



CENTRE FOR
Eye Research
Australia



INNOVATION

Annual
Report

2015

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Abridged audited financial statement



VISION STATEMENT

To save sight and change lives through research that matters.

MISSION STATEMENT

We are leading the way in innovative eye research that makes a difference in people's lives.

2015 AT A GLANCE

Research

12 research commercialisation projects



192 research papers published



34 competitive grants totalling over

19 clinical trials



\$4.8 million



Education & community



SUCCESSFUL EVENTS

- ★ 4 community information forums attended by 300+ guests
- ★ CERA Scientific Exchange
- ★ Annual Gerard Crock Lecture



7 students graduated with post-graduate degrees



315 LinkedIn connections



3,173 Facebook followers



370 Twitter followers

Philanthropy



1,442 donors gave \$1,885,935 to save sight and change lives

THANK YOU!



11 people left a gift for CERA in their will



Operations



Royal Victorian Eye and Ear Hospital

30

CERA researchers moved into our new campus within Baker IDI



Baker IDI

135 staff
18 students

Restructure of executive team to increase our focus on research commercialisation & mentoring/development



Prof Jonathan Crowston and Mr Peter Nankivell

CHAIR AND MANAGING DIRECTOR'S REPORT

Many people assume that science is the realm of logic and reason – not creativity and imagination – however at the Centre for Eye Research Australia (CERA), we believe creativity is fundamental to discovery.

Creativity means stretching your mind to imagine new ways to tackle old problems. It means looking at things from a different perspective, in a way that no one else has done before. It's looking at a blank sheet of paper, and seeing endless possibilities; a star, a plane, an elephant!

But creativity alone is not enough to enact change; to make an impact. In order for our research to make a real difference in people's lives, we need to harness our creativity and turn our ideas into reality. How do we do this? Through innovation.

We are proud to showcase inspiring examples of innovation at CERA in this report. Like Assoc. Prof Alex Hewitt, who is using gene-editing technology to prevent inherited retinal dystrophies.

Or Assoc. Prof Wilson Heriot, who developed a new technique called 'retinal thermofusion.' This is the first significant change in the method of sealing retinal tears in a century. Or Assoc. Prof Mark Daniell, who is using tissue engineering to reconstruct damaged corneas.

Not only are our researchers conducting innovative research in the laboratory, they are also leading the way in a new style of research, one that incorporates partnerships and collaborations with industry and other stakeholders.

For our research to truly make an impact, it must translate into better healthcare practice or policy. Major programs such as the National Eye Health Survey, led by Dr Mohamed Dirani in partnership with Vision 2020 Australia, have the capacity to be game-changers by informing health policy in Australia over the next decade.

Innovation is central to CERA's strategic direction, and this was clearly evident during the organisation restructure of 2015. With an increased focus on commercialising our research and diversifying funding streams, we welcomed three new members to our executive team; Dr Melissa Knight (Head of Business Development and Partnerships), Prof Darren Kelly (Head of Strategy and Mentoring) and Ms Jacinta Mackey (Head of Finance and Business Excellence).

These new positions, along with the promotion of Ms Julie Todaro to Head of People Development and Dr Ann Du to Grants and Research Portfolio Manager, form a leadership team to drive CERA's strategic development. The team also includes CERA Deputy Director Prof Robyn Guymer and three representatives from research; Prof Paul Baird (Lead – Education), Dr Mohamed Dirani (Lead – Translation and Funding) and Dr Peter van Wijngaarden (Lead – Scientific Excellence).

Another significant change in 2015 was the relocation of several research teams to a new purpose-built laboratory space within the Baker IDI Heart and Diabetes Institute premises in Melbourne. Coordination of the move was managed by Research Support staff and the

scientists are enjoying the state-of-the-art facilities and spacious accommodation, as well as the opportunity to collaborate with their peers at the Baker IDI.

Meanwhile, renovations at the Royal Victorian Eye and Ear Hospital continued to progress in 2015. It is hoped that Research Support, Clinical Trials and Behavioural Research staff will be relocated to our newly refurbished premises in late 2016. We are grateful to the Hospital and the Faculty of Medicine, Dentistry and Health Sciences at the University of Melbourne for their ongoing work in driving upgrades to our research and training facilities.

Amidst an increasingly tough funding environment, CERA continued to perform well, securing nearly \$5 million in competitive funding in 2015. Despite this excellent result, we continue to rely heavily on alternative funding sources, in particular philanthropy.

Donations to the Eye Research Australia Foundation directly support the sight-saving work of our talented CERA researchers. We would like to take this opportunity to extend our heartfelt gratitude to the private donors, estates, trusts and foundations who supported eye research in 2015 which made this amazing work possible.

Peter Nankivell

Jonathan Crowston

P.S On 1 July 2015, Her Excellency the Hon Linda Dessau AM became the first female Governor of Victoria and patron of CERA. We are honoured to have Her Excellency take on this important role in the CERA community.

“ Creativity is thinking up new things, innovation is doing new things. ”

CERA BOARD AND COMMITTEES



CERA Board

Back row L-R: Ms Christine Edwards, Dr Malcolm Brown, Prof Terry Nolan AO, Prof Robert Williamson AO, Prof Jonathan Crowston, Mr Peter Larsen, Ms Brigitte Smith.

Front row L-R: Mr James Joughin, Ms Olivia Hilton, Mr Peter Nankivell (Chair)

Absent: Mr Alfred Hawken

In 2015, we farewelled long-standing Board members Prof Terry Nolan AO and Mr Alfred Hawken. We are very grateful to them for their years of dedicated service. We also welcomed two new Board members; Ms Brigitte Smith and Ms Christine Edwards.

Committees

Finance and Risk Committee

The Finance and Risk Committee, which reports to the Board, reviews the financial planning and management of the company, financial reporting and statutory compliance obligations, and oversees risk management, investments and commercialisation activities.

Chaired by Treasurer Mr James Joughin, the committee included Mr Peter Nankivell, Mr Peter Larsen and Prof Jonathan Crowston. The committee met six times in 2015.

