in Molecular Biology and Evolution.

Current research projects

Cone photoreceptor cell death and migration in normal and degenerate retinas

As part of Dr Carvalho's DECRA fellowship, the aim of this project is to investigate the molecular mechanisms behind cone cell death and migration impairments during retinal development and how it is affected during diseases like achromatopsia. We are in the process of characterising cone migration using mouse models and will use state-of-the-art technologies like next generation sequencing and proteomics to establish the basic cellular and molecular pathways that are activated during cone photoreceptor cell death and migration in normal and degenerate retinas. Different mouse lines have now been established for this work which has opened up new international collaborations with researchers at the University of Tubingen, who are experts in the area of cone degeneration mechanisms.

Voltage-gated potassium channels in inherited retinal dystrophy: disease mechanisms and treatment strategies

At the clinical level it is not possible to diagnose the precise genetic lesion of inherited retinal disease without molecular analysis but a major exception to this is a disorder which presents as a cone dystrophy with supernormal rod electroretinogram (CDSRR) and it has now been established that the unusual electroretinogram (ERG) is diagnostic for the disorder. Professor Hunt has previously demonstrated that mutations in the gene KCNV2 which encodes the voltage-gated K+ channel protein Kv8.2 are responsible for this disorder. The ERG disease phenotype indicates that mutations in KCNV2 disrupt photoreceptor adaptation, the fundamental physiological process by which photoreceptor sensitivity is modulated. However, the precise mechanism has yet to be defined. Kv8.2 is the first and, as yet, only voltage-gated K+ channel protein where disease-causing mutations affecting vision have been identified. Also, CDSRR is a good candidate for treatment using viral-based gene therapy approaches. As part of a NHMRC project grant (2012-2014), Professor Hunt has been characterising novel mouse models of potassium channel deficiencies that affect vision. He has established that disease progression and phenotype in these models shows close similarities to the human condition and therefore provide good models for studying the role of Kv subunits in modulating the visual response and for validating gene therapy treatment approaches. Currently in preparation, a manuscript will soon be submitted with the initial findings of this study.

Evolution of the vertebrate phototransduction

The process of phototransduction in the rod and cone photoreceptors whereby light is converted into an electrical signal within the retina is now understood in some detail. However, many of the steps in phototransduction, although identical in rod and cones, are nevertheless carried by rod and cone-specific isoforms that are encoded by different genes. The project seeks to address the question of when in vertebrate evolution did these isoforms appear. The approach undertaken by Professor Hunt (in collaboration with Professor Trevor Lamb FRS at ANU in Canberra, Associate Professor Nathan Hart at Macquarie University in Sydney and Professor Shaun Collin and Dr Wayne Davies at UWA) has been to sequence the transcripts of all the genes expressed in the retina/eye of a large number of "ancient" vertebrates that include hagfish, lampreys, chimaeras, sharks, rays, and bony fish. These sequences are then aligned with the sequences of similar genes found in other members of vertebrate kingdom, including humans to determine when the isoforms first appeared.

Staff

· David M Hunt – UWA/LEI Emeritus Honorary Professor

· Livia S Carvalho – ARC DECRA Fellow

· Melanie Barth – Research Assistant (*past*)

During 2016, they have successfully established a working lab at the LEI and started working in new and ongoing projects.

Clinical Trials

The LEI has a long history of conducting clinical trials and is now home to one of the largest ophthalmological clinical trials research centres in the world.

The team consists of 11 coordinators supporting 10 ophthalmologists involved as clinical trials investigators in 40 active trials.

We conduct a wide range of clinical trials, including the testing of new drugs or devices, the collection of information from patients to better understand a particular ophthalmic condition and audits of patient medical notes to establish treatment outcomes and ways in which patient outcomes may be improved.

Our approach enables patients with specific eye disorders, or previously untreatable eye conditions, access to new treatments and therapeutic approaches well before they are available to the general public.

All trials run by the group are subject to the approval of a Human Research Ethics Committee and comply with stringent national and international regulations and guidelines.

Our new state-of-the-art Clinical Research Suite – a dedicated area of the refurbished clinic - provides a unique private space for our valued trial participants away from the busy clinic. Here our trial participants can relax with a cup of tea and watch TV between study-related testing.

Literally thousands of participants have been examined at LEI as part of a trial. Our highlights include:

- The first and only Australian gene therapy trial for macular degeneration
- Investigator led studies on retinal vein occlusion
- Investigations into therapies for currently non-treatable eye disease such as macular telangiectasia
- Commercially sponsored studies on diabetic retinopathy, various forms of macular degeneration, glaucoma and ocular inflammatory diseases including uveitis

The continued success of clinical research at the LEI is only made possible by the study participants who volunteer their time and are happy to take part in our studies and the dedication and professionalism of our clinicians, nurses, coordinators and staff. To those people, we say thank you.

The Clinical Trials team

Clinical Research Manager

Tracey-Anne Dickens

Clinical Trial Coordinators

Holly Brown

Toni Busby

Amelia Jason

Gareth Lingham

Rachel Matthews

Richard McKeone

Cora Pierce

Lynne Smithies

Jordanna Wilson

Hong Vu

Clinical Trials Administration

Diana Bowman

Dedicated contact line
(08) 9381 0750

To enable the LEI ophthalmologist to confirm diagnosis a referral from your optometrist, general practitioner or ophthalmologist is required prior to contacting the LEI. If you are interested in participating in a clinical trial or would like to find out more information please contact us at **clinicalresearch@lei.org.au** or **(08) 9381 0750**.

National recognition for LEI orthoptist

LEI Clinical Trials Research Orthoptist Gareth Lingham won a major national prize - the Emmie Russell Award - at the Orthoptics Australia 2016 Annual Scientific Conference in Melbourne.

The prize is presented to a graduate from one of the recognised Australian training schools for the best presentation at the annual conference, which is held in conjunction with the RANZCO Annual Scientific Congress.

Gareth's presentation - *Early life risk factors of amblyopia, strabismus and anisometropia in a young adult population* – was judged on its value to the profession, scientific content and integrity, clarity and presentation.

Gareth Lingham in the Clinical Trials Research Suite, which opened in 2016

New clinic to play key role in eye research

The newly refurbished ground floor clinic at the LEI will allow easy access to state-of-the-art equipment and facilities for people participating in clinical research studies.

During 2010-2012, the LEI conducted comprehensive eye examinations on 1350 participants aged around 20 years from the Western Australian Pregnancy Cohort (Raine) study.

This work allowed LEI researchers to confirm the association of myopia with lack of time outdoors using several different markers, including measures of sun damage to the eye and vitamin D levels.

The researchers also found that 1.5 per cent of young Western Australian adults had pterygium, caused by excessive sun damage to the eye and associated with conjunctival UV autofluorescence.

The LEI has been awarded an $800,000 NHMRC project grant to re-examine the Raine cohort at the age of 28 years to determine what level of progression with myopia occurs over the intervening period.

Very little data exists for eye disease and changes in eye disease in early adult life.

The study will look at the number of people with excessive conjunctival autofluorescence at age 20 to determine how many go on to develop pterygium.

In addition it will investigate the interaction of genes and environment in developing myopia as part of an international consortium known as CREAM.

The new clinic will also be used to assess the eyes of a group of young adults from the Kidskin study run by the Telethon Kids Institute.

The Kidskin participants were studied in their primary school years in Perth, and some groups of students spent less time outdoors than others as part of the intervention.

In addition to researchers examining relatives of glaucoma patients at the LEI, people who live in regional and remote WA with full glaucoma will be offered an examination on the Lions Outback Vision Van.

A further study with pilot funding from the Telethon/Perth Children's Hospital funding in 2016 is looking at myopia.

Clinical trials have suggested that low dose Atropine eye drops might help prevent the progression of myopia in children.

In association with parallel studies in the United Kingdom and Ireland the LEI proposes to enrol children with early myopia to participate in a randomised trial of low dose atropine or placebo. This is based on the earlier Singapore ATOM Studies.

Ballpoint Construction Group Dayle Bryant, Operations Manager Rick Shalders and Project Manager Tyrone Kennedy present a cheque representing recycling income to LEI Board Members Rudolph Brunovs, Dr Margaret Crowley, Peter Forbes and Stephen Pearce

Architects and builders deliver ground floor renovation around working clinic

Renovating the clinic around a busy workplace to a six-month construction program was one of the big challenges facing the LEI project manager, architects, consultants and builders during the course of 2016.

Planning for the clinic renovation began in earnest more than two years ago with surveys of staff, volunteers and patients to establish the current issues, what improvements needed to be made as well as other expectations for the new clinic.

The 1300 square metre project included partial demolition of the ground floor and making much better use of the space available with new administration, lobby and staircase areas, café and alfresco area.

Architects Silver Thomas Hanley, who have extensive experience in the design of health facilities were appointed - closely followed by specialist consultants, and then through a tender process head contractor Ballpoint Construction Group.

LEI Project Manager Steve Atkins said a significant feature of the project was just how much input all levels of staff – from management, to nurses, optometrists, clinicians and administration – had in the design process. Substantial stakeholder and user group meetings were conducted throughout the design process to arrive at a practical and ascetically pleasing end result.

"Their input can really be seen in the close attention to detail this project has," he said.

"The architects worked hard to incorporate their ideas and the builder worked successfully to minimise disruption around a busy workplace.

