

ABOUT

The Centre for Eye Research Australia (CERA) is an international leader in eye research with real-world impact. Our researchers are working to understand the causes of eye disease, to inform disease prevention and to improve the diagnosis and treatment of disease. Together we aim to save and restore sight.

CERA is an independent medical research institute closely affiliated with the University of Melbourne and is co-located together, with the discipline of Ophthalmology, in the Department of Surgery, Melbourne Medical School at The Royal Victorian Eye and Ear Hospital. The strength of the relationships between CERA, the University of Melbourne and The Royal Victorian Eye and Ear Hospital is key to the successful translation of research from the bench to the bedside.



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**For regular updates on CERA research
visit: www.cera.org.au**

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[www.twitter.com/EyeResearchAus](https://twitter.com/EyeResearchAus)



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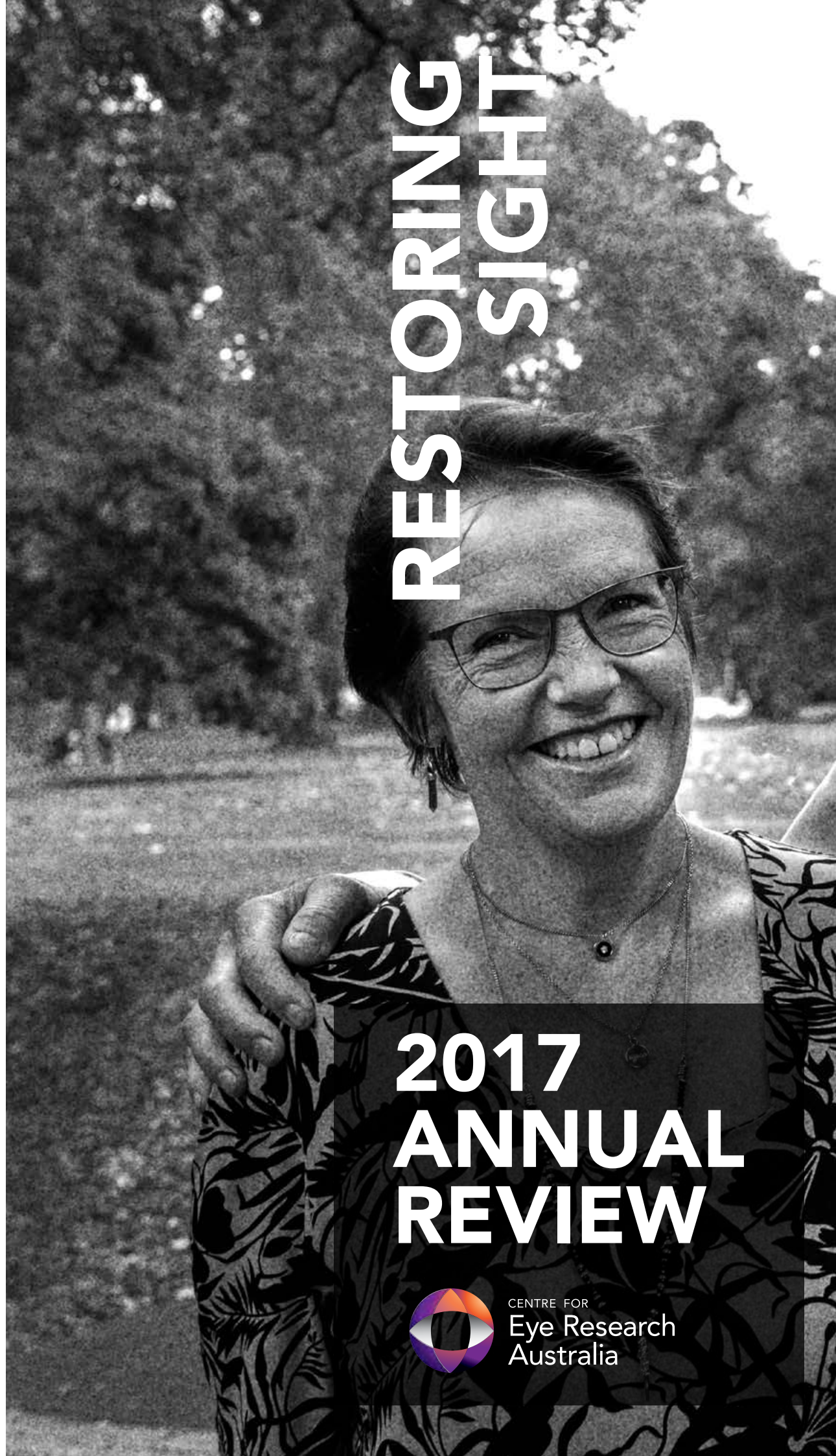
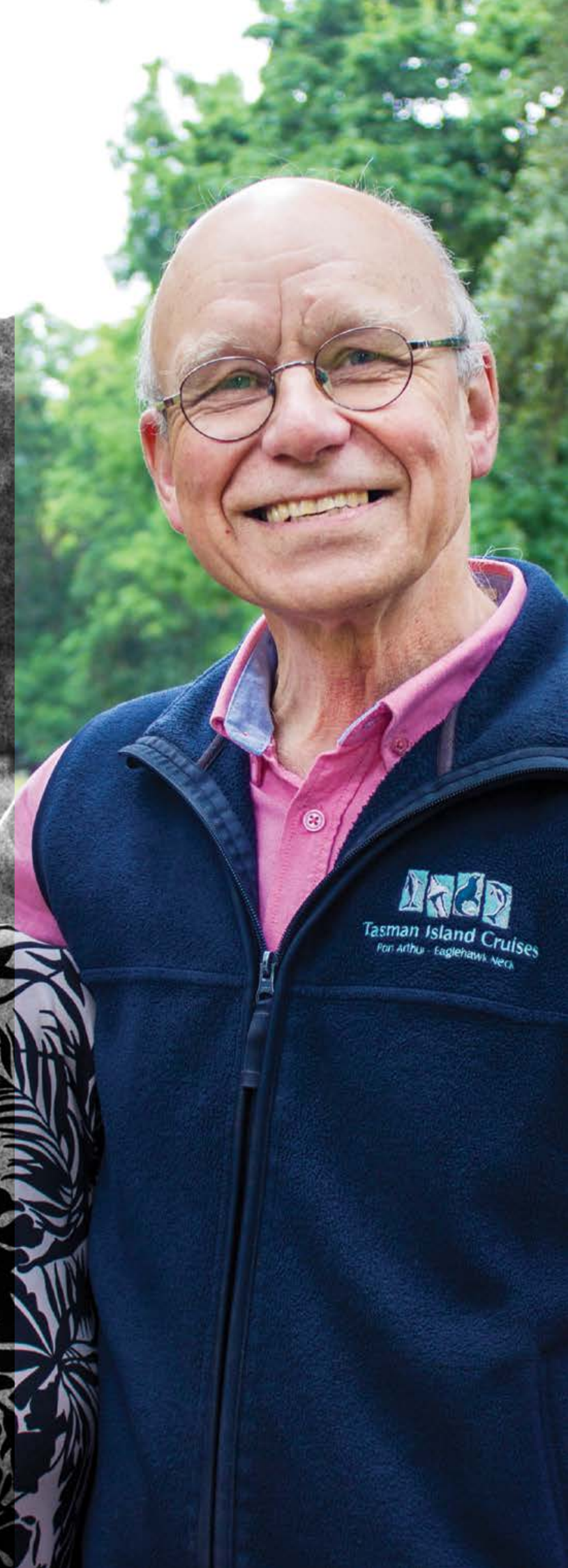