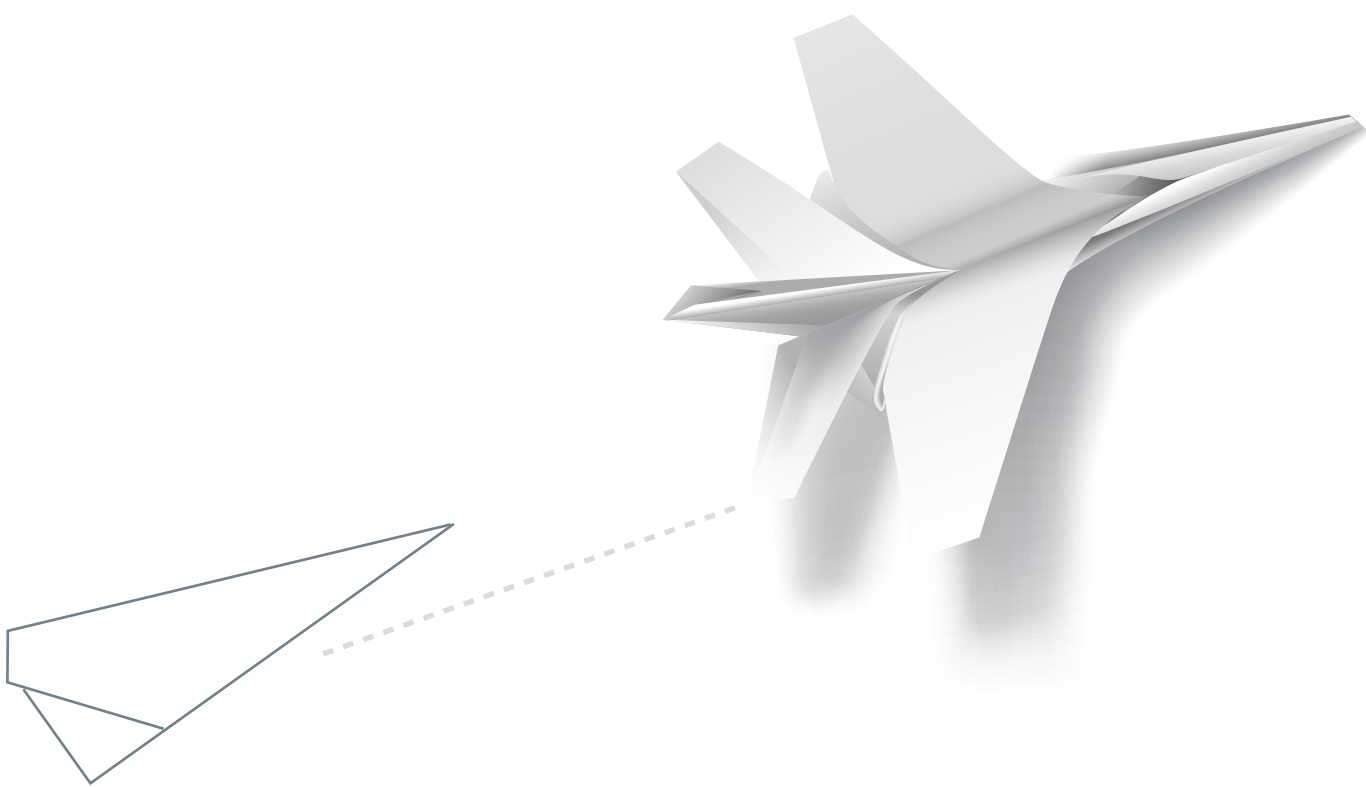
Nominations and Appointments Committee

The Nominations and Appointments Committee advises on succession planning and new appointments to the Board, senior researchers and senior management staff.

The committee was chaired by Mr Peter Nankivell and its members were Mr James Joughin, Prof Terry Nolan AO and Prof Jonathan Crowston. The committee met three times in 2015.

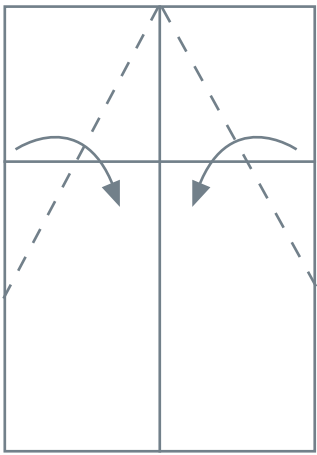
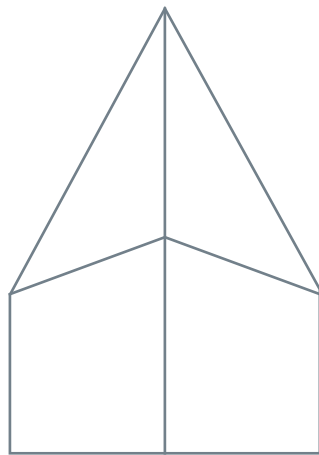
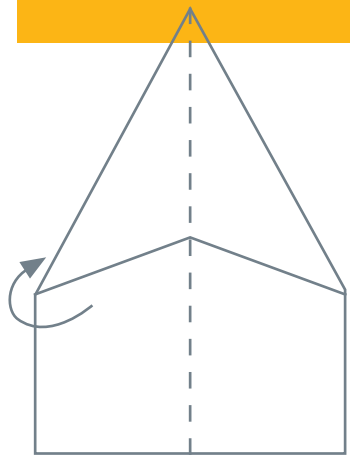
Research Advisory Committee

This committee is chaired by Prof Robert Williamson AO and its members are Prof Mark Cook, Dr Mirella Dottori, Prof John Hopper AM, Prof Terry Nolan AO, Dr Michelle Dunstone, Dr Ehud Zamir and Prof Jonathan Crowston. The role of the committee includes critical review of the company's research plans and evaluation of research results. The committee met once in 2015.



INNOVATION

in action



INNOVATION HUB: 'A ROOM OF ONE'S OWN' FOR INNOVATORS



In 2015, Prof Darren Kelly and Dr Melissa Knight were charged with the development of CERA's 'Innovation Hub' to support and inspire researchers to think innovatively. Both a physical and virtual space, the Innovation Hub will be a valuable resource for CERA researchers to collaborate and bounce ideas of each other.

"The Innovation Hub is a space where staff and students from different disciplines can work together to solve the most challenging problems," said Dr Knight. "We believe conducting ambitious - even audacious - research is what will separate CERA from our competitors."

EYE RESEARCH AUSTRALIA FOUNDATION INNOVATIVE SEED FUNDING

Prof Jonathan Crowston and Dr Ann Du initiated a process among CERA researchers late in 2014 to develop research proposals for early stage, innovative projects that would not be able to receive competitive funding from government grant schemes. In 2015, two prospective single-year grants of \$75,000 each from the Eye Research Australia Foundation were offered.

The grants were awarded to two exciting new projects:

In vivo editing to correct inherited eye disease
(Prof Jonathan Crowston, Assoc. Prof Alice Pébay, Assoc. Prof Alex Hewitt, Dr Sandy Hung, Dr Vicki Chrysostomou, Dr Raymond Wong)

This collaborative project between glaucoma and stem cell researchers involves editing mouse genomes *in vivo* using a process called CRISPR/Cas9. The researchers have shown that they are able to successfully edit the animals' retinal cells, which provides hope that gene

editing may be a potential therapy for treating inherited retinal diseases in humans.