"While challenging, we have a very successful outcome. In fact, the response to the new clinic has been overwhelmingly positive from both patients and staff."

Ballpoint Construction Group Managing Director Shane Ball said his company had been proud to partner in a project that would deliver community-wide benefits.

In November last year, his business partner Dayle Bryant presented the LEI with a cheque for $4241.70 – representing income received from recycling waste from the LEI site.

Project Manager Steve Atkins and Professor David Mackey look over plans for the new clinic during the construction phase

Clinic renovation project delivered on time and within budget

The new LEI ground floor clinic opened for business on Monday, December 5, 2016, following a six-month construction period that delivered the complex project on time and within budget.

The design was two years in the making and flowed from a detailed needs analysis and input from a large number of stakeholders including clinicians, staff and patients as well as external authorities. Extensive and frequent user group meetings were also conducted to ensure that the final design achieved the project brief.

The new clinic has been designed to ensure that all patients are able to easily navigate around the building. This was achieved by means of state of the art "way finding" techniques such as monitor displays, overhead lighting, floor transitions, wide corridors and ease of flow through the clinic. The design also created a generosity of space, light and privacy.

Patients now enjoy a vastly improved flow through the clinic with allocated lounge areas, tea and coffee making facilities, free Wi-Fi along with multiple television monitors for entertainment providing "free to air" channels as well as information on the LEI.

The new clinic was required due to a dramatic growth in demand for the Institute's Clinical Services - increasing at roughly six per cent per annum - while some speciality areas like intravitreal injections for age-related macular degeneration have grown two hundred per cent in the last six years. All up, patient numbers through Clinical Services are reaching 60,000 per annum.

The new clinic's reception area is accessible and spacious

Key components of the renovation included:

- Creation of a bright, fresh and welcoming new lobby and coffee shop facility complemented by improved way finding digital signage and strategic placement of front desk and volunteer receptacles.
- Improvements to the external courtyard to provide a peaceful and relaxing environment for the use of patients and staff alike.
- A new ground floor clinic to accommodate the retinal clinic on ground floor which included substantially more consultation and testing rooms along with ancillary services such as photography and laser testing rooms, administration and secretary functions.
- A separate injection suite consisting of two injection rooms, recovery suite and administrative functions designed to take away the pressure placed on standard clinic facilities.
- Inclusion of a dedicated Clinical Trials suite to accommodate the ever increasing demand and participation in the LEI's research programs.
- Improved staff areas within "back of house" to include a break away lunch room, end of trip facilities and amenities as well as manager offices and new supply room for all consumable and material deliveries.
- A Shared Vision Office has also been included within the lobby area to assist patients and increase interest within the bequests and donations realm along with further information on the functions of the LEI.

Emphasis was placed on creating a separate Clinical Trials suite to meet the needs of the dynamic and growing research team, now one of the largest in the world.

All trials, which give participating patients access to cutting edge treatments, require access to the clinic. The newly-renovated clinic gives Clinical Trials access to greater floor space and equipment and increased privacy for patients and staff.

Clinic Project Manager Steve Atkins and the LEI's former Director of Clinical Operations Paul Seats were critical to the smooth management of the project.

As a result of careful planning and staging of the works and consultation with stakeholders all staff were able to continue work efficiently despite the extensive construction works within an operating environment.

This is credit to the understanding of all parties involved and collaboration to complete the project as smoothly as possible.

LEI Director of Clinical Operations Paul Seats hanging the distinctive artwork that can be found throughout the clinic

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The LEI runs a busy Day Surgery centre

Clinical Services

This result is a great testament to the teamwork and dedication of all our staff and nurses, across the whole of the clinic.

2016 was an exciting period for the Clinical Services arm of the LEI.

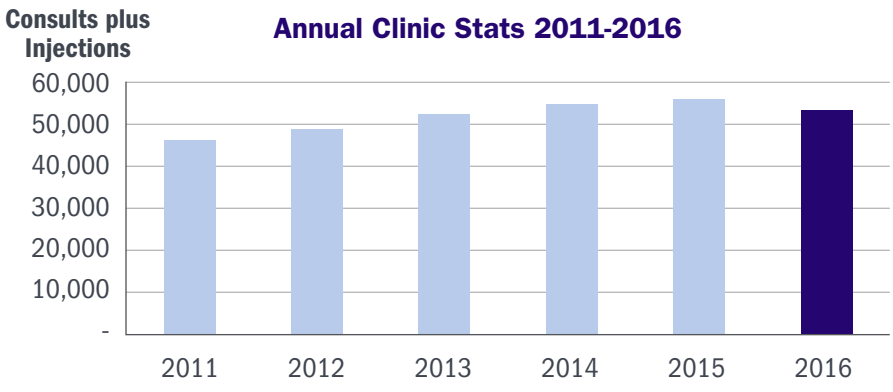
The refurbishment of the ground floor and replacement of much of the building plant of 'AA Block' - the LEI's building on the Sir Charles Gairdner Hospital campus in Nedlands - was the first major construction work since the premises were built with the support of donors and the community in the early 1990's. The investment in new facilities is now delivering the latest in contemporary patient care, and many of our more elderly patients no longer have to navigate to other floors in the clinic to see our Retinal specialists. Careful planning for potential further work on the other two floors of our Nedlands clinic is now under way.

During the year we farewelled Dr Tim Isaacs but welcomed three new, young ophthalmologists to the clinic – Dr Chandra Balaratnasingam, Dr Antony Clark and Dr Hessom Razavi. All of them have returned to Western Australia with international experience and they bring expanded skills in the areas of vitreo-retinal work, diabetic retinopathy and paediatric ophthalmology.

Our specialist doctors provided 53,000 patients with consultations in 2016, and undertook 4200 surgical procedures. These volumes represent a modest decrease from 2015 (our busiest year on record) and mark a pause after a number of years of growth.

Each year our services are audited by external agencies to ensure we meet all legislative requirements and industry standards. Every year brings increases in regulatory requirements and we are proud to consistently meet or exceed the health and quality standards. In 2016 the quality auditors again singled out our consumer engagement for particular commendation.

Operating a state-of-the-art clinical service requires our ophthalmologists to have access to the best tools and technology, and

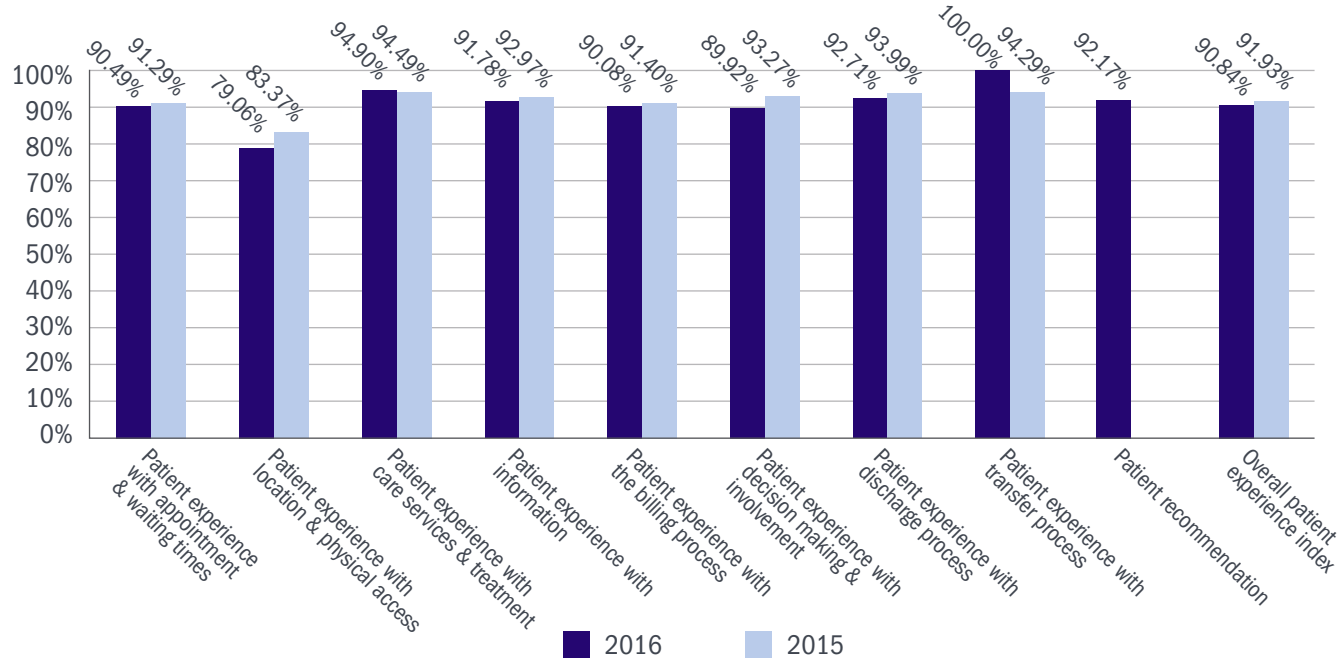


The light, bright and accessible clinic spaces represent the latest in contemporary patient care

in 2016 the LEI invested almost $500,000 into new clinic and day surgery equipment, while also continuing to improve the delivery of IT systems, services and support that underpin clinic management and patient data. Of particular note were the purchase of a new microscope for our day surgery and the fitout of the new ground floor consulting rooms.