RESTORING SIGHT

2017 ANNUAL REVIEW



CENTRE FOR
**Eye Research
Australia**



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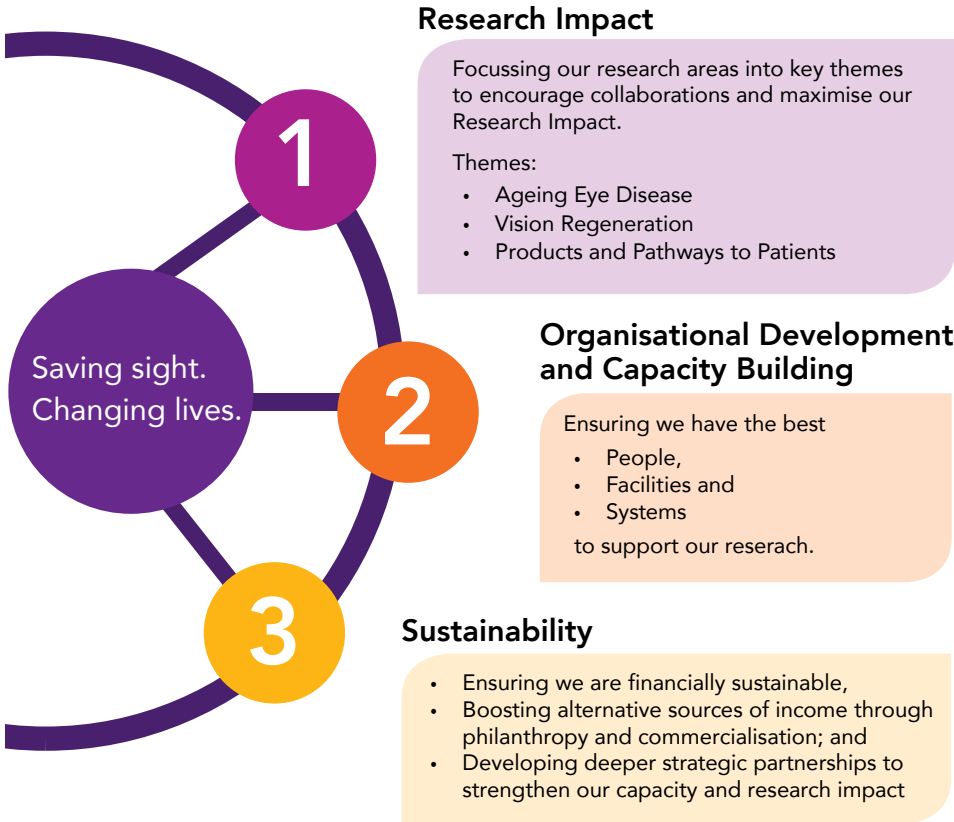
CHAIR AND MANAGING DIRECTOR'S REPORT

For 21 years, the Centre for Eye Research Australia (CERA) has worked towards a future free from blindness and vision loss.



ABOVE Prof Jonathan Crowston and Mr Peter Nankivell

CERA Strategic Plan Research, Translation and Innovation



During this time, our research program has grown to include researchers from every facet of eye health research; from fundamental, laboratory-based science that helps us understand the eye in health and disease, to clinical research that develops and tests new ways of diagnosing and treating eye disease, and finally, epidemiological research that allows us to help not just the patient sitting in front of us, but the thousands or even millions of patients affected world-wide.

CERA is entering an era where translation of research into patient outcomes requires excellence in the disciplines associated with innovation and commercialisation, as well as research. In the past two years, we have realigned our research program into three key themes under the Research Impact pillar of the Strategic Plan, which you can see illustrated on the page opposite.

The three themes are; Ageing Eye Disease, Vision Regeneration and Products and Pathways to Patients. By theming our research program in this way, we have formalised the collaborative style in which CERA researchers work together across disciplines, driven by a common purpose of developing treatments and cures for vision impairment. This review showcases our Vision Regeneration researchers, who are restoring sight to those who have lost it.

The quality of our research and published output is critical to our international standing in the research community. In 2017, CERA once again excelled on the world stage, ranking fourth globally in terms of scientific output behind Johns Hopkins University, Harvard University and University College London. Our research highlights included exciting new therapies for reversing age-related damage to eyes and restoring sight,

as well as exploring new technology for the diagnosis and monitoring of eye diseases such as macular degeneration and glaucoma.

Our Strategic Plan also focusses on the diversification of revenue streams — in particular, securing partnerships with industry, fostering a culture of enterprise, innovation, philanthropic engagement and commercialisation of research.

Following on from the success of Australia's first Bionic Eye in 2012, the Bionic Vision Australia consortium created a spin-off company — Bionic Vision Technologies Pty Ltd (BVT) — to develop and commercialise the technology.

CERA researchers are now working on the next generation Bionic Eye as a result of funding from BVT.

Finally, we conclude with our heartfelt thanks to our patron, the Governor of Victoria, the Honourable Linda Dessau AC and all the donors

and supporters who have continued to show their commitment to ending eye disease and vision loss in our lifetime. Without your support, this goal would be impossible to achieve but working together, we know that we can save sight and change lives.

Regards,

PETER NANKIVELL
CHAIR

JONATHAN CROWSTON
MANAGING DIRECTOR

BOARD AND GOVERNANCE

CERA thanks departing Eye Research Australia Foundation Directors, Ms Tina McMeckan, Mr Gerard Menses and Professor Tien Wong who have been outstanding contributors to CERA for many years, both as Foundation Directors and previously as CERA Board Members.

Executive Committee (as at December 2017)

- Professor Jonathan Crowston
Managing Director
- Professor Robyn Guymer
Deputy Director
- Dr Peter van Wijngaarden
Deputy Director
- Ms Jacinta Mackey
Chief Operating and Financial
Officer and Company Secretary
- Mr Michael Grigoletto
External Relations Manager
- Professor Darren Kelly
Director of Enterprise
and Innovation
- Ms Julie Todaro
Head of People
Development

The following staff also served on the Executive Committee in 2017:

Dr Ann Du, Grants and Research Portfolio Manager; Professor Mingguang He, Research Lead — International Partnerships; Dr Mohamed Dirani, Research Lead — Translation and Funding; Professor Paul Baird, Research Lead — Education.

Committees reporting to the Board

- Finance and Risk Committee
- Nominations and Appointments Committee
- Research Advisory Committee



ABOVE

2017 CERA Board and Deputy Directors. (L-R) Back row: Prof Geoff McColl, Mr Peter Larsen, Mr Simon Brewin, Prof Andrew Cuthbertson AO, Dr Peter van Wijngaarden (L-R) Front row: Prof Robyn Guymer AM, Mr Peter Nankivell (Chair), Prof Jonathan Crowston, Ms Christine Edwards. Absent: Ms Olivia Hilton, Dr Malcom Brown, Ms Brigitte Smith

CERA thanks Mr Peter Nankivell

The Board, staff and students of CERA are extremely indebted to outgoing Chair, Mr Peter Nankivell, for his enduring commitment and contributions to CERA and to the Board.

Mr Nankivell has been associated with CERA for over 16 years, from his initial involvement on the Eye Research Foundation Fundraising Committee in 2000, to his recent retirement from the position of Chair of the CERA Board in December 2017.

Incoming Chair Ms Oliva Hilton expressed her deep gratitude to Mr Nankivell for his years of service. “For over 16 years, Peter freely and willingly gave of his time and expertise to help elevate CERA to its current enviable position as Australia’s leading eye research institute. Mr Nankivell served in numerous capacities from sub-committees to hosting

many CERA events. He has truly been a selfless and hard-working Director and for this, the whole of CERA is extremely grateful and thankful,” she said.

For full details of our Board Directors, please visit www.cera.org.au/about/our-board

EXECUTIVE AND OPERATIONS REPORT

2017 was a year of big structural changes at CERA — both physically with the hospital redevelopment and as an organisation.

We began the year in the newly refurbished Level 7 in the Peter Howson Wing of The Royal Victorian Eye and Ear Hospital. This has enabled the consolidation of all our key administration functions into the one space along with some of our non-lab-based research groups, students and principal investigators.

A legal restructure of two foundations closely aligned with CERA was completed, resulting in the newly formed Centre for Eye Research Australia Foundation (CERA Foundation) reflecting modern, best practice structures.

While the CERA Foundation’s purpose to support cutting edge vision research remains unchanged from the objectives of the two predecessor Foundations, its funding decisions will be made with close reference to the CERA Strategic Plan and associated Research Themes.