Reconstituted high density lipoprotein as a potential treatment for age-related macular degeneration
(Assoc. Prof Chi Luu, Dr Hitesh Peshavariya, Prof Robyn Guymer)

Reconstituted high-density lipoprotein (rHDL) mimics the effect of HDL ('good cholesterol') in protecting against cardiovascular disease. Now, CERA researchers are examining its effects on Age-related Macular Degeneration in an animal model, which could potentially lead to a new treatment option for humans. The team has completed the experimental work and the initial findings are promising.



BETTER THAN A LETTER: INTRODUCING OCULO™

Oculo™, CERA's first spin-off company, was formed in 2015 to develop a secure-messaging service to facilitate better communication between optometrists and ophthalmologists.

The brainchild of CERA Managing Director Prof Jonathan Crowston and CERA Director Mr Peter Larsen, the Oculo system improves patient outcomes by centralising patient medical histories, ocular examination results and clinical imagery. It also aims to deepen professional networks and develop a stronger patient-focussed community of practice among eye care professionals.

"In my work as an ophthalmologist, I know that patients sometimes do not receive the optimal continuity of care when their eye care professionals rely on handwritten letters and faxes to send clinical information," said Prof Crowston.

Prof Crowston said that the technology was developed with input from both ophthalmologists and optometrists to ensure the Oculo system meets their needs. "The team has invested thousands of hours to develop privacy and data security controls that mean that

correspondence by Oculo is indeed better than a letter, and so much more," Prof Crowston said. It has intelligent prompts and other features to enhance the quality of referrals and to create a shared eye e-health record," he said.

Oculo was developed in collaboration with Specsavers, Luxottica, and Bupa Optical. Oculo has now built clusters of ophthalmologists around these optometrists to create clinical networks, also reaching out to new corporate and independent optometrists.

Amongst Oculo's other early users is Assoc. Prof Angus Turner, Director of Lions' Outback Vision in Western Australia, who is trialling it for teleophthalmology with Specsavers, OPSM, and Laubman and Pank sites in Albany, Kalgoorlie and Karratha.

"We are already seeing the difference Oculo can make for patients based in rural and regional areas. It means ophthalmologists can access quality information from across the country to provide more timely, better-informed care," Assoc. Prof Turner said.



RETINAL THERMOFUSION: BREAKTHROUGH OF THE YEAR



Assoc. Prof Wilson Heriot

For Assoc. Prof Wilson Heriot, his most significant achievement in the last 12 months has been publication of his method of 'retinal thermofusion' with histologic verification of its effectiveness.

"The process of thermofusion is the first significant change in the method of sealing retinal tears to cure retinal detachment in 100 years," said Assoc. Prof Heriot.

"It is based on simple physiological principles that enable instant fusing between the retina and the underlying tissue to make the tear margin waterproof, thus simplifying retinal detachment repair and speeding recovery."

Traditional retinal reattachment surgery involves inflammation of the retina and the cells underneath it (retinal pigment epithelium) with laser or freezing and 'clamping' these two tissues together.

The new thermofusion technique dehydrates the subretinal space to induce direct contact between the retina and the retinal pigment epithelium. Thermal coagulation is then used to form an instant bond and prevent further fluid entry into the space.

Effectively, the tear boundary is 'spot welded' to the underlying tissue. Assoc. Prof Heriot and his partners at medical device company Ingeneus, believe thermofusion will result in reduced surgical time, less intraoperative complications and less inconvenience compared to traditional repair surgery.

Ingeneus was involved in the initial construction of a control box for the technology designed by Assoc. Prof Heriot, supported by a Victorian Government Technology Voucher Program grant.

National Phase patents have been filed in the US and Australia titled 'Method and device for treating retinal detachment'. There will be further preliminary patents filed during the product's development, with the aim to capture the European market.



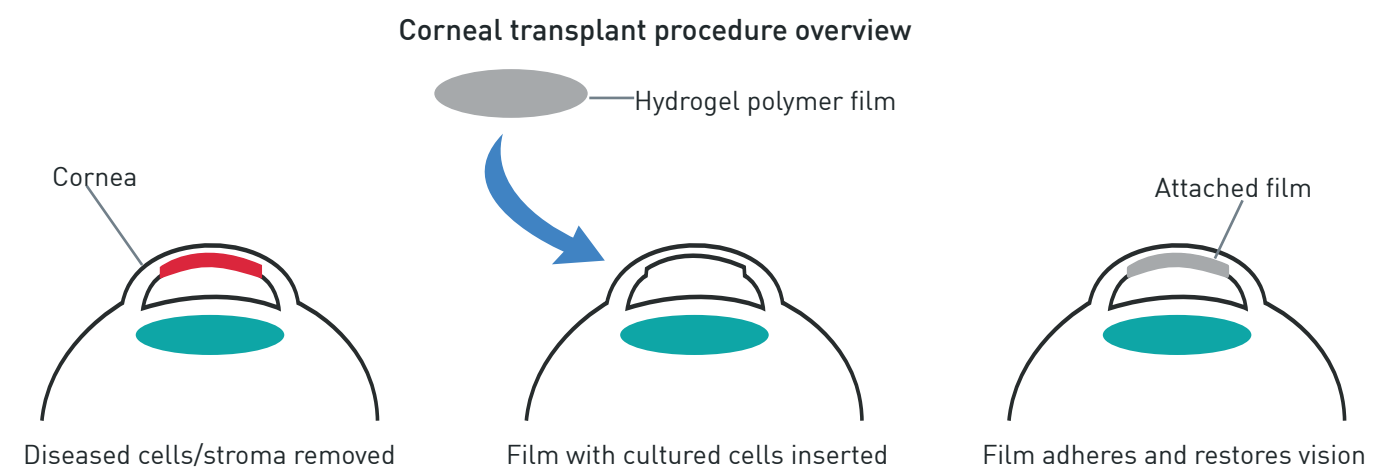
TISSUE-ENGINEERING A CORNEA

Damage to the thin outer layer of the eye called the cornea leads to loss of transparency and impaired vision. Currently the only treatment option is a full or partial corneal transplant to replace the damaged tissue. Donor tissue is not widely available in the developing world and in some developed countries, such as Japan, for cultural reasons. There is also a risk of graft failure from rejection, as well as transmission of infection from the donor.

Assoc. Prof Mark Daniell and Dr Karl Brown are working closely with biomolecular and chemical engineering researchers from the University of Melbourne to develop a tissue-engineered corneal transplant that could ultimately be used to replace the need for a donor cornea.

Prof Greg Qiao and his team developed an ultrathin synthetic hydrogel polymer film which Assoc. Prof Daniell used as a scaffold for growing a new corneal endothelial layer. The new corneal endothelium can be grown from either a patient's own remaining healthy cells, or a donor's cells, and then the film containing the new corneal endothelium is surgically implanted.

Assoc. Prof Daniell and his team have produced promising proof-of-principle results and will proceed with further pre-clinical work in 2016, ultimately leading to patient trials in the near future.