Once again our Day Surgery facility scored highly in the area of patient satisfaction, and improved on the already high scores from 2015 in almost all areas. We are here for our patients, and this result is a great testament to the teamwork and dedication of all our staff and nurses, across the whole of the clinic.

Patient Satisfaction - LEI Day Surgery 2016 vs 2015



world class scientific research with the highest level of eye care delivery

LEI staff photographed in the new clinic in 2016

Our Ophthalmologists

Dr Andrea Ang

Dr Andrea Ang is an ophthalmologist with a wide area of expertise and a member of the LEI's renowned Lions Laser Vision team.

Dr Ang specialises in the management of cornea, anterior segment and external diseases including pterygium surgery, corneal transplantation, and limbal stem cell surgery. Dr Ang also specialises in cataract surgery and refractive surgery, including LASIK and PRK, and refractive lens exchange.

After training in ophthalmology at The University of Western Australia and Harvard University in the United States, she undertook fellowships in cornea, anterior segment and external diseases at the Cincinnati Eye Institute and the Singapore National Eye Centre.

Dr Ang is a passionate supporter of vision programs in developing nations and is a Myanmar Eye Care Program volunteer and Equal Health volunteer in India.

She was attracted to ophthalmology by the advancing science and precision surgery involved in eye care.

"I feel very fortunate in my job, that I can improve someone's quality of life so much by an operation such as cataract surgery or corneal transplantation," she said.

Dr Ang is a consultant ophthalmologist at Royal Perth Hospital and a lecturer with The University of Western Australia, where she teaches medical students and supervises training Registrars and Fellows. She serves on several committees of the Royal Australian and New Zealand College of Ophthalmologists.

Her research interests include ocular surface reconstruction techniques and corneal transplant outcomes.

Dr Chandra Balaratnasingam

After a three year stint completing fellowships in vitreoretinal surgery and medical retina in Canada and the United States, Dr Chandra Balaratnasingam has returned to Western Australia and the LEI.

While in the United States, he trained under internationally renowned retinal specialist Lawrence Yannuzzi and joined the clinical faculty at New York University, also working as a vitreoretinal surgeon in Manhattan for nearly a year.

In the research area, he was a major contributor to a range of clinical trials and research studies related to retinal diseases.

Before honing his skills overseas, Dr Balaratnasingam was a member of the LEI's Physiology and Pharmacology group for more than 10 years. He completed his PhD at the LEI before starting ophthalmology training in Perth.

His research interests cover retinal vascular diseases, particularly diabetic retinopathy.

"I perform laboratory-based and clinical research at the LEI," he said.

"The primary aims of my research are to develop novel techniques to non-invasively monitor and treat the complications of retinal vascular diseases, such as diabetic retinopathy.

"I am also involved in a range of clinical trials investigating new treatments for macular oedema, retinal vascular diseases and macular degeneration."

Dr Balaratnasingam practices at the Nedlands and Murdoch offices of the LEI and treats patients with medical and surgical diseases of the retina. He also holds public appointments at Royal Perth Hospital and Sir Charles Gairdner Hospital.

Professor Graham Barrett

Professor Graham Barrett trained in ophthalmology in Perth and undertook specialty training in the United States.

He is a consultant ophthalmic surgeon at Sir Charles Gairdner Hospital.

Professor Barrett is the founding and current president of the Australasian Society of Cataract and Refractive Surgeons and past president of the Asia Pacific Association of Cataract and Refractive Surgeons.

He is the recipient of major international awards, including the Ridley Medal from the European Society of Cataract and Refractive Surgeons, the Binkhorst Medal from the American Society of Cataract and Refractive Surgeons and the Ridley Medal from the Congress of German Ophthalmic Surgeons. He is also the 2016 recipient of the Innovators Kelman Lecture Award from the American Society of Cataract and Refractive Surgeons.

Professor Barrett's areas of expertise include cataract and refractive surgery, corneal and anterior segment disorders and surgery.

Dr Fred Chen

Retinal diseases specialist Dr Fred Chen combines clinical and surgical expertise with translational research interests.

He was born in Taiwan and studied medicine at The University of Western Australia.

After completing his ophthalmology training at Royal Perth Hospital, he moved to London for advanced training in medical and surgical retina at Moorfields Eye Hospital and studied a Doctorate of Philosophy (PhD) in surgical techniques of retinal pigment epithelium transplantation for treatment of dry and wet macular degenerations at the University College of London's Institute of Ophthalmology.

Dr Chen returned to Perth in 2010 as a Senior Research Fellow at the UWA Centre for Ophthalmology and Visual Science and established and leads the LEI's Ocular Tissue Engineering Group. He is also a consultant retinal surgeon at Royal Perth Hospital and the LEI.

Dr Chen was attracted to ophthalmology because of the ingenious ways in which knowledge from a broad range of scientific disciplines have been applied to the diagnosis and treatment of eye diseases.

"The opportunity to use precision technology and molecular therapy developed by scientists and clinicians to diagnosed eye diseases and restore sight gives me the greatest satisfaction in my work," he said.

Dr Chen's areas of expertise include retinal detachment repair, macular surgery, retinal imaging, treatment of various forms of macular degeneration, Stargardt disease, retinitis pigmentosa and clinical trials of new drugs and retinal lasers.

His research teams are involved in testing of new treatments in age-related macular degeneration, high resolution retinal imaging, monitoring of inherited retinal diseases and application of stem cell technology in personalised medicine.

Dr Antony Clark

Dr Antony Clark is the newest recruit to the LEI's team of clinicians and brings with him expertise in general ophthalmology, cataract surgery, glaucoma, strabismus and paediatric ophthalmology.

Dr Clark completed his ophthalmology training in Western Australia and has returned to Perth after two years of further sub-specialty training in Toronto, Canada.

He spent the first year undertaking advanced training in adult glaucoma and anterior segment surgery before completing further training in paediatric ophthalmology and strabismus at Toronto's world-renowned Hospital for Sick Children (Sick Kids).

Dr Clark has a PhD in public health from Curtin University, where his research focused on using big data techniques to explore the outcomes of cataract surgery and other eye services provided in Western Australia.

"I was drawn to ophthalmology for several reasons. It is a fascinating specialty that combines many areas of medicine with technically challenging and intricate surgery," he said.

"The technological advances we are seeing in eye care also make it an exciting time to be an ophthalmologist. Ultimately it is the patients that drew me to ophthalmology. Our eye sight is so important to us all and having the privilege of being able to prevent blindness or improve a person's vision is immensely satisfying and rewarding.

"The information we glean from epidemiology and public health research is so important since it informs our understanding of the patterns and magnitude of disease in the community and thus where to direct our health efforts. It is often through epidemiological studies that we identify important risk factors or potential causes for diseases and ultimately directs our study into possible treatments."

In addition to consulting at the LEI, Dr Clark is a consultant ophthalmologist at Sir Charles Gairdner Hospital and Perth Children's Hospital.

He is also a Senior Research Fellow with the Centre for Ophthalmology and Visual Science at The University of Western Australia; and Adjunct Research Fellow with the Centre for Population Health Research, Curtin University, where he is continuing on his research interests.

Professor Ian Constable AO

Professor Ian Constable AO has had a major impact on the field of ophthalmology in Australia and internationally for more than 40 years.

He was recruited from Harvard University in 1975 as the inaugural Lions Chair in Ophthalmology at The University of Western Australia, and founded the Lions Eye Institute (LEI) in 1983.

Under his guidance, the LEI has become a leader in eye research and operator of one of the largest clinical practices in Australia.

The LEI has a long history of developing basic science into real-world treatments for most major eye diseases.

This commitment to next generation research will be bolstered by the creation of the Ian Constable Chair in Discovery and Translational Ophthalmic Science at UWA.

"As the projected growth of the Western Australian population rises to six million by 2050, the LEI will attract an ever-evolving team of scientists and clinician scientists capable of launching major new research initiatives and international collaborations while serving the needs of our growing population in a multi-centre institute," Professor Constable said.

"The unique LEI model of patient-based revenues to supplement competitive research programs will propel us toward a status as one of the major eye centres of the world."

Professor Constable trained in ophthalmology in Sydney before his appointment as a Retinal Fellow at the Massachusetts Eye and Ear Infirmary and lecturer at Harvard University.

His areas of expertise include retinal vascular disease, diabetic retinopathy, macular degeneration, complex referrals and cataracts.

Professor Constable is past president of the Asia-Pacific Academy of Ophthalmology and Chairman of the Asia-Pacific Association of University Professors and consultant retinal surgeon at Sir Charles Gairdner Hospital.

Professor Geoffrey Crawford

Professor Geoffrey Crawford specialises in refractive surgery – surgical solutions that correct common vision problems such as short and long-sightedness, astigmatism and presbyopia without glasses or contact lenses.

Considered a pioneer and world-leading practitioner in his field, Professor Crawford's leadership of the Lions Laser Vision Centre has made it Western Australia's leading ophthalmology centre.

"Our history is one of firsts for Western Australia," he said. "We were the first refractive laser centre, the first to perform laser PRK surgery, the first centre to perform LASIK and the first and still the only accredited laser vision centre in the State.

"Our continued investment in the latest and most advanced technology in the world means patients are assured of the best possible visual outcome after laser vision correction."