During 2017, CERA created an Innovation Fund with a significant seeding contribution from the CERA Foundation (supported by a major philanthropic gift). The Innovation Fund

will provide funds for research that has the potential to build our pipeline of projects with commercial value. This will support CERA’s innovation agenda and build the organisation’s capability in this critical area.

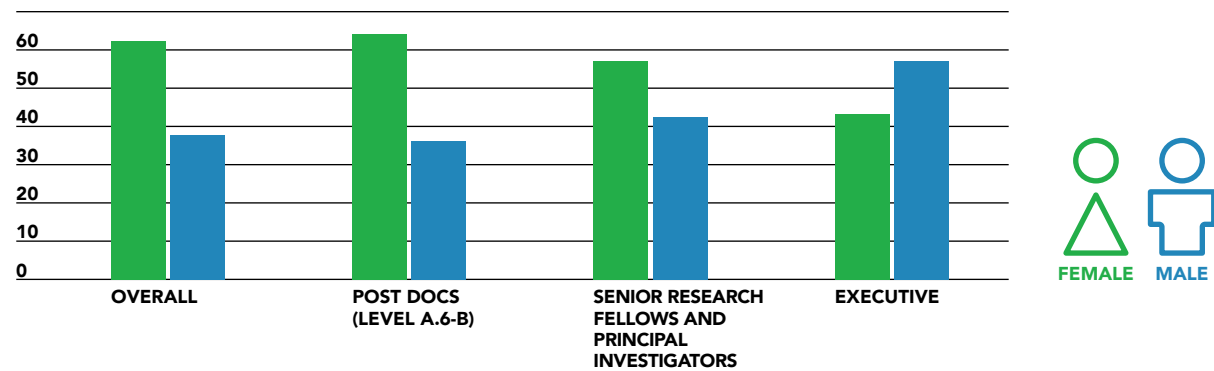


ABOVE Ms Jacinta Mackey, CFO/COO

GENDER EQUITY AT CERA

In 2017, the CERA Gender Equity Committee, led by Head of People Development Ms Julie Todaro, hosted the first ‘Women in Research Leadership Lunch’. A panel of high-profile researchers and business leaders spoke about the opportunities and challenges they

have faced throughout their careers. Grants and Research Portfolio Manager Dr Ann Du organised the event and said “it was wonderful to hear about the different perspectives of how to approach gender equity in research from leaders in the field.”



During 2017, we developed the four CERA values:



INTEGRITY



UNITY








AGILITY



MAKING A DIFFERENCE

CERA at a glance

-  23 competitive grants totalling \$2.48 million
-  More than 30 clinical trials
-  211 publications in peer-reviewed journals
-  \$2.5 million in regular fundraising and appeals
-  127 staff and 11 students

LEAD RESEARCHERS AT CERA

Our research program is organised into three overarching themes; Ageing Eye Disease, Vision Regeneration and Products and Pathways to Patients. CERA researchers work collaboratively across these themes, driven by a common purpose of creating treatments and cures for vision impairment.



**ASSOCIATE PROFESSOR
PENELOPE ALLEN**

Bionic Eye Project

Associate Professor Penelope Allen leads the Bionic Eye research at CERA. Her team is helping to develop a next-generation bionic eye implant that is fully implantable and offers more portability than earlier prototypes. Associate Professor Allen also works on the Victorian Endophthalmitis Registry, identifying trends in this disease and working towards new treatment options.



PROFESSOR PAUL BAIRD

Ocular Genetics

Professor Paul Baird's research team uses genomics together with bioinformatics, high level computing and artificial intelligence to focus on the identification of genes and risk factors involved in several major eye diseases including glaucoma, age-related macular degeneration, myopia and keratoconus, for precision medicine.



**ASSOCIATE PROFESSOR
MICHAEL COOTE**

Surgical Glaucoma Research

Associate Professor Michael Coote is the lead clinician on a project to develop a simple tele-ophthalmology system. This is a joint government, industry and hospital innovation, and it has developed the EyeConnect device (a remote operated slit lamp, operating through the web) as well as a disposable tonometer, which is a device to measure eye pressure.



**PROFESSOR JONATHAN
CROWSTON**

Glaucoma Research and Managing Director of CERA

Professor Jonathan Crowston's research focusses on ageing and rejuvenation of the optic nerve. In particular, his work examines the role played by mitochondrial dysfunction in glaucoma.



**ASSOCIATE PROFESSOR
MARK DANIELL**

Corneal Research

Associate Professor Mark Daniell's research interests are in; cornea and external disease, surgery of the cornea and lens and developing a tissue-engineered cornea. He has a particular focus on keratoconus, evaluating new treatments and looking for the underlying causes.



DR THOMAS EDWARDS

Retinal Gene Therapy Research

Dr Thomas Edwards' research looks at the potential of retinal gene therapy to cure inherited eye diseases.

His research will establish the infrastructure and knowledge base necessary to build an Australian gene therapy centre of excellence in Melbourne.



**PROFESSOR ROBYN
GUYMER AM**

Macular Research and Deputy Director of CERA

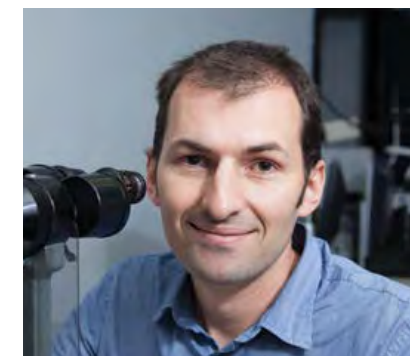
Professor Robyn Guymer and her team primarily investigate the causes and treatments of age-related macular degeneration (AMD). They aim to identify novel biomarkers to better detect and monitor disease, and they work both independently, and with industry partners, to find better ways of preventing and treating vision threatening AMD complications. Additionally, Professor Guymer is part of a world-wide consortium looking to understand, and prevent macular telangiectasis (Mactel).



**PROFESSOR
MINGGUANG HE**

Ophthalmic Epidemiology at the University of Melbourne

Professor Mingguang He is a world leader in the fields of clinical and epidemiological research, randomised clinical trials, twin studies and imaging technology in ophthalmology. His group is developing and testing artificial intelligence systems to support the early detection of eye diseases.



PROFESSOR ALEX HEWITT

Clinical Genetics

Professor Alex Hewitt's group is focussed on the clinical and genetic analysis of inherited eye diseases, including glaucoma, retinitis pigmentosa and other rare hereditary eye diseases. The team is actively involved in research into gene therapy, stem cell biology and gene editing approaches.



ASSOCIATE PROFESSOR WILSON HERIOT

Vitreoretinal Surgical Research

Associate Professor Wilson Heriot is the Principal Investigator for a US Congressionally Awarded Grant of US\$1.48 million to translate the experimental optimisation of an improved method for retinal detachment repair into a routine clinical surgical technique.



PROFESSOR DARREN KELLY

Director of Enterprise and Innovation

Professor Darren Kelly is the Director of Enterprise and Innovation at CERA, the Associate Dean (Innovation and Enterprise, MDHS) and the Director of Biomedical Research, Department of Medicine, University of Melbourne. He is also the CEO of Certa Therapeutics and Occurx, two biotechnology companies developing drugs for diabetes complications.



DR NATHAN KERR

Clinical Lead for Glaucoma Surgical Trials

Dr Nathan Kerr is motivated to help people with glaucoma save their sight by finding better treatments. Utilising new methods of medication delivery and microscopic devices, Dr Kerr is investigating a new implant that may replace daily eye drops as well as safer surgical procedures called the XEN and CyPass.



ASSOCIATE PROFESSOR ALICE PÉBAY

Neuroregeneration

Associate Professor Alice Pébay's group utilises human pluripotent stem cells to improve our understanding of diseases of the eye and brain, and to identify new treatment approaches. The team are working at the cutting edge of stem cell science.



DR HITESH PESHAVARIYA

Oxidant Signalling (deceased October 2017)

Dr Hitesh Peshavariya was a biochemist with over 15 years' experience in the fields of biochemistry, cellular and molecular biology and pharmacology.

Dr Peshavariya was researching a way to prevent scar formation in the eye after glaucoma surgery and this research is still continuing at CERA.