TELEOPHTHALMOLOGY: BRINGING EYE CARE TO ALL AUSTRALIANS

In a country as vast as Australia, access to specialist eye care is not always readily available. To solve this problem, CERA researcher Assoc. Prof Michael Coote is exploring 'teleophthalmology' as a means to deliver eye care to people in regional and remote locations.

With support from the government, industry (medical device company Ingeneus) and the Royal Victorian Eye and Ear Hospital, Assoc. Prof Coote developed the eyeConnect device, a remote ophthalmic diagnostic system. The device can be operated by primary health care staff (such as nurses, GPs and pharmacists) and can record acuity test information, high resolution white

light photographs and corneal fluorescein photographs. This information is transmitted online to a specialist who reviews the information and communicates instructions regarding follow-up treatment or screening.

Assoc. Prof Coote also developed a disposable tonometer, the first of its kind in the world. The disposable tonometer is not designed to replace the current gold-standard Goldmann tonometer, but rather it offers a cheaper and more readily available alternative which will be better suited to developing countries and remote and regional locations.



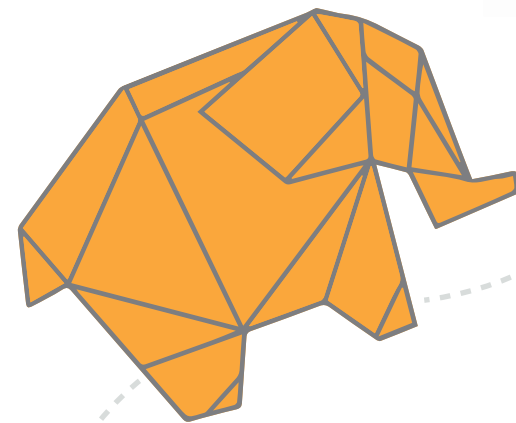
Dr Eva Fenwick

MEASURING 'QUALITY OF LIFE' WITH AN ADAPTIVE QUESTIONNAIRE

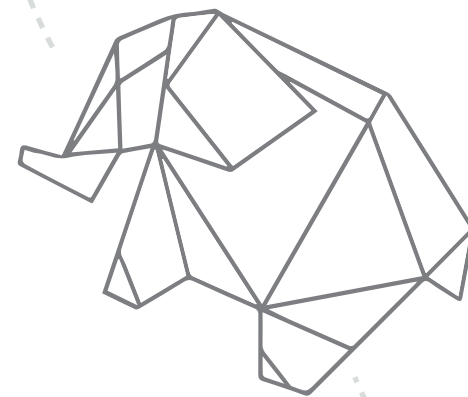
Dr Eva Fenwick is developing computer adaptive software to validate a tool she created to measure 'quality of life' in people with Diabetic Retinopathy (DR). Dr Fenwick produced the tool (called an item bank) as part of her PhD research to capture all the ways that DR can impact a person's life. The comprehensive questionnaire is however lengthy to administer and data entry and analysis is time-consuming.

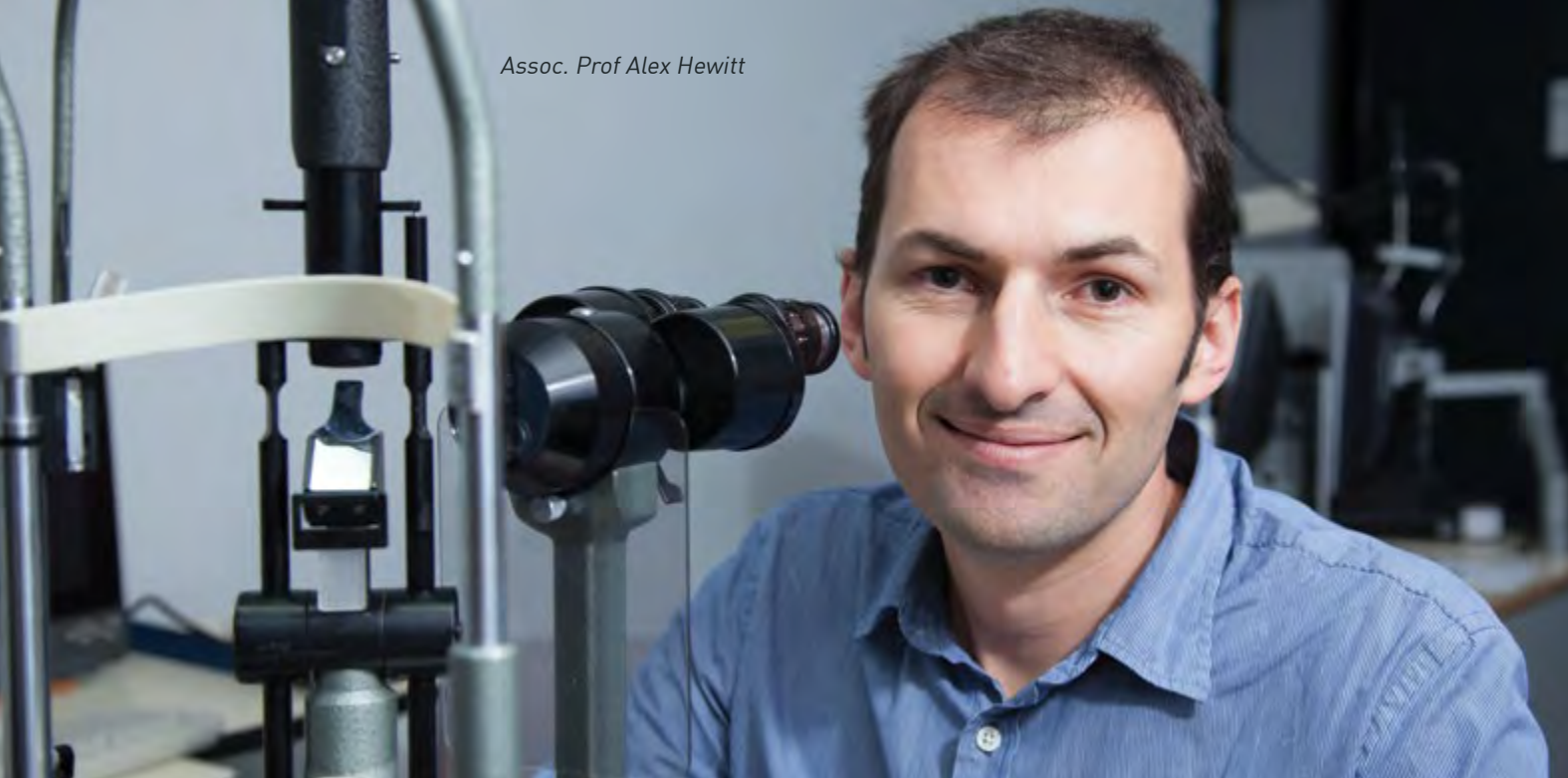
Now, Dr Fenwick is using computer adaptive technology to administer the questions, whereby the computer tailors the questions based on the person's previous answers. This means that instead of answering 300 questions, a person may only have to answer 10-20 questions for the computer to get an accurate and precise measurement of quality of life.