Professor Crawford also has a strong background in translational research and innovation – co-inventing the AlphaCor artificial cornea and AlphaSphere orbital implant and developing the techniques for insertion of these devices.

He specialises in all forms of refractive surgery including LASIK, LASEK, PRK and insertion of phakic intraocular lenses, lens surgery for cataracts and refractive errors. He also specialises in corneal diseases of the eye and performs all surgeries related to these conditions including all types of corneal transplantation, pterygium removal, tumour removal and correction of keratoconus with intracorneal ring segments (Kerarings) and corneal collagen cross-linking.

Professor Crawford completed his ophthalmic training in Western Australia and completed further sub-specialty training in cornea and refractive surgery at Moorfields Eye Hospital in the United Kingdom and at Emory University in the United States.

He is the LEI's Director of Surgical Services and a consultant ophthalmic surgeon at Royal Perth Hospital and Princess Margaret Hospital for Children.

Professor Crawford is also a Fellow of the Royal Australian and New Zealand College of Ophthalmologists and a Fellow of the Royal Australasian College of Surgeons.

Dr Jean-Louis deSousa

Dr Jean-Louis deSousa trained in ophthalmology in Perth before completing fellowships in ophthalmic plastic and reconstructive surgery in Oxford and East Grinstead in the United Kingdom.

He is a member of the Australian and New Zealand Society of Ophthalmic Plastic Surgeons.

Head of Department at Royal Perth Hospital, he also provides ophthalmic services to the central wheatbelt from Merredin.

Dr deSousa is a basic sciences examiner for the Royal Australian and New Zealand College of Ophthalmologists and a consultant and visiting surgeon and lecturer for humanitarian eye projects in Bali and East Timor.

His areas of expertise include oculoplastic surgery – eyelid tumours, eyelid malposition, cosmetic surgery, non-surgical cosmetic procedures; orbital disease – tumours, trauma and inflammatory orbital disease; and endoscopic lacrimal surgery.

Dr Antonio Giubilato

Dr Antonio Giubilato is a glaucoma expert who underwent subspecialty fellowship training at the Royal Victorian Eye and Ear Hospital after studying general ophthalmology in Western Australia.

His specialty training included both the clinical and surgical management of glaucoma as well as research into new therapies for the condition.

Dr Giubilato is heavily involved in teaching the next generation of ophthalmologists as well as offering, with his colleagues, an internationally recognised glaucoma fellowship. His is currently involved in trials in new glaucoma therapies and collaborating on research into MIGS (Minimally Invasive Glaucoma Surgery). His special interest area is surgical management of glaucoma in particular glaucoma drainage devices.

Dr Giubilato was attracted to ophthalmology because of his interest in blinding eye diseases, specifically glaucoma, and having patients trust in him to keep them sighted.

“When you look after patients for years, even decades, you learn about their family and experiences and being part of that is special,” he said.

“Seeing the smile on a patient’s face when you know you are keeping them sighted is a humbling experience.”

Dr Giubilato is a consultant ophthalmologist in the Glaucoma Clinic at Royal Perth Hospital and operates at Royal Perth Hospital and Bentley Hospital for public patients.

He has a truly state wide practice and consults both south (Murdoch) and north (Nedlands) of the river.

He is also a WA committee member of the Australian and New Zealand Glaucoma Interest Group and is on numerous advisory boards both medical and surgical.

Dr Adam Gajdatsy

As an oculoplastic, lacrimal and orbital sub-specialist, Dr Adam Gajdatsy deals with many problems that impact on vision from outside the eye itself.

This includes benign and malignant tumour management – both within and outside the eye, as well as eyelid and tear drainage disorders.

Dr Gajdatsy trained in ophthalmology in Western Australia before undertaking fellowship training at the University Hospital of Wales in Cardiff and at Moorfields Eye Hospital in London.

He operates as an ophthalmic surgeon at the LEI, Osborne Park Hospital, Sir Charles Gairdner and Murdoch Hospital. He is one of four leading ophthalmologists from the LEI now operating at Murdoch.

He is also an honorary ophthalmic plastic surgical consultant at Princess Margaret Hospital.

Dr Gajdatsy gets great satisfaction in using his surgeon’s skills to improve a patient’s quality of life.

“Faulty lids and tear drainage cause loss of visual performance, where tumours of the orbits or around and within the eye may blind or kill,” he said.

“My research collaboration into orbital and ocular cancers will hopefully make a difference down the track too.”

As well as his work with the LEI, Dr Gajdatsy sits on the Curriculum Review Committee of the Royal Australian and New Zealand College of Ophthalmologists and is President of the Australian and New Zealand Society of Ophthalmic Plastic Surgeons.. In the last decade he has acted as WA RANZCO director of training and as UWA Ophthalmology teaching coordinator.

His areas of special expertise are lid malposition repair (droopy lid corrections), lid cancer management, cosmetic eyelid surgery, tear drainage surgery, eye socket surgery and orbital surgery. He also maintains a general ophthalmology practice, including cataract and pterygium surgery.

Professor Ian McAllister

The LEI'S Director of Clinical Services, Professor Ian McAllister, is a passionate clinician-scientist who combines high-level patient care with research into cures for a range of serious eye diseases.

His expertise covers vitreoretinal surgery and disorders, retinal vascular disease, diabetic retinopathy, macular degeneration, ocular trauma and cataract surgery.

Professor McAllister is actively involved in researching cures for vitreoretinal disorders – especially retinal vascular disorders – and has held 10 National Health and Medical Research Council grants in this area as well as numerous minor grants.

He led the LEI research team that investigated a method of creating a bypass around the site of a blockage in the retinal vein – the first successful treatment of this type in the world.

Professor McAllister said he was drawn to ophthalmology because of its capacity to make major beneficial changes to people's lives.

Professor McAllister trained in Western Australia and completed additional sub-specialty training in vitreoretinal disorders in the USA. He has published more than 140 papers in scientific journals and delivered more than 170 papers at international meetings. He has received an American Academy of Ophthalmology achievement award for distinguished service and was awarded a Doctorate in Medicine from The University of Western Australia last year.

He is also a consultant ophthalmologist at Royal Perth, continues to service remote communities and has been involved for many years in Statewide diabetic retinopathy screening and treatment.

Professor McAllister was Vice-Chairman of the Ophthalmic Research Institute of Australia and chairman of its research board for many years.

Professor David Mackey

As Managing Director, Professor David Mackey has led the Lions Eye Institute (LEI) through a new era of expansion – overseeing the development of state-of-the-art research laboratories at the Harry Perkins Institute of Medical Research, launch of the Lions Outback Vision Van and new clinic space in the LEI building.

"Our mission is to achieve leadership in scientific research and clinical practice with the clear aim of preventing and curing blindness and eye disease," he said.

"To do this, we have to equip our clinicians and researchers with the tools to do the job – whether it's state-of-the-art research laboratories or new clinic space like the one being officially opened this weekend."

As well as his leadership role as the head of the LEI, Professor Mackey is a world-leading authority on the genetics of eye disease, with his research extending beyond the laboratory to cascade genetic screening for at-risk individuals. He is the Chief Investigator on a NHMRC Centre of Research Excellence project "From discovery to therapy in genetic eye diseases."

He sees patients at the LEI with rare genetic eye diseases and more common genetic eye diseases involving new genetic research.

Professor Mackey is also Professor of Ophthalmology/ Director of the Centre for Ophthalmology and Visual Science at The University of Western Australia (UWA). Since 2016 he has been Associate Dean (Research) for the Faculty of Medicine Dentistry and Health Science at UWA.

Born and educated in Tasmania, he studied medicine at the University of Tasmania, completing ophthalmology training at the Royal Victorian Eye and Ear Hospital and Fellowships in paediatric and genetic eye diseases in Melbourne, Baltimore and London.

He was a member of the NHMRC Human Genetics Advisory Committee from 2012 to 2015 and is past president of the International Society for Genetic Eye Disease and Retinoblastoma. He is a Fellow of the Australian Academy of Health and Medical Sciences and a Fellow of the Association for Research in Vision and Ophthalmology.

Professor Bill Morgan

Professor Bill Morgan maintains an active research interest in glaucoma – the leading cause of irreversible blindness worldwide and a disease that affects one in eight Australians over the age of 80.

He is the Co-Director of the LEI's McCusker Glaucoma Centre, head of the Department of Ophthalmology at Royal Perth Hospital, consultant ophthalmologist at Princess Margaret Hospital and a Professor at The University of Western Australia.

Professor Morgan was drawn to ophthalmology because one can generally always help the patient and improve some aspect of their life quality.

"Ophthalmology reinforces how vital good vision is to everyday living," he said.

"The greatest satisfaction I get is seeing people with poor but useful vision from nasty glaucoma maintain the bulk of that vision for many years."

Professor Morgan initially trained in Western Australia and undertook his fellowship at the Centre for Ophthalmology and Visual Science at UWA.

He has completed a doctorate in philosophy, studying the response of the optic nerve to pressure, particularly in relation to glaucoma. He is co-inventor of the XEN glaucoma operation and is also particularly interested in cerebrospinal fluid pressure and retinal vessel pressures in relation to disease.

As well as his interest in glaucoma, Professor Morgan also has expertise in the epidemiology of blinding eye disease and eye diseases within Aboriginal populations.