ASSOCIATE PROFESSOR IAN TROUNCE

Mitochondria and Neurodegeneration

Associate Professor Ian Trounce's research focus is on mitochondria and how genetic defects in this cellular power generator contribute to age-related neurodegenerative diseases, including diseases of the optic nerve.



DR GEORGE KONG

Honorary Clinical Lecturer, University of Melbourne

Dr George Kong is an ophthalmologist with an interest in utilising portable technology to improve future eye care. Dr Kong has designed and validated a software capable of assessing the vision for patients with glaucoma, macular degeneration, diabetic retinopathy and neurological conditions. He is currently recruiting patients for home monitoring trials.



ASSOCIATE PROFESSOR LYNDELL LIM

Clinical Trials Research

Associate Professor Lyndell Lim's main research interests are clinical studies in uveitis, ocular immunology and diabetic retinopathy. Her Clinical Trial Research Centre runs both investigator-initiated and commercially-sponsored clinical trials that aim to investigate new treatments, as well as the mechanism of action and effectiveness of current treatments.



ASSOCIATE PROFESSOR CHI LUU

Macular Research

Associate Professor Chi Luu works on preclinical models to better understand the causes and progression of Age-related Macular Degeneration (AMD), and to evaluate the efficacy of new interventions. He also researches neuroprotective electrical stimulation as a method of slowing degeneration of retinal neurons.



DR PETER VAN WIJNGAARDEN

Diabetic Retinopathy and Neuroglial Interactions, Deputy Director of CERA (Interim Managing Director from June 2018)

Dr Peter van Wijngaarden's research group focuses on three broad areas: harnessing the power of resident stem cells in the brain and spinal cord for regeneration in multiple sclerosis; understanding the role played by support cells in the optic nerve in glaucoma; and developing a novel approach to eye imaging to detect early markers of eye and brain diseases, including Alzheimer's disease. He is an advocate for a coordinated national approach to eye examinations for all Australians with diabetes.



DR RAYMOND WONG

Cellular Reprogramming

Dr Raymond Wong is a stem cell biologist specialising in cellular reprogramming. His research has identified new methodologies to generate human pluripotent stem cells and he's developing new reprogramming technology to generate retinal cells, providing important steps to realise the medical potentials of these cells.

WORKING TOWARDS VISION REGENERATION USING STEM CELL TECHNOLOGIES

One of the fundamental challenges facing researchers working on blinding eye diseases is that once retinal cells are damaged or lost to disease, there is no way to replace or restore them. CERA researchers are embracing and developing new stem cell techniques that they hope will ultimately lead to sight-restoring treatments.

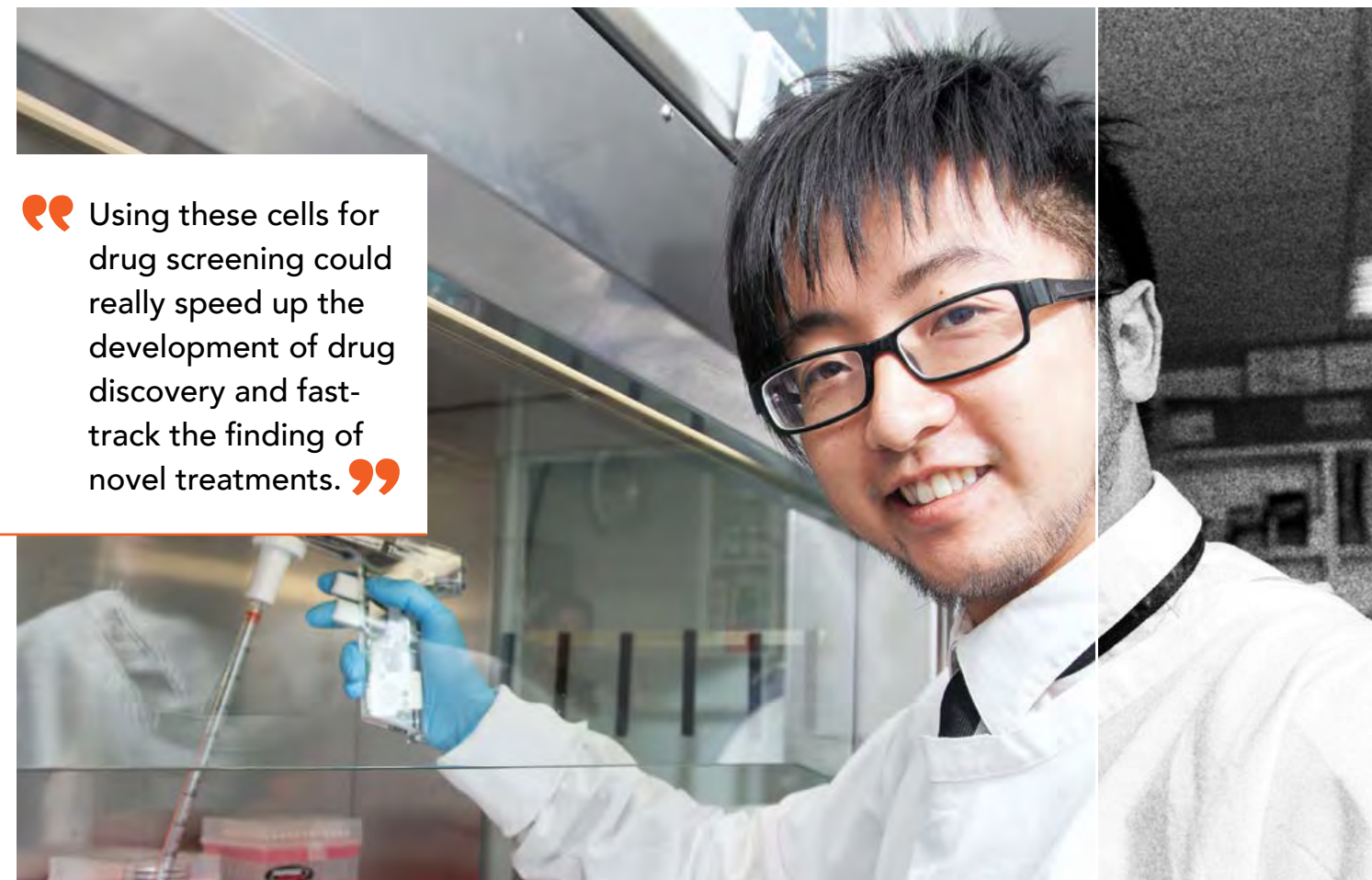
As a result of recent advances, researchers are now able to take a skin sample from a patient and use it to generate pluripotent stem cells, which have the potential to become any cell type in the body. In itself, this technology overcomes a major barrier to eye research — the inaccessible nature of retinal cells from patients with eye disease. What's more, CERA researchers can do this on a large scale, using a robotic stem cell platform that was set up in 2014 with the help of a generous donation by the Joan and Peter Clemenger Trust.

In 2017, Associate Professor Alice Pébay, Head of CERA's Neuroregeneration research group, was awarded a significant grant from the Macular Disease Foundation Australia to model Geographic Atrophy using stem cells. "Thanks to the stem cell robot, we can grow retinal cells from hundreds of patients and use those to assess which genes

are expressed differently between patient and control samples," explains Associate Professor Pébay. "Identifying genetic differences in diseased cells can uncover the causes of disease and suggest new avenues for treatment options," she said.

Associate Professor Pébay is also developing ways of using stem cells from patients to grow organoids that contain many different cell types arranged in a structured way. This new type of model allows researchers to study cells in a more realistic environment. Dr Damián Hernández, a Research Fellow in Associate Professor Pébay's group, was awarded a 2017 Brain Foundation Grant to develop 'mini-brains' from Alzheimer's disease patients and use them to investigate the role of a specific protein, 'APOE', in disease development. "Our model will help researchers better understand Alzheimer's disease and be a tool for new drug development," Dr Hernández said.

“Using these cells for drug screening could really speed up the development of drug discovery and fast-track the finding of novel treatments.”