"Because there are so many new treatments coming out for DR, we really need a good tool that can assess their impact from the person's perspective," said Dr Fenwick. "This adaptive software will provide a quick yet detailed picture of the person's experience of DR and treatments, as well as making data collection more efficient and reducing burden on the participant."



RE SEARCH with impact





REWRITING OUR GENETIC CODE TO PREVENT EYE DISEASE

"It's not enough to just find new genes causing inherited diseases, we need to start fixing them." Assoc. Prof Alex Hewitt

Imagine taking a pair of biological scissors to your genetic code, snipping out the parts you don't want, (for example, a faulty sequence that codes for inherited eye disease), and then pasting in new correct genetic information. Although it sounds like science-fiction, this technology is already available and it is causing researchers to rethink the way they tackle inherited diseases.

The process is called 'gene editing' and it uses a naturally occurring phenomenon known as CRISPR/Cas to effectively cut and paste DNA inside living cells. Based on an immune response in bacteria, CRISPR/Cas9 (the most well-known version) has been used to edit the genomes of a variety of organisms including yeast, zebrafish, fruit flies, plants, mice, monkeys and most recently, human embryos.

Assoc. Prof Alex Hewitt believes CRISPR-based technology is the next great weapon against inherited eye diseases, such as retinal dystrophies. Along with colleagues Dr Sandy Hung, Dr Vicki Chrysostomou and Dr Rick Liu, Assoc. Prof Hewitt successfully edited retinal cells in a transgenic mouse model. "We've recently shown that we can accurately edit the genes in the eye of a mouse, so our next aim is to bring this technology to the clinic."

Gene editing is considered more precise and effective than gene therapy. Unlike gene therapy which involves

increasing the expression of a gene, gene editing actually fixes the 'typo' in the genetic code. The easiest way to do this is to simply 'whiteout' or delete the offending section but Assoc. Prof Hewitt and his team want to go one step further and correct the 'spelling mistake', so that the gene does what it is supposed to do.

Assoc. Prof Hewitt describes this approach as 'anticipatory medicine', meaning that it is useful for preventing eye disease before the damage occurs. It will not replace therapies for established eye disease, or devices that restore vision, such as the Bionic Eye, however it does offer hope to the thousands of people affected by inherited retinal dystrophies, which are now the leading cause of blindness in working age individuals in the UK. There are currently no effective treatments for retinal dystrophies, which strike people from early childhood to middle-age. CRISPR-based technology could also be adapted to work for other eye diseases, such as Age-related Macular Degeneration or glaucoma.

Given the far-reaching applications of this technology, and alarm over 'designer babies' and genetically-modified food, Assoc. Prof Hewitt and his team were interested to investigate public opinion on gene editing for medical purposes. They surveyed 12,000 people worldwide for their opinions on gene editing and will report the preliminary results of this study in 2016.

NASA-INSPIRED CAMERA TO DETECT RETINAL DISEASE

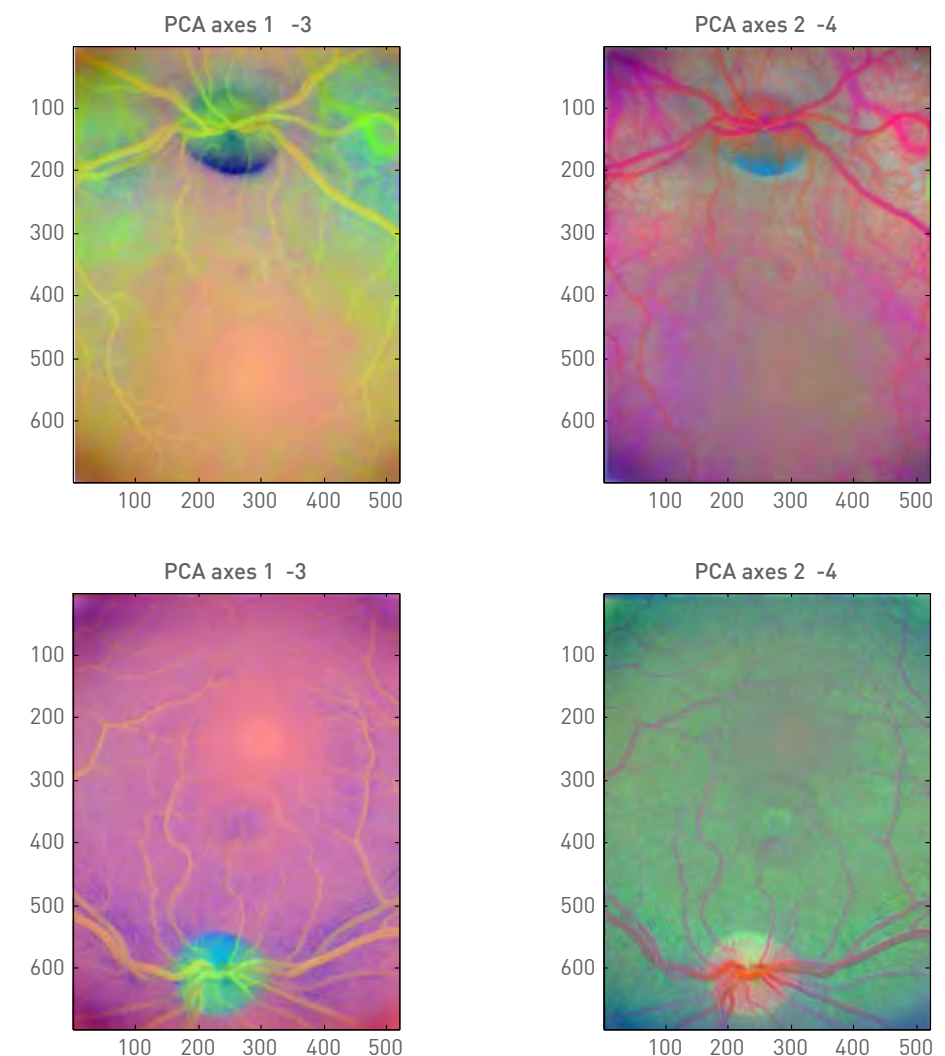
A camera inspired by NASA's remote sensing satellites will be arriving at CERA soon to help researchers see the retina like never before.

Drs Peter van Wijngaarden, Xavier Hadoux and Marc Sarossy are soon to test a novel form of retinal imaging called hyperspectral imaging. Unlike a standard retinal image which is made up of three different coloured wavelengths (red, green and blue), this new technology can image hundreds of wavelengths of coloured light, providing researchers with a lot more information about the composition of the retina.