Dr Hessom Razavi

A commitment to Indigenous eye health, diabetic retinopathy and macular degeneration drives the LEI's Dr Hessom Razavi.

Dr Razavi has completed fellowships in Western Australia and Victoria – the first with Associate Professor Angus Turner's Lions Outback Vision, where he spent a year providing eye care in remote Western Australian communities.

He then undertook a fellowship with Professor Robyn Guymer and Dr Alex Harper in Melbourne, focussing on medical retina diseases and research.

Dr Razavi was attracted to ophthalmology by its potential impact on the lives of patients.

"It has the potential to improve the quality of vision – and therefore the quality of life - of patients, with treatments that are often rapid, safe, and have measureable outcomes," he said.

Prior to his training and work in Australia, Dr Razavi completed a Masters degree at the University of London. This included field work in Iran, and receiving the Gordon Johnson Prize for first academic standing.

Dr Razavi practices at the LEI and he has a public post at Fremantle Hospital. His research interests include diabetic retinopathy, macular degeneration and Indigenous eye health. He is also unit coordinator of ophthalmology teaching for medical students at The University of Western Australia.

Associate Professor Mei-Ling Tay-Kearney

Associate Professor Mei-Ling Tay-Kearney completed her medical training in Western Australia before pursuing postgraduate study at Johns Hopkins Hospital in the United States.

In 2003, she was appointed Head of Department of Ophthalmology at Royal Perth Hospital. She is a senior lecturer at UWA and a member of the International Ocular Inflammation Society and the Australian Uveitis Study Group.

Associate Professor Tay-Kearney was attracted to ophthalmology because of the mix of surgical and medical expertise required and the ability to make a tangible difference in patients' quality of life.

Associate Professor Tay-Kearney is the Chair of Qualifications and Education, member of the Trainee Progression Committee, and was an examiner for the RANZCO Part 2 College Examinations.

Her areas of expertise are ocular infections, uveitis and inflammatory disorders of the eye.

Associate Professor Angus Turner

As the head of Lions Outback Vision (LOV), Associate Professor Angus Turner is having a major impact on eye health services in regional and remote Western Australia.

Associate Professor Turner completed his medical training at The University of Western Australia before studying at Oxford University and completing a Masters of Evidence Based Medicine.

As McCusker Director, Lions Outback Vision, Associate Professor Turner is actively involved in the delivery of specialist outreach services to remote and Indigenous communities in the Kimberley, Pilbara, Goldfields, Great Southern and South-West regions.

He is a strong advocate for collaboration between optometrists and ophthalmologists and an active proponent of telehealth services with a focus on the best outcomes for patient care and equal opportunity for quality eye health care in regional Western Australia. He has spearheaded the Lions Outback Vision Van (LOVV) project, a custom-built mobile eye clinic which is delivering specialised care for all major eye conditions where people live.

"Providing eye care close to home is so important and reduces the barriers of moving 'off country' for treatment," Associate Professor Turner said.

"While a new project, the LOVV model appears to be delivering on its goal and leading to greater equity of access to specialist eye health services for regional and remote Western Australians."

As well as overseeing the LOVV, Associate Professor Turner is engaged in a number of research projects at the LEI focusing on service delivery for remote and Indigenous people.

Associate Professor Turner is also a consultant at Fremantle Hospital and an ophthalmology teacher for the Rural Clinical School.

Dr Steven Wiffen

Dr Steven Wiffen trained in ophthalmology in Western Australia before undertaking fellowships at the Corneo-Plastic Unit, East Grinstead, in the United Kingdom and at the Mayo Clinic in Rochester, Minnesota, in the United States.

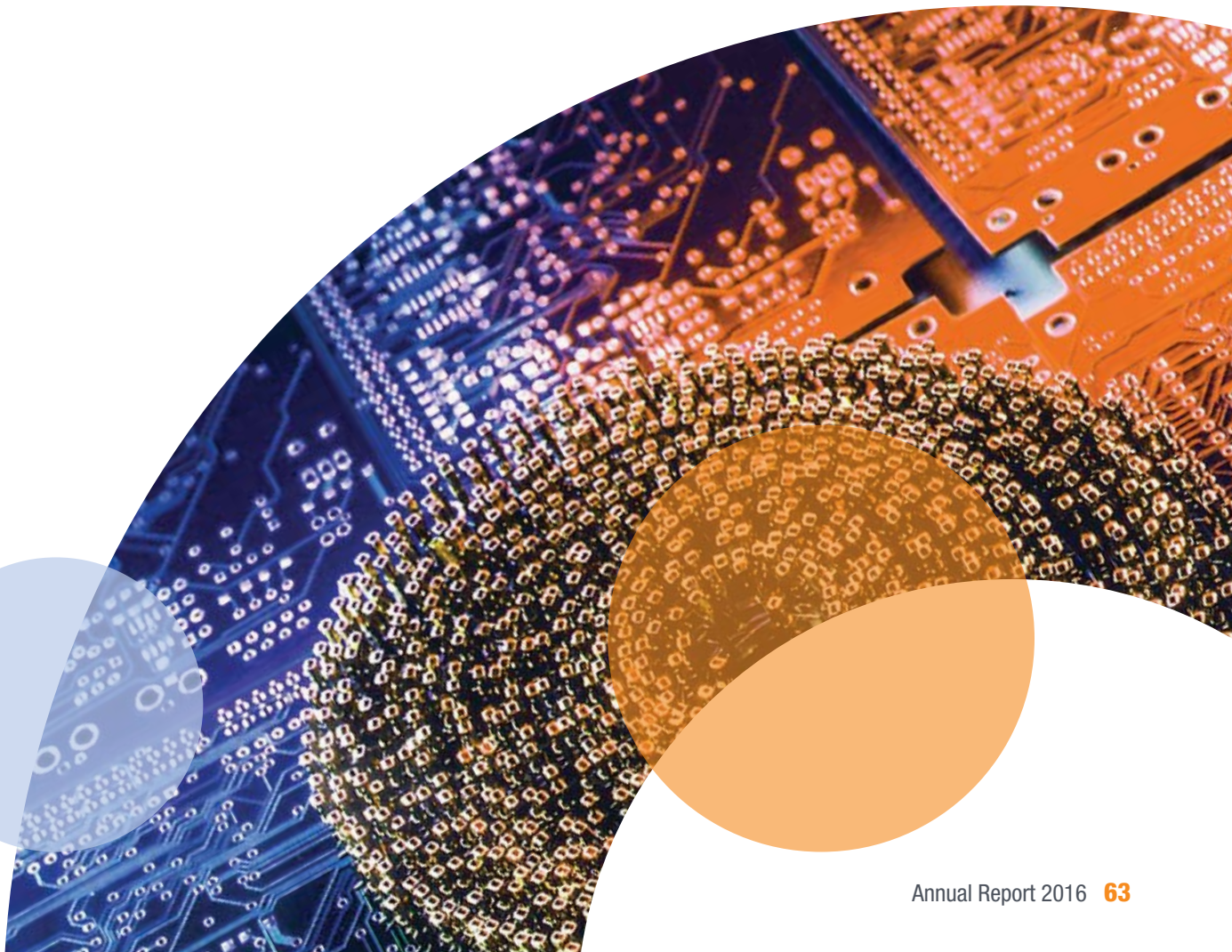
Dr Wiffen is a consultant ophthalmologist at Fremantle Hospital and a Senior Lecturer at The University of Western Australia.

He is also the Director of the Lions Eye Bank of Western Australia.

Dr Wiffen's areas of expertise include ocular surface disorders, corneal and refractive surgery, anterior segment disorders and surgery.

"Seeing the smile on a patient's face when you know you are keeping them sighted is a humbling experience."

Dr Antonio Giubilato



Lions Laser Vision surgeons Professor Geoffrey Crawford, Professor Graham Barrett, Dr Andrea Ang and Associate Professor Steven Wiffen

Lions Laser Vision

Lions Laser Vision is at the cutting edge of laser technology, offering patients the best possible vision without glasses or contact lenses.

The clinic is the only one in Perth to use the world's fastest and most advanced excimer laser source, the Schwind Amaris 1050RS, which corrects one dioptre of myopia in just 1.3 seconds.

It is considered the best laser device available in the world today for LASIK (laser in-situ keratomileusis) and photorefractive keratectomy (laser surface ablation).

LASIK is the gold standard of laser refractive surgery and the second most commonly performed eye operation in the world after cataract surgery.

Andrea Ang with patient

Professor Geoffrey Crawford with the Schwind machine

Lions Laser Vision puts patient safety first and ongoing investment in the latest technology is crucial to meet its goal. Patients can expect the best possible visual outcome after laser vision correction at Lions Laser Vision.

The history of Lions Laser Vision has been one of firsts - the first refractive laser centre in Western Australia; the first centre to perform laser PRK surgery in Australia in 1991, the first centre to perform LASIK in Western Australia in 1996 and the first and still the only accredited laser vision centre in Western Australia.

The centre has achieved accreditation each year since 2006 with ISO 9001 - an internationally-recognised quality management system.

Laser refractive surgery began with the introduction of an excimer laser in 1982 to reshape the surface of the human cornea and achieve correction of refractive errors in the eye that normally would require glasses or contact lenses.

Initially the surface of the cornea was lasered to flatten the cornea for correction of short-sightedness (myopia). It is now possible to also correct long-sightedness (hyperopia) and astigmatism.