ABOVE Dr Raymond Wong

CERA's Cellular Reprogramming group, led by Dr Raymond Wong, is working on deriving retinal and optic nerve cells from a patient's own cells. Their hope is that by developing genetic correction techniques or drug treatments that can correct the disease in stem cells, cell replacement therapy to regenerate vision will become a reality.

In collaboration with Associate Professor Pébay and others, Dr Wong recently published a significant paper in the journal, *Aging*, demonstrating that Leber's Hereditary Optic Neuropathy (LHON), a mitochondrial genetic disease that results in blindness, can be successfully modelled in stem cells derived from patients' skin samples. Dr Wong is also working on using stem cell disease models such as the LHON model for drug screening. For many eye diseases there are no human cell models available so this approach holds great promise.

"Using these cells for drug screening could really speed up the development of drug discovery and fast-track the finding of novel treatments," Dr Wong said.

One of Dr Wong's other ongoing projects is to map out the genes expressed in all cells of the human retina. This project was given a major boost in 2017 with funding from the Ophthalmic Research Institute of Australia.

At a glance



14 publications from Neuroregeneration and Cellular Reprogramming groups



350 stem cell lines generated from research patients



6 research groups at CERA collaborating on stem cell research

PROTECTING AND RESTORING THE OPTIC NERVE

Glaucoma is a disease of the optic nerve which transmits information from our eye to our brain. In this neurodegenerative disease, the nerve cells die prematurely and once gone, they cannot be restored.

"Genetics are a key risk factor. People with family members with glaucoma are more likely to have the disease. It can be associated with high-eye pressure, but one of the main risk factors is from ageing," said Professor Jonathan Crowston, Head of Glaucoma Research at CERA.

"For most types of glaucoma, you can have moderate to advanced disease and still not be aware you have it. The astounding fact is our brains are very good at filling in the picture, even when 80–90% of your visual field is lost," Professor Crowston said.

UNRAVELLING THE CAUSES

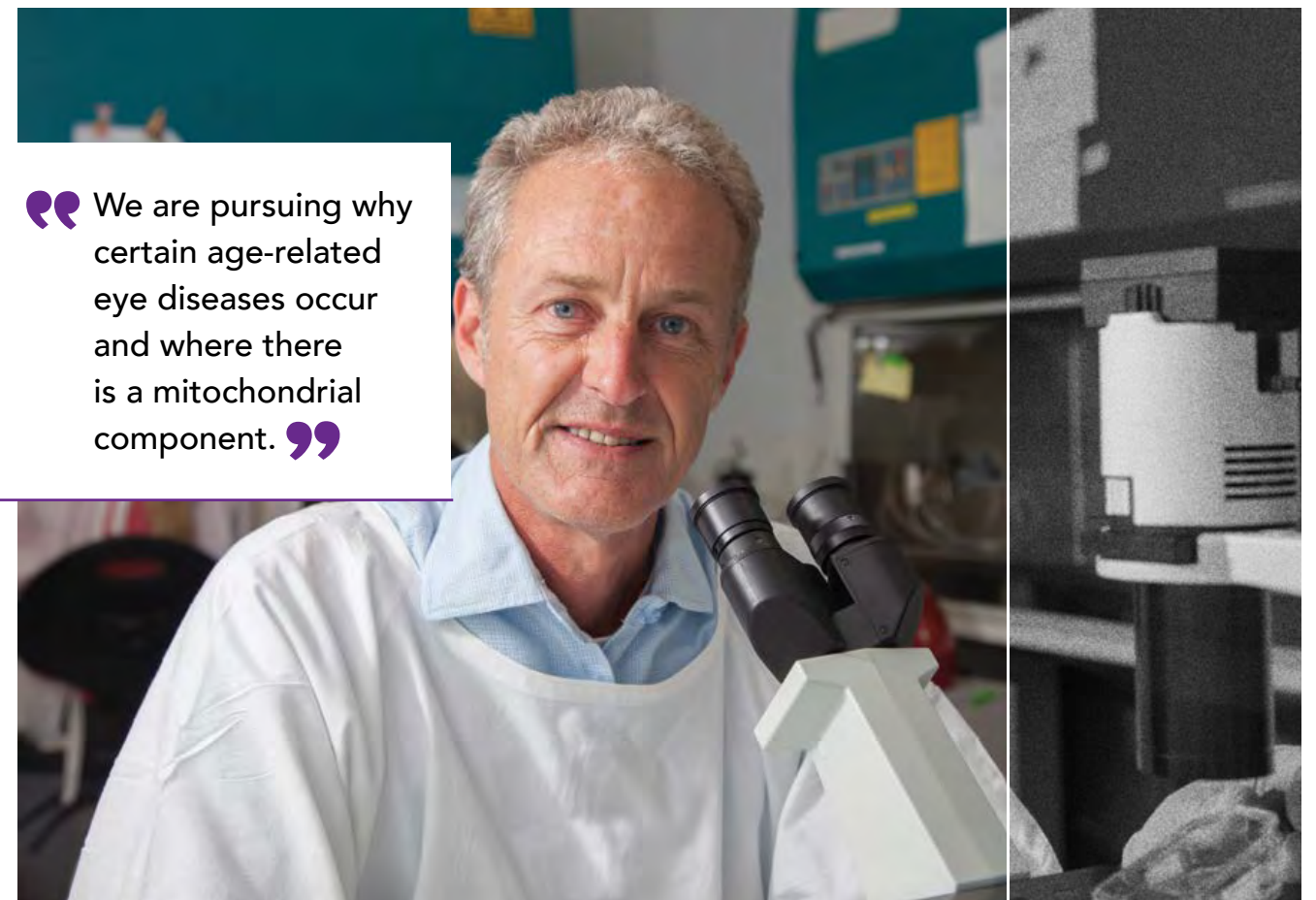
CERA runs laboratory and clinical research trying to understand why getting older predisposes us to developing glaucoma. Associate Professor Ian Trounce leads the mitochondria and neurodegeneration research at CERA.

"Mitochondria are the energy factories of our cells and we know they are very much involved in the proper functioning of the optic nerve. We are pursuing why certain age-related eye diseases occur and where there is a mitochondrial component," said Associate Professor Trounce.

"Our research has shown a measurable defect in mitochondrial energy supply in cells of patients with glaucoma and other neurodegenerative diseases, such as Leber's Hereditary Optic Neuropathy," he said.

Associate Professor Trounce and his team are now looking at biochemical solutions to this problem, including the moderating effects of hormones and increasing the fuel available to the mitochondria, with the plan to translate this research into new therapies.

“We are pursuing why certain age-related eye diseases occur and where there is a mitochondrial component.”



ABOVE A/Prof Ian Trounce


EARLIER DIAGNOSIS


"Every month I see patients in the advanced stages of the disease who are much harder to treat than the patients who are diagnosed early on," said Professor Jonathan Crowston.


New diagnostic methods to detect structural changes to the optic nerve before functional changes occur, and well before a patient is able to detect vision loss, are being trialled at CERA.

PhD student Dr Jessica Tang is using a portable electroretinography (ERG) device to objectively assess the function of the optic nerve in patients with glaucoma. The device measures the electrical impulses generated by the optic nerve cells in response to light — damaged nerve cells send weaker signals while recovered cells send stronger signals. She hopes this will allow eye health professionals to better monitor how the optic nerve is working after glaucoma treatment.

At a glance

 Glaucoma is the second most common cause of blindness worldwide, affecting more than 60 million people

 A positive family history of glaucoma increases your glaucoma risk by 5 to 10 times

 The total annual cost of glaucoma on our health care system is expected to increase to \$4.3 billion by 2025 (Access Economics — The Economic Impact of Glaucoma)

85% of vision loss is preventable or treatable if detected early

BETTER TREATMENTS

CERA research is also looking at new treatments to make the optic nerve more robust.

Research from CERA’s Professor Jonathan Crowston and Dr Vicki Chrysostomou has shown that exercise and dietary control may play a role in protecting the optic nerve.

A recent study from the US has now shown promising results for treating optic nerve damage in mice with dietary supplementation of nicotinamide. Nicotinamide, a type of Vitamin B3, is already approved for use in humans by the Therapeutic Goods Administration. Professor Crowston and Associate Professor Trounce were invited by the prestigious journal, *Science*, to provide a perspective commenting on this research study.