"We will use the camera to image a wide range of eye diseases with a view to finding unique imaging features that can be used to assist in their diagnosis," said Dr van Wijngaarden. "In addition, we will explore the potential of the technology to detect retinal changes in people with Alzheimer's disease."

Emerging evidence suggests that amyloid-beta, a protein implicated in Alzheimer's disease, accumulates in the retina and that it may be possible to detect retinal amyloid-beta with the new imaging approach. If proven correct, the technique may provide useful insights into the onset and progression of Alzheimer's disease and potentially provide a non-invasive means of monitoring the response to therapy.

"The application of this technology to the eye is highly innovative and we will be one of the first research groups in the world to do so. We are very grateful to the Yulgilbar Foundation and the Joan Margaret Ponting Charitable Trust for supporting this ground-breaking research," said Dr van Wijngaarden.



Highlighting new retinal features using hyperspectral images. Image courtesy of Dr Xavier Hadoux.

RESCUING OPTIC NERVE CELLS

Glaucoma is the leading cause of irreversible blindness in Australia and is characterised by gradual loss of peripheral vision. Prof Jonathan Crowston and the glaucoma researchers are tackling an area of glaucoma research that has been largely ignored – until now.

The researchers have discovered that while some optic nerve cells in glaucoma get sick and die, others get sick or injured but can be restored and the patient's vision is maintained. "You only need approximately 20-30% of your optic nerves cells functioning relatively well and you can lead a pretty normal life," explained Prof Crowston.

Drs Eamonn Fahy and Lewis Fry have uncovered key new information on the cellular characteristics of injured and recovering retinal ganglion cells (optic nerve cells).

"By studying these cells that are potentially recoverable, we hope to identify biomarkers that will allow us to identify changes in the optic nerve that are evident long before any changes to vision," said Prof Crowston.

This would give researchers the ability to fast-track clinical trials for glaucoma treatments, by designing experiments that could be run over the course of 3-6 months, as opposed to 5-10 years.

"Our goal is to prove that the changes in the biomarkers are predictive of longer-term outcomes in glaucoma, identify one or two candidate interventions, and then run the clinical studies," said Prof Crowston.

Glaucoma researcher Dr Vicki Chrysostomou was the first to show the protective effect of exercise on the retinal ganglion cells. Researchers have already shown that exercise has a potent effect on protecting the optic nerve cells from dying. They are now investigating other factors associated with lower rates of glaucoma to see if they can be converted into treatments.

NOT JUST A FLAT BATTERY: IMPACT OF MITOCHONDRIAL DYSFUNCTION

A faulty gene that causes mitochondria – the batteries of the cell – to stop working has been implicated in a range of diseases associated with ageing, including glaucoma, Parkinson's disease and Alzheimer's disease. Dysfunctional mitochondria are also found in people with rarer genetic eye diseases, such as Leber's Hereditary Optic Neuropathy (LHON) and Autosomal Dominant Optic Atrophy.

Led by Assoc. Prof Ian Trounce, CERA's Mitochondria and Neurodegeneration researchers are investigating why in certain families with a history of LHON, one child may lose his or her vision but another may not, despite them both carrying the same faulty mitochondrial gene. "As LHON typically strikes young males, we hypothesise that there may be a protective effect from oestrogen," said Assoc. Prof Trounce.

His colleague Dr Isabel Lopez Sanchez is using a type of analysis called 'transcriptomics' to determine which genetic pathways are switched on and which are not in people who have managed to avoid the disease, despite carrying the gene.

The team is also collaborating with Prof Doug Wallace from the University of Pennsylvania to sequence mitochondrial DNA of Melbourne glaucoma patients. The project hopes to determine if there are clues in the mitochondrial DNA to suggest why primary open-angle glaucoma patients have lower mitochondrial activity.

Assoc. Prof Trounce's research into the crossover between Alzheimer's, Parkinson's and mitochondrial disease has attracted generous support from the DHB Foundation (Equity Trustees) and previously, the Michael J. Fox Foundation. With this support, Assoc. Prof Trounce has engineered a mouse with mitochondrial DNA from another species, creating a deliberate mismatch between mitochondrial DNA and nuclear DNA.

"As this mouse ages, it has Parkinson's-like symptoms," said Assoc. Prof Trounce. "So a small defect in one mitochondrial protein seems to have effects in both the optic nerve and brain."



EYE SPY A GOOD REASON TO PLAY OUTSIDE

"If we can delay the onset of myopia through a simple and cost-effective intervention like this, we can provide great long-term eye health benefits." Prof Mingguang He

Spending more time playing outside could protect children from short-sightedness as they grow up, according to a study published in the Journal of the American Medical Association by Prof Mingguang He, Head of Ophthalmic Epidemiology at CERA and the University of Melbourne.

Prof He examined the effect of 40 minutes of additional outside activity daily on the eyesight of Grade 1 primary school children in China. The children were monitored for three years and the researchers found that the extra time outdoors resulted in a 23% reduction in the incident rate of myopia (short-sightedness) compared to children who did not participate in any additional outdoor play time. The results were measured using annual cycloplegic refraction tests and examinations of the eye anatomy.

"This reduction is clinically important because we targeted young children around six years of age and these children are at greater risk of progressing to severe myopia if they develop myopia early," said Prof He.

Young adults in East and South East Asian countries are increasingly affected by myopia, with 80-90% of high school graduates diagnosed with the condition and 20% of these defined as high myopia (≤ -6 diopters). Not only does this mean they require correction for refractive error (glasses or contacts lenses), but they are also at risk of sight-threatening complications such as myopic macular degeneration later in life.



Prof He examines a child.

UNLOCKING THE GENETICS OF AMD, MYOPIA AND KERATOCONUS

Significant involvement in international collaborations was key to developing a better understanding of the genetics of three major eye diseases in 2015.

As part of the Consortium for Refractive Error and Myopia (CREAM), Prof Paul Baird looked at the interactions between genes and environment which contribute to the epidemic of myopia. "To date, 30 odd genetic variants for myopia have been discovered, however these explain less than 10% of myopia, hence we know there is something missing and some of this will be due to the environment" said Prof Baird. "This is typical of complex diseases."

On the other hand, the genetics of Age-related Macular Degeneration (AMD) are much better understood. Profs Baird and Robyn Guymer are both members of a consortium that identified new genes for AMD in 2015. In particular, they found that one gene could potentially offer a new target for AMD drugs.

"We now need to know more about this gene," said Prof Baird. "Where is it expressed? Why is it expressed? What is it doing? Is it involved in angiogenesis? If we can prove a biologically plausible pathway, we can proceed to developing a therapy (make it a drug target)."

Although an effective treatment for wet-AMD, anti-VEGF injections are expensive and due to being frequently administered, cause a large burden on hospital systems worldwide. This is why CERA researchers are searching for new AMD-related genes that might be involved in this pathway, as well as trying to gain a better understanding of the genes that we know already are involved.