In 1990 the technique was improved by adding the creation of a flap with the ablation performed under this. LASIK was more effective and accurate and more comfortable post-operatively with more rapid visual recovery.

Laser eye surgery can eliminate the need for glasses or contact lenses in patients with short-sightedness, long-sightedness and astigmatism to produce excellent unaided vision.

There are four refractive surgeons at Lions Laser Vison: Professor Crawford, Professor Graham Barrett, Associate Professor Steven Wiffen and Dr Andrea Ang, all of whom have had specialist fellowship training in refractive and corneal surgery in the United States.

Lions Eye Bank

The Lions Eye Bank celebrated its 30th anniversary in 2016 with transplant recipients, family members and staff sharing their stories about the importance of sight.

The Lions Eye Bank was established in 1986 by the LEI and has saved the sight of more than 4500 people through corneal transplantation.

Prior to its establishment, the collection of donor tissue was extremely difficult, with patients waiting up to two years for corneas.

New storage methods and advances in corneal surgery have transformed eye banking since 1986.

Back then, only one type of graft – penetrating keratoplasty – was offered, regardless of which part of the cornea was diseased.

Thirty years later, state-of-the-art surgical techniques have evolved so only the diseased portion of the cornea is replaced, shortening the recovery period and improving visual outcomes for the patient.

Donated tissue can also be stored for up to a month with virtually no waiting times for surgery.

All donor tissue is used either for transplantation or, if unsuitable, for ethically approved research or surgical training with the consent of the donor's family. This tissue is crucial to advancing research and developing surgical techniques.

Ten surgeons perform corneal grafts for both public and private patients including LEI clinicians Professor Graham Barrett, Professor Geoffrey Crawford, Dr Andrea Ang and Lions Eye Bank Director Dr Steven Wiffen.

Prevent blindness and improve the outcome of eye disease by providing corneal and sclera tissue for transplantation.

The Lions Eye Bank encouraged people to share their stories about the importance of sight as part of its 30th anniversary celebrations during the month of July

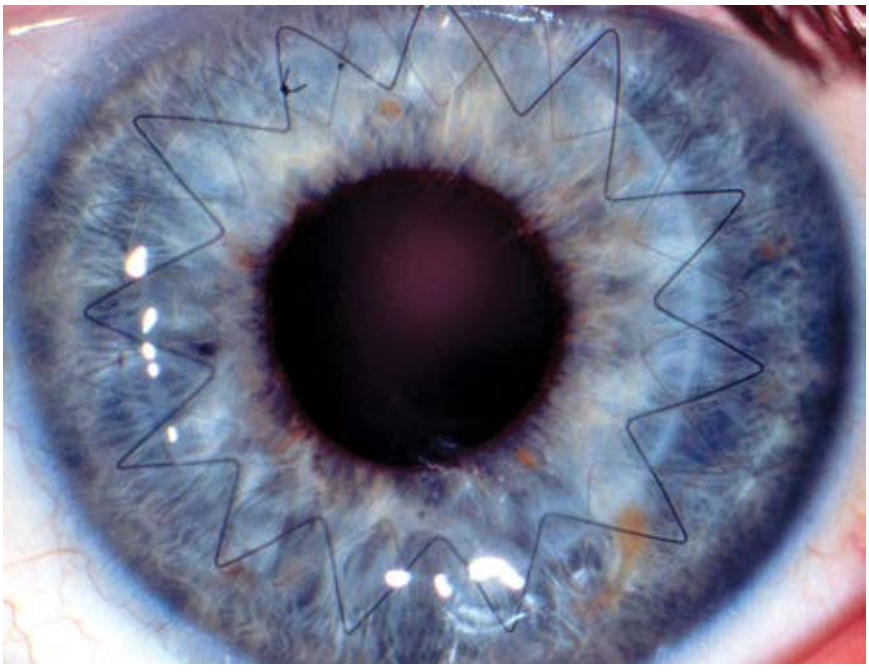
Glaucoma surgeons Professor William Morgan and Dr Antonio Guibilato use scleral grafts in surgery to reduce intraocular pressure.

As a member of the Eye Bank Association of Australia and New Zealand (EBAANZ), the Lions Eye Bank works collaboratively with other eye banks to maintain consistently high levels of quality, safety, proficiency and ethics. Excess tissue is shared when appropriate and emergency requests for tissue are always supported.

The goals of the Lions Eye Bank are to:

- Prevent blindness and improve the outcome of eye disease by providing corneal and sclera tissue for transplantation.
- Raise the profile of the LEI in the community, both locally and nationally, by educating the public and medical providers about the critical role of the Eye Bank in sight-saving procedures.
- Continue to remain a sustainable unit within the LEI by generating sufficient proceeds through the provision of eye tissues for transplantation.

As an independent organisation, the Lions Eye Bank of Western Australia is self-funded through cost recovery and is supported by the Lions Save-Sight Foundation.



Penetrating keratoplasty sutures

Lions Optics provides a full optometric service

Lions Optics

Lions Optics provides a full optometric service to the Western Australian community.

Well-trained staff members are up to date with the latest lens technologies and can assist with individual lens selections and visual requirements.

Lions Optics has steadily built a strong base of loyal clientele over more than 30 years and enjoys a long-standing reputation for optimum service.

Our affiliation with the LEI enables us to cater for an array of complicated eye conditions and patients enjoy peace of mind with the knowledge that profits support vital eye research.

Lions Optics has four different optometrists consulting - all of which have a wealth of knowledge and proficiency. Two of these consult at Visibility Low Vision Clinic, previously known as the Association of the Blind.

Lions Optics offers a wide range of services including:

- Comprehensive eye testing
- Medicare bulk-billing in most instances
- Extensive range of both budget and designer frames and sunglasses
- Private health cover direct claiming facility (HICAPS)
- Referrals to eye specialists and low vision clinics
- Broad selection of magnifiers and low vision aids
- Contact lens training, fitting and dispensing
- Spectacle repairs and adjustments done on site
- A qualified Optical Technician on site for lens glazing and fitting

During 2016, Lions Optics began preparations for the opening of the new Perth Children's Hospital and now stocks a large range of children's frames from health fund budget spectacles through to designer lines.

2016 Ian Constable Lecture

The head of Sydney's Garvan Institute of Medical Research, Professor John Mattick, delivered the 2016 Ian Constable Lecture on December 1 at The University of Western Australia (UWA).

The annual Ian Constable Lecture is presented by the LEI and the UWA Institute of Advanced Studies.

It honours the work of Professor Ian Constable – recognised as one of the world's leading ophthalmic surgeons and founder of the LEI.

For the 2016 lecture, Professor Mattick addressed the topic: *The central role of RNA in human evolution and development*.

In his fascinating presentation, Professor Mattick challenged 50 years of genetic theory – arguing that what had previously been dismissed as "junk DNA" almost certainly held the secret to understanding human development and cognition, as well as many complex diseases.

Professor Mattick won the prestigious Human Genome Organisation's Chen Award in 2012 for his work on non-coding RNA.

He has also been recognised by the National Health and Medical Research Council as one of the all-time high achievers in Australian health and medical research and by Thomson Reuters as one of the world's most influential scientific minds.

What had previously been dismissed as "junk DNA" almost certainly held the secret to understanding human development.

Professor John Mattick delivered the 2016 Ian Constable Lecture

Visionaries Luncheon

The 2016 Visionaries Luncheon was held at the UWA University Club on April 18.

The luncheon is an important event on the LEI's calendar and an opportunity to thank the people dedicated to achieving our vision to prevent and cure blindness and eye disease.

Chairman Stephen Pearce thanked the LEI's Visionaries for their support and Managing Director Professor David Mackey provided an overview of the LEI's achievements for the year.

After lunch, the director of the Physiology and Pharmacology research group, Professor Dao-Yi Yu, spoke about the development of a new surgical procedure for lowering pressure in the eye of glaucoma patients.

The luncheon is an opportunity to thank the people dedicated to achieving our vision to prevent and cure blindness and eye disease.

Professor Dao-Yi-Yu talks to guests at the 2016 Visionaries Luncheon

George's great legacy

Kojunup sheep farmer George Church left a great legacy to eye health in Western Australia with an estimated $1.4 million donation from his estate to the LEI.

George, who died aged 96, suffered from macular degeneration.

His passion for children's and rural health saw the balance of his estate go to the Telethon Kids Institute and the Royal Flying Doctor Service.

The West Australian featured George's remarkable story on its front page on February 24, 2016.

A veteran of World War II, George and his wife Patricia were known for their incredible generosity.

In 2014, they donated $500,000 toward the construction of a new medical centre in Kojonup.