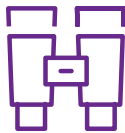
In 2017, Professor Crowston and Dr Flora Hui commenced the world-first human clinical trial using nicotinamide to treat glaucoma. The randomised controlled study recruited 60 patients with glaucoma and will assess the effect of high-dose nicotinamide supplementation. Dr Hui and her CERA colleague Dr Xavier Hadoux are monitoring the trial participants with a new type of retinal camera that is capable of taking up to 90 images per second as well as the portable ERG device, to provide detailed measures of the function of the nerve cells that are affected in glaucoma. These sensitive tests may detect subtle changes in the structure and function of the eye, well before the patient can detect any changes in their vision.



ABOVE (L-R): Dr Jennifer Fan Gaskin, Dr Flora Hui, Prof Jonathan Crowston, Dr Jessica Tang, Dr Xavier Hadoux



ABOVE Dr Peter van Wijngaarden



THE LINK BETWEEN EYES AND ALZHEIMER’S DISEASE

CERA Deputy Director Dr Peter van Wijngaarden is investigating the link between two common ageing diseases; glaucoma and Alzheimer’s disease. “Both diseases are related to nerve degeneration, in fact the optic nerve and retina develop as an extension of the brain,” Dr van Wijngaarden explains.

With the generous support of the H and L Hecht Trust, the Pratt Foundation and the Yulgilbar Foundation through its Yulgilbar Alzheimer’s Research Program, Dr van Wijngaarden and his team are using a novel approach to eye imaging based on NASA satellite imaging technology in an attempt to detect signs of Alzheimer’s disease in the eye. This imaging approach is also being used to detect markers of a range of eye diseases (See previous page).

HIGHLIGHTS FROM THE GLAUCOMA AND NEURODEGENERATION RESEARCH TEAMS

- Professor Jonathan Crowston received a World Glaucoma Association (WGA) Special Recognition Award and an American Academy of Ophthalmology (AAO) Achievement Award
- Dr Flora Hui was awarded grants from the Jack Brockhoff Foundation and EH Flack Trust, the William Angliss Charitable Fund and the Ophthalmic Research Institute of Australia
- Dr Isabel Lopez Sanchez was awarded a grant from the Ophthalmic Research Institute of Australia and a CASS Foundation Travel Award
- Associate Professor Michael Coote’s endeavours to develop surgical glaucoma treatments and devices is reaching the commercialisation stage and is generously supported by Reece Australia Limited
- Thanks to the outstanding support of Mr and Mrs Craig and Connie Kimberley, Professor Jonathan Crowston’s glaucoma research is poised to expand into an international collaboration to restore optic nerve function

NEXT GENERATION BIONIC EYE ON THE HORIZON

Science fiction writers have long fantasised about a world where 'faulty' body parts can be replaced with bionic organs and limbs. For some people who have lost their vision, a bionic eye might offer their only hope of ever seeing again.

Fifty years after Professor Graeme Clark's bionic ear was first unveiled, researchers at CERA, the Bionics Institute, the University of Melbourne and Data61 are developing a new and improved bionic eye implant that could one day transform the lives of people who have lost their sight.



ABOVE A/Prof Penny Allen

The next generation device offers higher resolution images and more mobility than the earlier prototype, first trialled in 2012. Patients testing the new bionic eye device will be able to take it home with them and use it in the real world, unlike the original prototype which was only switched on in a controlled laboratory environment.

"The bionic eye has officially moved out of the realm of science fiction and into the real world," declared Associate Professor Penelope Allen, Australia's first female vitreoretinal surgeon and the Chief Vitreoretinal Surgeon of the Bionic Eye team.

"We are excited to be embarking on this new phase of our research which builds on our prototype clinical study of three patients conducted in 2012–2014. It is great to be able to offer some hope to this group of profoundly visually impaired patients with inherited retinal degeneration. This is the largest cause of blindness in working age people," she said.



“The bionic eye has officially moved out of the realms of science fiction and into the real world.”

ABOVE Prof Robyn Guymer AM helped develop Australia's first bionic eye

Australia's bionic eye research was originally funded through a six-year AU\$50 million Special Research Initiative grant to Bionic Vision Australia (BVA) administered by the Australian Research Council, and a three-year project grant to Associate Professor Allen administered by the National Health and Medical Research Council.

This next phase in the development of the bionic eye was made possible thanks to a large investment secured by Bionic Vision Technologies Pty Ltd (BVT); a spin-off company created by the BVA consortium to develop and commercialise the technology. In 2017, Hong Kong-based China Huarong International Holdings Ltd and State Path Capital Limited invested US\$18 million in BVT, formally launching BVT's transition to the commercialisation stage.

CERA and other members of the BVA consortium have now become shareholders in BVT, alongside the new investors. The other investors in the consortium are the University

of Melbourne, the University of New South Wales, the Bionics Institute, CSIRO's Data 61, The Royal Victorian Eye and Ear Hospital, Western Sydney University, and the Australian College of Optometry.

At a glance



US \$18 million investment in new bionic eye technology



New device expected to significantly improve the resolution of the original



Patients will trial device at home

A CURE IN SIGHT FOR RETINAL DISEASE

Inherited retinal disorders are now the leading cause of blindness in working age adults. For patients with this type of disorder, little could be done to save their sight. Until now.

In the 2017 CERA Tax Appeal, Research Fellow Dr Thomas Edwards discussed his work towards finding a cure for inherited retinal disorders.

"Through my research, I know that the best prospect for a cure for inherited retinal disorders lies in gene therapy," he said.

Dr Thomas Edwards is an ophthalmologist at The Royal Victorian Eye and Ear Hospital with a PhD from the University of Cambridge, UK. Supported by Professor Jonathan Crowston's mentorship and training early in his ophthalmology career, Dr Edwards was awarded a prestigious Oxford Nuffield Medical Fellowship in 2014 to study in the Nuffield Laboratory of Ophthalmology at the University of Oxford, UK — a world-leading centre for gene therapy.

"During my time at Oxford, I learned how to perform the latest retinal surgery techniques," said Dr Edwards. "Now that I am back in Melbourne, I want to combine

my clinical and research skills to develop new treatments for incurable inherited eye diseases in Australia."

The promise of gene therapy is very exciting for those with an inherited retinal disorder. In gene therapy, a normal copy of a gene is delivered to the retina to prevent further vision loss. Gene therapy also has the potential to restore vision.

A condition called retinitis pigmentosa (RP), an inherited genetic disease of the retina, is ideal to test the impact of gene therapy because there is a good understanding of the genetics of this condition.

"Until recently, someone with RP was deemed incurable," said Professor Crowston. "But with the advent of gene therapy and Tom's work, treatment is a possibility."

Dr Edwards' research has the potential to give hope and save sight for thousands of Australians.

During my time at Oxford, I learned how to perform the latest retinal surgery techniques.



ABOVE Dr Thomas Edwards

"My hope is that we will soon be entering an era where, for the first time, a treatment exists for patients with incurable inherited retinal degeneration that halts or even reverses vision loss," said Dr Edwards.

"We are still very much in the early stages of this research project, working on optimising the genetic code of our gene delivery DNA and performing experiments on cells grown from patients with RP. We hope that in the future this work will lead to a clinical trial."

At a glance



Retinitis pigmentosa affects approximately 1 in 4,000 people worldwide



Inherited retinal diseases are the leading cause of blindness in working age adults



Gene therapy offers the best hope for a cure for these diseases

HIGHLIGHTS FROM THE MACULAR RESEARCH TEAM

- Professor Robyn Guymer AM received a prestigious Bayer Global Ophthalmology Award
- Dr Lauren Ayton received a University of Melbourne Academic Women in Leadership award and a Translating-Research-into-Practice fellowship from the NHMRC
- Associate Professor Chi Luu received a BrightFocus Foundation grant
- Dr Carla Abbott received a Cass Foundation grant

EDUCATION AT CERA

CERA hosts growing numbers of higher degree research students each year who are supervised by our principal investigators. Postgraduate students enrol through the University of Melbourne in a Masters, Doctorate or PhD program.