Prof Baird and his team are also undertaking an extensive *Australian Study of Keratoconus* to better understand keratoconus and the role that genetic and environmental risk factors play in the disease and how disease progression can be better determined. To date, they have recruited 375 keratoconus patients and published several studies investigating genetic and clinical findings.

Recently they showed a significant association of asthma with an increased severity of keratoconus and the researchers are undertaking further investigation to see if these two conditions share any common genetic elements. They are also undertaking an analysis of the economic burden of the condition and using novel genetic techniques to identify causative genes for keratoconus.

STOPPING LEAKY BLOOD VESSEL GROWTH IN THE EYE USING GENE THERAPY

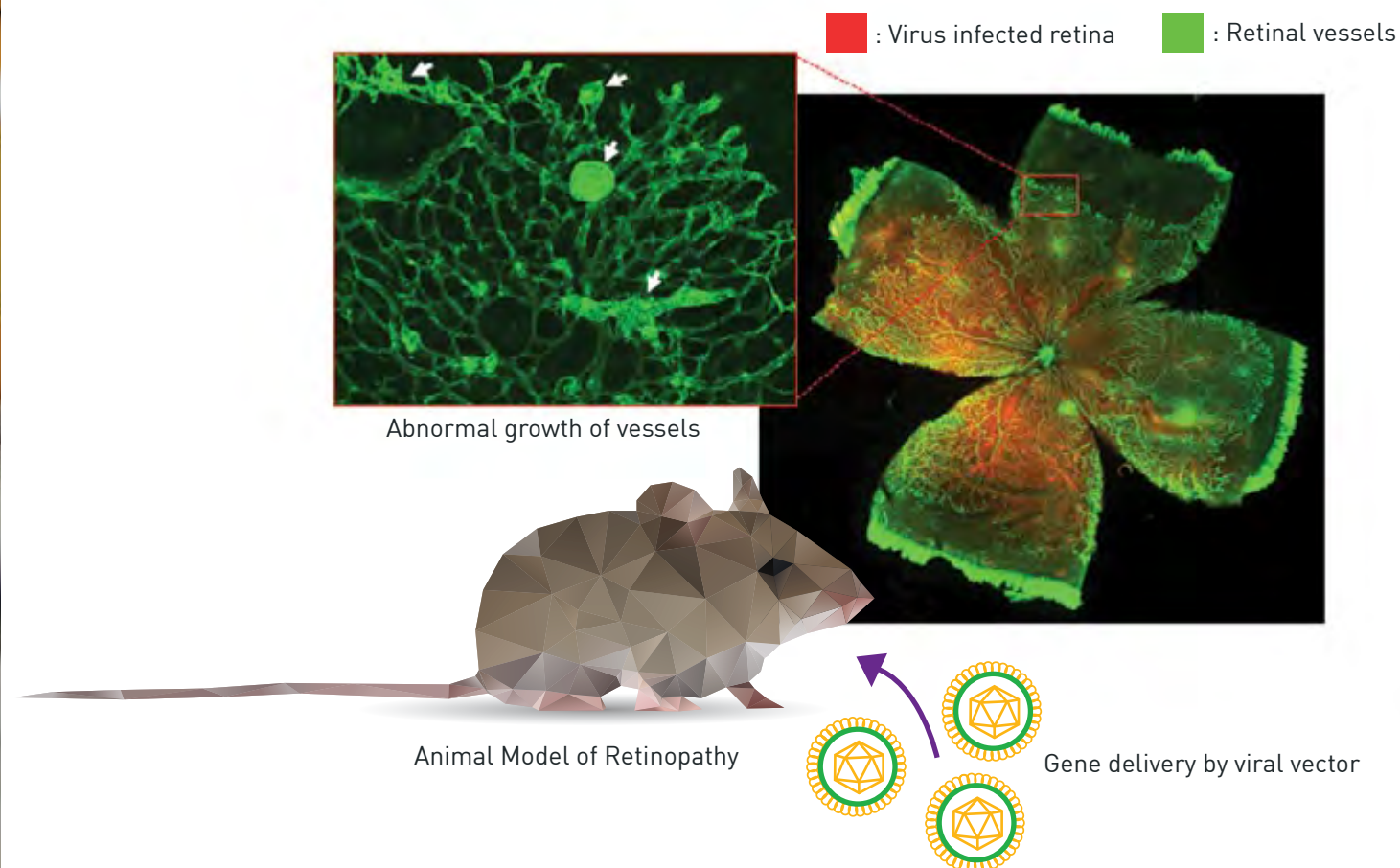
Growth of leaky blood vessels in the back of the eye is associated with excess Vascular Endothelial Growth Factor (VEGF) and leads to major eye diseases such as Age-related Macular Degeneration and Diabetic Retinopathy. These conditions are commonly treated with monthly anti-VEGF injections directly into the eye, but these are expensive, inconvenient and carry some risk. Prof Greg Dusting and his team are investigating new approaches to avoid these monthly injections by using gene therapy.

The team with Dr Rick Liu are investigating two main approaches. The first involves administering a new viral particle carrying a gene (which exists in the eye but is usually inactive) to reduce blood vessel growth. "This approach works on a different biological pathway to anti-VEGF, and if successful, it could help those patients

who don't respond to the standard treatment," said Dr Liu.

The second approach involves using a decoy receptor for VEGF, which binds to the molecule and destroys it, reducing the amount of VEGF in the eye and therefore reducing blood vessel growth. This strategy utilises gene delivery turned on by a common antibiotic drug, which can be taken orally. When a patient has excess VEGF in their retinal cells making blood vessels leaky, taking this drug could lower the level of VEGF and slow blood vessel growth.

"The concept of gene therapy that people have been pursuing for decades has really turned around recently" said Prof Greg Dusting. "We can now make gene therapy safer and more useful for treatment of these eye diseases."



Researchers deliver gene therapy via a viral vector into the eye of the animal. The virus drives a gene to reduce blood vessel growth.

CERA researchers with the stem cell robot (L-R):
Dr Helena Liang, Dr Duncan Crombie, Assoc. Prof Alice Pébay,
Assoc. Prof Alex Hewitt and Dr Raymond Wong.



STEM CELL ROBOT A SUCCESS

In 2014, CERA received a generous donation from the Joan and Peter Clemenger Trust to purchase an Automated Stem Cell Facility ('robot'), to generate stem cells on a large scale.