George Church was a man of great generosity

Kate's story

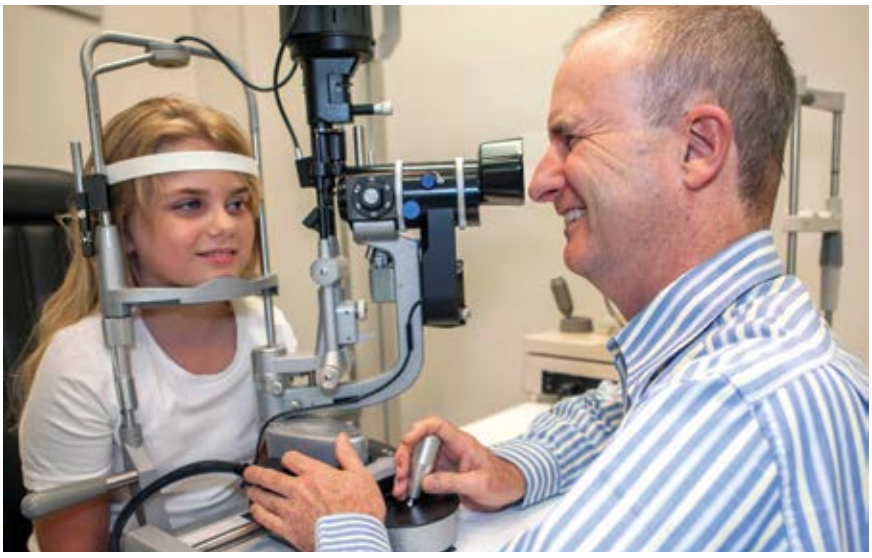
The 2016 Tax Appeal featured the story of Kate, a young girl who was born with cataracts and also has glaucoma.

Extensive treatment at the LEI by Professor Bill Morgan has helped protect Kate's eyesight.

Kate underwent surgery for cataracts at just nine weeks to allow her infant vision to develop. But after her cataracts were removed, she began to develop glaucoma – the result of fluid not draining correctly from her eyes.

With the build of pressure on her eyes, Kate faced serious damage to her optic nerves.

It is especially important for doctors to manager her glaucoma so that when Kate is older, she can receive new lenses. These will replace the opacified (cataractous) lenses that were removed when she was an infant.



Glaucoma patient Kate with her doctor Professor Bill Morgan

Kate's condition was managed for some years with eye drops but when she was eight, the pressure in her eyes began to build up again and Professor Morgan implanted a drainage system – called a Molteno tube – into her eyes.

Years of clinical experience have proven the tube to be a robust and durable drainage system for severe glaucoma cases like Kate's.

Kate continues to see Professor Morgan at the LEI regularly to monitor her eye condition.

Acknowledgments

including grants

Bequests

Estate of the Late Alan and Lilian Cameron

Estate of the Late George Church

Estate of the Late Jim Haddock

Estate of the Late Carol Hunter

Estate of the Late Verdun Jones

Estate of the Late Margaret Kerman

Estate of the Late Wally McCabe

Estate of the Late Lilian Rowlands

Estate of the Late Judith Smart

Estate of the Late Doreen Sullivan

Memorial gifts, honouring

Ms Elizabeth Bowes

Mr Peter Kemp

M. Kruger

Ms Mary Margaritis

Mr William (Bill) Swindells

Bringing us closer to a future without blindness

Special Gifts

Anonymous

Ballpoint Construction Group

Miss Ella Bone

Mr James Candy

Mr Toby Carboni

Professor Ian Constable

Mr John Cruickshank

Devil Creek Gas Plant Joint Venture

Mr Kerry Harmanis

Mr Norman Hogg

Dr Patricia Kailis AM OBE

Lions Club of Capalaba

Lions Club of Cunderdin

Oxford Compounding

Mr Carlo Manera

Mr Walter Millsteed

Mr and Mrs Brad and Carolyn Miocevich

Mrs Elva Moore

Mrs Gwynneth Roberts

Mr and Mrs John and Lee Saleeba

Mrs Kim Spence

Mr and Mrs Joe and Helen Sweet

Telstra WA

Mr Reginald Watts

Trusts and Foundations

Australian Foundation for the Prevention of Blindness (AFPB)

Brightfocus Foundation

Constantine Family Foundation Pty Ltd

Fred Hollows Foundation

Hardie Foundation Pty Ltd

Lindsay and Heather Payne Medical Research Foundation

Lions Save-Sight Foundation

Lowy Foundation Pty Ltd

McCusker Charitable Foundation

Newman's Own Foundation

Patrick Foundation

Retina Australia WA

Stan Perron Charitable Foundation Ltd

Wheatley Family Foundation

Major Institutional Support

Federal Government of Australia

Australian Research Council

Commonwealth Department of Health

National Health and Medical Research Council

Government of Western Australia

Department of Health

Country Health Service

Lotterywest

Ophthalmic Research Institute of Australia

Perpetual IMPACT Philanthropy

The University of Western Australia

Professor David Mackey leads a tour of some of the LEI's donors

Lions Youth of the Year finalists tour the LEI's facilities

Lions Save-Sight Foundation

LSSF Chairman Ambrose Depiazzi

The year 2016 has again seen the continuation of our association with the LEI following the path of support both in the financial and general sense.

We are grateful for the support we receive from the LEI and similarly proud of our contribution.

During 2016, the LEI assisted us with our Lions Youth of the Year by organising a tour of LEI facilities for the six State winners of this project.

It is important that these young people are aware of these great facilities to see what Lions can achieve - with much help from the community - in bringing such a project to fruition.

This group of young people are truly the cream of the crop and all will be future leaders in our community.

One such past example is the Hon. Simon Birmingham; currently Minister for Education in the Federal government. He was the South Australia Lions Youth of the Year winner in 1992.

The support from the LEI in allowing Lions groups to tour our facility is also much appreciated. Many Lions members are not aware of what we have here at the LEI and are "blown away" following a tour. To those at the LEI who act as guides may I say a special "thank you".

Regretfully we were unable to find a suitable candidate in 2016 to take up the PDG Brian King Fellowship. However, I am pleased to say that late 2016 saw this situation change

Brian King received his honorary doctorate at UWA in 2016

and the appointment of a Fellow to this role will see the new appointee commence in January 2017.

In the meantime, we continue to financially support our long standing commitments assisting with salary costs in relation to the Lions UWA Chair of Ophthalmology, the Director of Research and in support of other ongoing projects. We are indeed honoured to have the opportunity to contribute in this way.

In concluding, I would like to add the congratulations of our Board to the many others that would have been received by Professor Ian Constable following the creation of The Ian Constable Chair in Discovery and Translation Ophthalmic Science at UWA. This is a great recognition of Ian's contribution to ophthalmology in Western Australia.

We also extend congratulations to PDG Brian King who in March 2016 received an Honorary Doctorate of Letters from UWA. Again this is due recognition of the work that Dr King has contributed to sight over many years.

To all who have assisted us during 2016, may I sincerely say "thank you". I look forward to your continued support in 2017.

Ambrose Depiazzi
Chairman, Lions Save-Sight Foundation (WA) Inc.

Our Volunteers

The LEI's volunteer Concierge Program at the LEI is now in its seventh year and going strong.

Volunteering gives people the opportunity to become an active member of the community, while helping others and themselves, so those participating in our program find it most rewarding.

Our group numbers 30 and many of those have been in the program since its inception.

2016 has been a challenging year with the renovation of the new clinic on the ground floor but all worth it now with our new location – spacious, light and airy, and we can't be missed with our name in lights!

The role of volunteers is aimed at making a visit to the LEI a more seamless experience and is greatly appreciated by patients and visitors.

Duties consist of escorting elderly and vision impaired patients to their appointment, collecting prescriptions, conveying them from treatment areas, arranging transport and making a tea or coffee whilst they wait in the clinic.

As Coordinator of the Volunteer Program and a very proud one, I came across this quote the other day, which can be said of all volunteers but especially those at the LEI: *"Volunteers don't get paid because they are worthless, but because they are priceless!"*

Robin Miller
Volunteer Coordinator

"Volunteers don't get paid because they are worthless, but because they are priceless!"

Robin Miller

Christabel Lee and Robin Miller at the new-look volunteers desk in the LEI foyer

Grants

Grants

Australian Competitive Grants

NHMRC Program Grant

Immunological therapies for cancer, chronic infection and autoimmunity

Chief Investigator – Degli-Esposti M

NHMRC Centre of Research Excellence

Translation of genetic eye research integrating education, counselling and testing with gene discovery and gene based therapies for eye disease

Chief Investigators – Mackey D, Hewitt A

NHMRC Project

Understanding the role of CD4 T cells in viral infection a means of improving anti-viral immunotherapy

Chief Investigators – Degli-Esposti M, Andoniou C

NHMRC Project

Non-invasive retinal vein pulsation pressure measurement: A new assessment of glaucoma treatment

Chief Investigators – Morgan W, Yu D-Y

NHMRC Project

A Fibroin-based Prosthetic Bruch's Membrane for the treatment of Age-related Macular Degeneration

Chief Investigator – Chen F

NHMRC Project

The interplay between IL-6 and GVHD on anti-viral and anti-leukaemic immunity

Chief Investigator – Andoniou C

NHMRC Development

Non-invasive intra-cranial Pressure Measurement

Chief Investigator – Morgan W

NHMRC Principal Research Fellowship

Degli-Esposti M

NHMRC Early Career Fellowship

Chen F

NHMRC Early Career Fellowship

Yazar S

ARC Discovery Project

Utilizing virally-encoded proteins to decipher apoptotic regulatory mechanisms

Chief investigators - Andoniou C, Degli-Esposti M

ARC Discovery Early Career Researcher Award

Understanding cone photoreceptor migration and cell death mechanisms

Chief Investigator - Carvalho L

Ophthalmic Research Institute of Australia

Structure and function correlation in human macula - relationship between cone packing density and retinal sensitivity