TWO STUDENTS COMPLETED THEIR HIGHER DEGREE RESEARCH STUDIES IN 2017:

- Dr Edith Holloway, PhD, "Improving psychosocial outcomes in adults with vision impairment: the effectiveness of integrating an evidence-based therapy 'Problem-Solving Treatment for Primary Care' within low vision rehabilitation services"
- Dr Jonathan Goh, MSc, "Functional biomarkers of age-related macular degeneration in patients with unilateral choroidal neovascularisation"

CERA staff members Alison Conquest and Heather Machin were awarded NHMRC scholarships to undertake a PhD at CERA.



ABOVE Dr Jessica Tang won the University of Melbourne's 3MT competition in 2017

HAVE YOU GOT A MINUTE (OR THREE) TO LEARN ABOUT GLAUCOMA RESEARCH?

Breaking down years of scientific research into three minutes might seem like an impossible task, but that's exactly what PhD candidate Dr Jessica Tang did when she took home the top prize at the University of Melbourne's annual 3 Minute Thesis Competition in 2017. The competition challenges postgraduate students to explain their research in under three minutes, without using scientific jargon.

Dr Tang's PhD research is based on creating a more reliable and portable test for glaucoma patients to discover whether their field of vision is deteriorating. She continued a proud tradition of our students who have excelled at the 3MT competition in recent years.

To view Dr Tang's presentation, visit
www.cera.org.au/cera-highlights-from-2017/

COMMUNITY ENGAGEMENT AND PHILANTHROPY

Philanthropy is a fundamental source of support for the research community. With the funding environment growing tougher each year, many worthy projects would never get off the ground and many promising researchers would be forced to leave the laboratory for good, were it not for the generosity of donors.



ABOVE CERA supporter Mr Peter Sierakowski



ABOVE CERA staff member Ms Melanie Larizza participated in the 2017 Lions Ride for Sight

DIRECT MAIL APPEALS

Supporters responded positively to CERA's six direct mail appeals in 2017. A new initiative trialled in 2017 encouraged collaborative approaches such as matching gift arrangements, with excellent results.

9TH ANNUAL GERARD CROCK LECTURE

The 9th Annual Gerard Crock lecture was presented by Associate Professor Angus Turner. His inspiring talk, 'Eye care in the Wild West', drew on his experiences delivering eye care to remote and regional communities in Western Australia, and the associated challenges.

LIONS RIDE FOR SIGHT

Since its inception, the Lions Ride for Sight has raised a total of \$500,000 for CERA's vision research. Professor Crowston, staff and students of CERA thank the Lions District 201V3, sponsors, riders and local Lions Clubs for their generosity and ongoing support.

FEDERAL HEALTH MINISTER GREG HUNT VISITED CERA

Federal Health Minister Greg Hunt MP visited in November 2017 to hear more about Professor Robyn Guymer's research into web and game-based apps for monitoring disease progression, along with cutting edge retinal analysis techniques to improve diagnosis and treatment of age-



ABOVE Dr Peter van Wijngaarden, CERA Chair Mr Peter Nankivell, Prof Robyn Guymer AM, Minister Greg Hunt MP

related macular degeneration (AMD). This work has the potential to dramatically improve outcomes for AMD patients while saving millions of dollars from the health budget.

BE PART OF THE CERA COMMUNITY

If you would like to know more about supporting CERA and making a real difference to people with vision loss and blindness, please contact the External Relations team on **+61 3 9929 8360**

At a glance



\$375,000 received from annual appeals



\$3.5 million single bequest helped enable the creation of the CERA Innovation Fund



\$60,000 raised by 2017 Lions Ride for Sight

THROUGH THEIR EYES: MEET CERA SUPPORTERS DAVID AND MARGARET KNIGHT

“ I have nothing but the utmost respect and gratitude to the researchers for what they do. ”



ABOVE CERA supporters Margaret and David Knight

David and Margaret Knight have been supporting CERA since 1998. They first became interested in eye research when David's mother developed age-related macular degeneration (AMD) and sadly, went blind.

Several years ago, the Knights began attending CERA's regular community information forums. "We're so fortunate to have the opportunity to hear first-hand about the amazing research into not only AMD, but glaucoma, stem cells and diabetic eye disease too. The researchers always take the time to explain their work so that non-scientists can understand it. We began to realise that not only was this work very interesting, it was also incredibly important," said David.

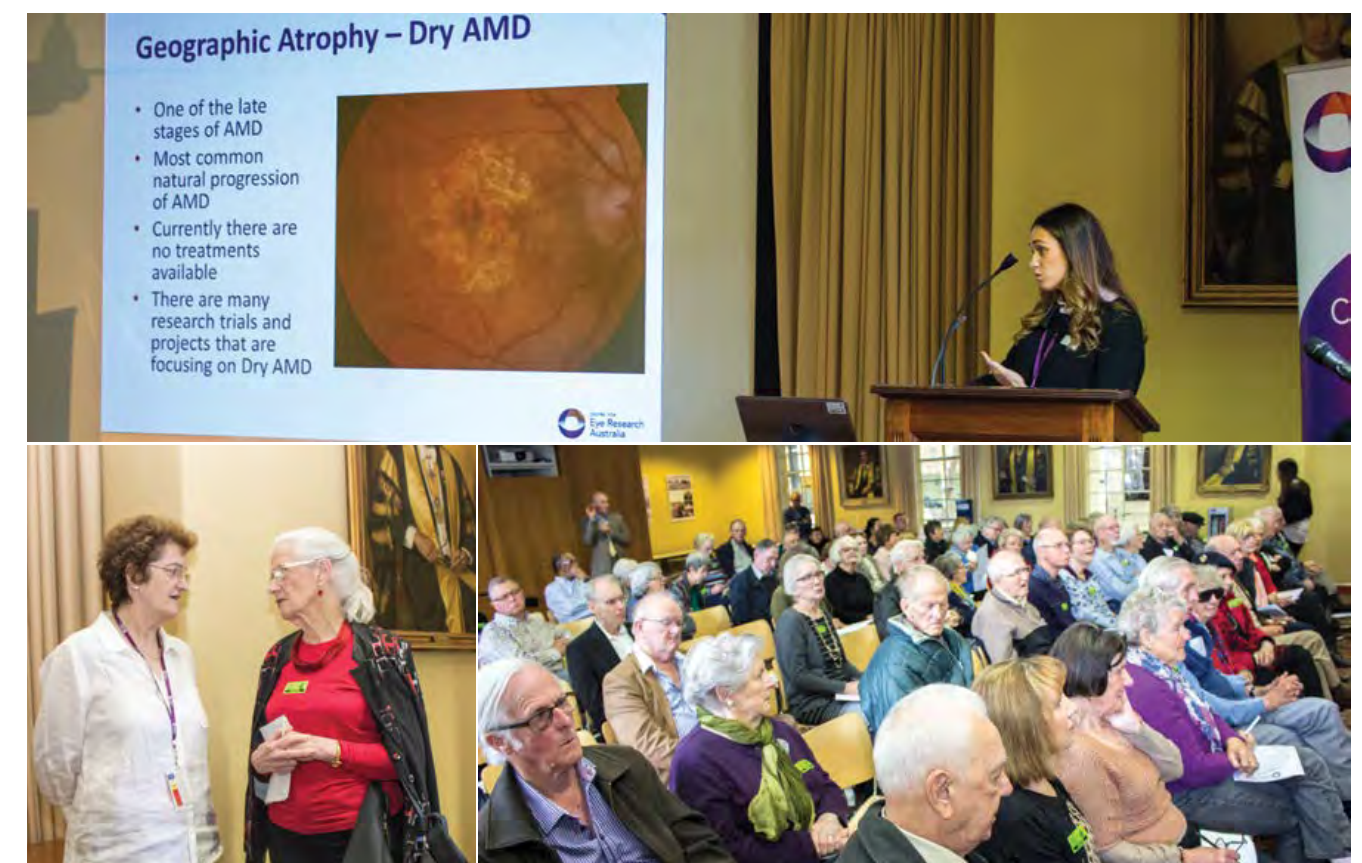
2017 marked the 7th Annual CERA Scientific Exchange and Awards. "It's a chance for regular supporters like us to get up close and personal with a wide variety of eye researchers — and every one of them is doing

amazing work," said Margaret. Guests were also given a glimpse into the culture and sense of community at CERA, with the awards presented to staff and students recognising: 10–25 years of service milestones; outstanding achievements; and contributions over the past year.