Chief Investigator - Bukowska D

Ophthalmic Research Institute of Australia

Developing personalized disease modelling for testing novel treatment in inherited retinal disease due to RP1 mutation

Chief Investigator - McLenachan S

Retina Australia

Cone photoreceptor development and cell death mechanisms during retinal degeneration in mouse models of Achromatopsia

Chief investigator - Carvalho L

Perpetual IMPACT Philanthropy Program

Preventing blindness caused by ocular cancer - investigation of genetic factors that lead to the development of tumours in the eye

Chief investigators - Mackey D, Gajdatsy A

Government Grants

Commonwealth Department of Health

Lions Outback Vision

Turner A

Government of Western Australia Department of Health

Round 19 MHRIF

Government of Western Australia Department of Health

Merit Award - Project

Developing stem cell therapy for macular Degeneration

Chen F

Government of Western Australia Department of Health

Merit Award - Fellowship

Novel non-invasive assessments of early retinal vein occlusion

Balaratnasingam C

Government of Western Australia Department of Health

Research Translation Project

A novel approach to significantly improve clinical management of glaucoma

Yu D-Y

Government of Western Australia Department of Health

Lions Outback Vision

Turner A

Government of Western Australia Department of Health

Research Institute Support (RIS)

WA Country Health Service

Turner A

Other Grants

Lotterywest

Lions Eye Institute Outback Vision

Turner A

Telstra WA

Lions Eye Institute Outback Vision

Turner A

Fred Hollows Foundation

Turner A

RANZCO

Turner A

Stan Perron Charitable Foundation

Degli-Esposti M

Lions Save-Sight Foundation

Research Support

The University of Western Australia

Education Futures Scholarship

Razavi H

The University of Western Australia

Alumni Fund Grant

Razavi H

The University of Western Australia

Centre for Ophthalmology and Visual Science Infrastructure Funding

International Grants

BrightFocus Foundation

Mackey D

Newman's Own Foundation

Turner A

Total Grants 2016

6,172,834

Financial Statements

Profit or Loss and Statement of Other Comprehensive Income	2016	2015
Year ended 31 December 2016	**$**	**$**
Revenue	25,272,550	21,303,943
Materials, supplies and consumables	(2,729,149)	(2,438,776)
Other direct operating expenses	(8,781,346)	(7,884,836)
Gross surplus	13,762,055	10,980,331
Other non-operating income	1,481,170	1,986,816
Fair value adjustment of investments to market value	443,017	347,601
Marketing expenses	(749,983)	(328,980)
Research and development	(5,349,393)	(6,362,693)
Occupancy costs	(890,121)	(843,645)
Administrative employee expenses	(2,109,128)	(1,850,980)
Administration expenses	(2,156,565)	(1,829,273)
Surplus before income tax	4,431,052	2,099,177
Income tax expense	-	-
Surplus after tax	**4,431,052**	**687,599**
Other Comprehensive Income	(1,699,402)	2,367,702
Total Comprehensive Income	**2,731,650**	**4,466,879**

Statement of Changes in Equity	Revaluation of Available for Sale Financial Assets	Retained Earnings	Total
Year ended 31 December 2016	**$**		**$**
Balance at 1 January 2015	**-**	**32,637,545**	**32,637,545**
Surplus After Tax for the year	-	2,099,177	2,099,177
Other Comprehensive Income for the year	2,367,702	-	2,367,702
Balance at 1 January 2016	**2,367,702**	**34,736,722**	**37,104,424**
Surplus After Tax for the year	-	4,431,052	4,431,052
Other Comprehensive Income for the year	(1,699,402)	-	(1,699,402)
Balance at 31 December 2016	**668,300**	**39,167,774**	**39,836,074**

Statement of Financial Position	2016	2015
As at 31 December 2016	**$**	**$**
Current Assets		
Cash and cash equivalents	15,993,141	14,790,421
Financial assets	879,483	2,878,780
Trade and other receivables	1,947,070	1,717,696
Inventories	35,907	48,885
Other current assets	197,301	197,850
Total Current Assets	19,052,902	19,633,632
Non Current Assets		
Financial assets	23,381,550	24,925,916
Property, plant and equipment	12,760,235	8,212,963
Total Non Current Assets	36,141,785	33,138,879
Total Assets	55,194,687	52,772,511
Current Liabilities		
Trade and other payables	13,542,273	14,115,748
Short-term provisions	1,360,340	1,190,339
Total Current Liabilities	14,902,613	15,306,087
Non Current Liabilities		
Long-term provisions	456,000	362,000
Total Non Current Liabilities	456,000	362,000
Total Liabilities	15,358,613	15,668,087
Net Assets	39,836,074	37,104,424
Equity		
Revaluation of Available for Sale Financial Assets	668,300	2,367,702
Retained Earnings	39,167,774	34,736,722
Total Equity	**39,836,074**	**37,104,424**

Statement of Cash Flows	2016	2015
Year ended 31 December 2016	**$**	**$**
Cash flows from operating activities		
Receipts from customers	26,460,981	20,415,164
Payments to suppliers and employees	(22,628,467)	(17,892,517)
Net cash provided by operating activities	3,832,514	2,522,647
Cash flows from investing activities		
Interest received	284,947	491,125
Dividends received	1,045,484	990,672
Proceeds from sale of investment securities	4,562,831	5,315,131
Proceeds from sale of capital assets	7,373	10,045
Payments for investment securities	(2,639,620)	(10,904,024)
Payments for property, plant and equipment	(6,098,347)	(1,458,196)
Net cash (used in) investing activities	(2,837,332)	(5,555,247)
Net increase/(decrease) in cash held	995,182	(3,032,600)
Cash and cash equivalents at the beginning of the financial year	16,498,038	19,530,638
Cash and cash equivalents at the end of the financial year	17,493,220	16,498,038
Cash and cash equivalents comprise		
- Current cash at bank, on hand and deposits	12,988,925	11,756,689
- Current restricted cash	3,004,216	3,033,732
	15,993,141	14,790,421
- Non-current term deposits	1,500,079	1,707,617
	17,493,220	16,498,038

Auditor's Report

Level 1
10 Kings Park Road
West Perth WA 6005

Correspondence to:
PO Box 570
West Perth WA 6872

T +61 8 9480 2000
F +61 8 9322 7787
E info.wa@au.gt.com
W www.grantthornton.com.au

Independent Auditor's Report
To the Members of Lions Eye Institute Limited

Report on the concise financial report

The accompanying concise financial report of Lions Eye Institute Limited comprises the statement of financial position as at 31 December 2016, the statement of profit or loss and other comprehensive income, statement of changes in equity and statement of cash flows for the year then ended, derived from the audited financial report of Lions Eye Institute Limited for the year ended 31 December 2016. The concise financial report does not contain all the disclosures required by the Australian Accounting Standards and accordingly, reading the concise financial report is not a substitute for reading the audited financial report.

Directors responsibility for the concise financial report

The Directors are responsible for the preparation and presentation of the concise financial report in accordance with Accounting Standard AASB 1039 Concise Financial Reports, and the *Australian Charities and Not-for-profits Commission Act 2012*. This responsibility includes establishing and maintaining internal control as the directors determine are necessary to enable the preparation of the concise financial report.

Auditor's responsibility

Our responsibility is to express an opinion on the concise financial report based on our audit procedures which were conducted in accordance with Auditing Standard ASA 810 Engagements to Report on Summary Financial Statements. We have conducted an independent audit, in accordance with Australian Auditing Standards, of the financial report of Lions Eye Institute Limited for the year ended 31 December 2016. Our audit report on the financial report for the year was signed on 11 April 2017 and was not subject to any modification. The Australian Auditing Standards require that we comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance whether the financial report for the year is free from material misstatement.

Grant Thornton

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the concise financial report. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the concise financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation of the concise financial report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control.

Our procedures in respect of the concise financial report included testing that the information in the concise financial report is derived from, and is consistent with, the financial report for the year, and examination on a test basis, of evidence supporting the amounts and other disclosures which were not directly derived from the financial report for the year. These procedures have been undertaken to form an opinion whether, in all material respects, the concise financial report complies with Accounting Standard AASB 1039 Concise Financial Reports.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Independence

In conducting our audit, we have complied with the independence requirements of the Accounting Professional and Ethical Standards Board and the Australian Charities and Not-for-profits Commission Act 2012.

Auditor's opinion

In our opinion, the concise financial report of Lions Eye Institute Limited for the year ended 31 December 2016 complies with Accounting Standard AASB 1039 Concise Financial Reports.

Grant Thornton

GRANT THORNTON AUDIT PTY LTD
Chartered Accountants

M A Petricevic
Partner - Audit & Assurance

Perth, 11 April 2017

Prevent and cure blindness and eye disease

www.lei.org.au

E enquiry@lei.org.au **ABN** 48 106 521 439

Nedlands 2 Verdun Street, Nedlands WA 6009
Ph +61 8 9381 0777 **Fax** +61 8 9381 0700

Murdoch Level 1, Suite 24, Murdoch Medical Clinic, St John of God Hospital
100 Murdoch Drive, Murdoch WA 6150
Ph +61 8 9381 0765 **Fax** +61 8 9311 4134

Midland Level 1, St John of God Midland Public Hospital
1 Clayton Street, Midland WA 6056
Ph +61 8 9462 4030 **Fax** +61 8 9462 4085