For the first time, the award categories focused on the CERA values of unity, agility, integrity and making a difference. For a full list of the award recipients please visit www.cera.org.au/events/2017-scientific-exchange

It is clear that David and Margaret are committed members of the CERA community.

"I have nothing but the utmost respect and gratitude to the researchers for what they do and I encourage everyone to get behind these people and show your support. Big or small, all donations are appreciated and we have seen first-hand that your money will be put to good use," said David.



ABOVE (T): David and Margaret attended the CERA AMD community forum in 2017 (BL): Prof Robyn Guymer speaking with a guest. (BR): Guests at the forum



ABOVE Dr Hitesh Peshavariya

VALE DR HITESH PESHAVARIYA

One of CERA's brightest up-and-coming researchers, Dr Hitesh Peshavariya passed away suddenly on Saturday 7 October, 2017, to the immense shock and sadness of his family, friends and workmates in Australia and overseas.

Principal Researcher and Head of the Oxidant Signalling group, Dr Peshavariya was a biochemist with over 15 years' experience in the fields of biochemistry, cellular and molecular biology and pharmacology.

He joined CERA in 2011, working with his mentor Professor Greg Dusting to establish CERA's Cytoprotection Pharmacology unit. In 2016, he was awarded a prestigious National Health and Medical Research Council (NHMRC) Project Grant to investigate a non-cytotoxic approach to reducing ocular fibrosis following glaucoma surgery.

This led to the establishment of an independent research group and Dr Peshavariya was appointed its Principal Investigator.

Although he began his research career studying oxidant signalling in the brain and heart, Dr Peshavariya found a new passion at CERA looking at the impact of oxidative stress in the eye. In particular, he was researching a way to prevent scar formation in the eye after glaucoma surgery and a potential role for 'good' HDL cholesterol in protecting against age-related macular degeneration.

PROFESSOR GREG DUSTING REFLECTED ON HIS 13-YEAR COLLABORATION WITH HITESH:

After arriving in Australia, Hitesh came to see me at the Florey with some data in hand, looking to start a PhD. We continued to work together at the O'Brien Institute, and then CERA from 2011 onwards.

Hitesh's death is a great loss, his career was right on the threshold, in fact he had just crossed it. He was not just generating new ideas but was translating them into successful grant applications and had interest from commercial partners as well.

It's a tough road for young researchers but he managed to find funding to keep himself going. He was very sharp in lots of ways. I knew when he was coming to me with a new idea because he would always have a cheeky look on his face and would sit down and start chattering away. He was a great guy and his family and friends know that. I would say he was one of the best in the business.

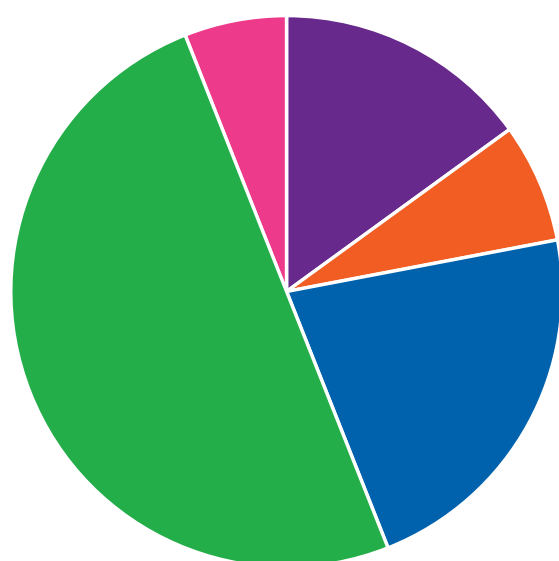


ABOVE Dr Hitesh Peshavariya and Professor Greg Dusting

ABRIDGED AUDITED FINANCIAL STATEMENTS

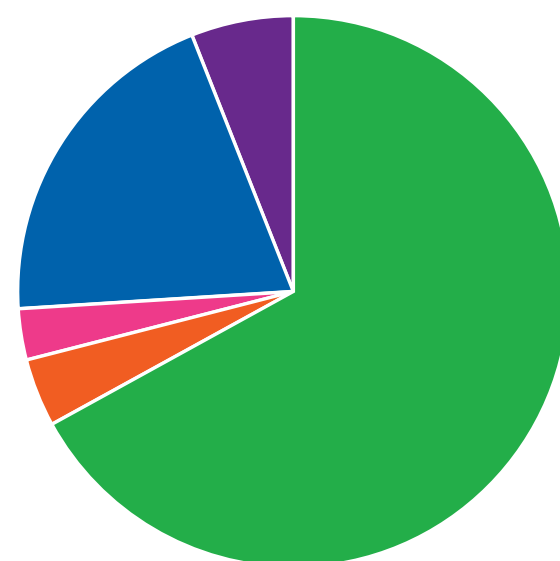
*The Centre for Eye Research Australia (ABN 72 076 481 984)
for the year ended 31 December 2017.*

OPERATING INCOME 2017



OPERATING INCOME 2017	%
Federal Government Grants	15%
State Government Grants	7%
Clinical Trials/Research Contracts	22%
Donations/Bequests/Research Foundations	50%
Other income	6%
Total	100%

OPERATING EXPENSES 2017



OPERATING EXPENSES 2017	%
Research and Laboratory Expenditure	67%
Depreciation	4%
Building/Facilities Expenditure	3%
Administration	20%
Other	6%
Total	100%

STATEMENT OF COMPREHENSIVE INCOME

Revenue

	2017	2016 ii
Federal Government	2,836,411	4,405,969
State Government iii	1,282,524	950,882
Charitable contributions and Other Income	14,400,028	12,063,116
Total Revenue from operating activities	18,518,963	17,419,967
Less Expenditure on operating activities	17,370,401	18,276,591
Surplus/(Deficit) on operating activities	1,148,562	(856,624)
Net Financial Income	692,178	499,784
Capital Grant	0	0
Net Surplus/(Deficit) iv	1,840,740	(356,840)

STATEMENT OF FINANCIAL POSITION

Current Assets	2,708,729	3,819,693
Non-Current Assets	11,250,102	7,697,713
Total Assets	13,958,831	11,517,406
Current Liabilities		
Trade and other payables	3,411,418	3,673,818
Employee Benefits	1,249,647	1,281,770
Total Current Liabilities	4,661,065	4,955,588
Non Current Liabilities	138,623	155,480
Total Liabilities	4,799,688	5,111,068
Net Assets	9,159,143	6,406,338
Reserves	9,159,143	6,406,338
Total Equity	9,159,143	6,406,338

CERA AND ITS CONTROLLED ENTITY — CONSOLIDATED EQUITY

CERA Reserves v	9,159,143
CERA Foundation Corpus vi	12,177,126
Total	21,336,269

- These abridged audited financial statements have been extracted from the full audited financial statements for CERA; and for CERA and its controlled entity CERA Foundation (the consolidated statements) which include more detailed disclosures. Full copies may be extracted from the ACNC (Australian Charities and Not-for-profits Commission) website.
- There were several adjustments to prior year retained earnings that were not reflected in the original 2016 figures.
- CERA receives Operational Infrastructure Support from the Victorian Government.
- The year resulted in a surplus of \$1,840,740 for CERA Ltd (unconsolidated).
- CERA operates as a not-for-profit organisation. Accordingly, prior years' accumulated surpluses are held as reserves to support future research projects and operations.
- The Reserves, or corpus of the CERA Foundation are held for future grants for ophthalmology research and strategic plan needs of CERA. As a Public Ancillary Fund, a minimum of 4% of prior year net assets must be paid out by CERA Foundation each year.