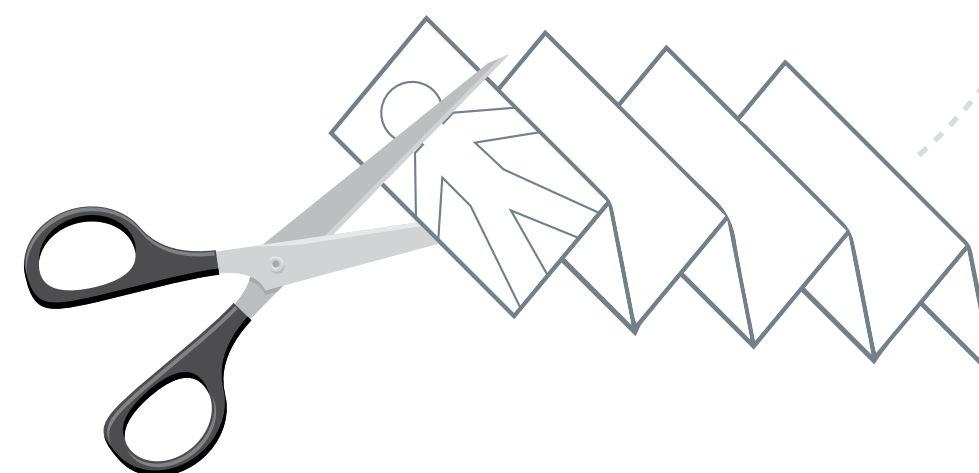
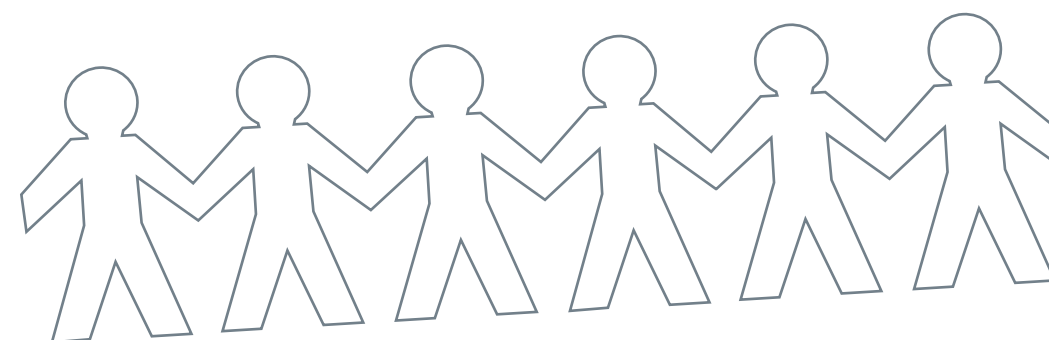
In 2015, the researchers used the robot to successfully generate cells for complex eye diseases, such as glaucoma and Age-related Macular Degeneration (AMD). Unlike simple genetic diseases caused by a single mutation, glaucoma and AMD have multiple genetic variations.

"For our research on these diseases to be significant, we need to generate stem cell lines for a large number of patients. This is where the robot has made the greatest impact, by reducing the amount of time our researchers need to spend cultivating cell lines," said Assoc. Prof Alice Pébay.

According to Assoc. Prof Pébay, the one drawback to the robot is that it is very expensive to operate; it costs \$50,000 to run the robot for six months. "We were very fortunate to receive a competitive grant from ORIA to help fund the robot's operating costs for six months, which has allowed us to take the next step in the generation of cells. CERA is now the 'place to go' when you want stem cells for eye research, and we are currently open to expressions of interest from other research groups who would like to access this facility."



PARTNERSHIPS



HEALTHCARE SECTOR



Located within the Royal Victorian Eye and Ear Hospital, CERA has always maintained a close working relationship with our hospital colleagues. In fact, many of our clinician-researchers also hold hospital appointments and many of our clinical trial patients are recruited through the hospital clinics. It is this symbiotic partnership that makes translation of research not only possible, but immediate.

IMPROVING OUTCOMES FOR PATIENTS AT THE ROYAL VICTORIAN EYE AND EAR HOSPITAL

Assoc. Prof Lyndell Lim heads CERA's Clinical Trials Research team and is lead investigator of the DIMECAT trial; a clinical trial which aims to determine how best to manage patients with Diabetic Macular Oedema (DMO) who are also facing cataract surgery.

"If we perform cataract surgery on these patients with no other intervention, their DMO gets worse and they experience poor outcomes," explained Assoc. Prof Lim. With the support of a Royal Victorian Eye and Ear Hospital research grant and funding from the Diabetes Australia Research Trust, Assoc. Prof Lim and her co-investigator Assoc. Prof Salmaan Qureshi set out to determine if administering anti-VEGF or steroids at the time of cataract surgery produced better outcomes for patients.

"The idea for the study came about because we couldn't agree on the best management for these patients, so we

decided to run a clinical trial and find out for sure," said Assoc. Prof Lim. Results from the pilot study showed that in the short-term at least, administering steroids gives a better outcome for patients. "This has important implications for service provision at the hospital because anti-VEGF injections need to be administered monthly, however steroids can be given every three months, which means less hospital visits and better efficiency for the clinic."

"The Eye and Ear hospital supports interesting and relevant research that has a direct result on their patients; so the DIMECAT study has been a very nice example of how the hospital and CERA can work together," she added.

The full results of the DIMECAT trial will be published in mid-2016.

CENTRALISED PLATFORM FOR CLINICAL TRIALS AT CERA

A major focus in 2015 for Assoc. Prof Lyndell Lim, Prof Robyn Guymer and their team was developing a centralised platform for clinical trials. This cohesive model requires involvement of a range of stakeholders, including CERA research teams - in particular the Macular Research team, the Royal Victorian Eye and Ear Hospital, the University of Melbourne, other research institutions and the hospital's Health and Research Ethics Committee to name a few.

The Clinical Trials Centre will include a centralised database to track all clinical trials patients' details and record their involvement across a variety of trials; important information that is not currently available to the researchers. This information is also valuable when attracting investors and sponsored clinical trials.

Logistically, this is a massive undertaking that Prof Guymer and Assoc. Prof Lim have together embarked upon. In this regard, they are both grateful for the support of Dr Helen Ormandy, our newly appointed Clinical Trials Centre Manager.

Dr Ormandy commenced in late 2015 and is driving the development of the Centre including creating Standard Operating Procedures, Good Clinical Practice Guidelines and electronic medical records. "Dr Ormandy has a strong industry and operational background, and has a skill set that complements my own, so it's a real boon that we've been able to bring her to CERA to drive this project forward," said Assoc. Prof Lim.

Assoc. Prof Lyndell Lim



GOVERNMENT AND EYE HEALTH SECTOR

AUSTRALIA'S EYE HEALTH IN FOCUS

- How many Australians have vision loss?
- Which areas are most in need of extra services?
- What will be the impact of vision loss and eye disease on our country in the next 5, 10 or 20 years?

These are just some of the questions researchers hoped to answer by conducting the first National Eye Health Survey.

In 2014, the Australian Government announced \$1.126 million in funding for a comprehensive research project on eye health in Australia, followed by an additional \$650,000 in 2015. The project is a collaboration between CERA and the national peak body for eye health advocacy, Vision 2020 Australia, to identify the gaps in eye health at a population level, as well as provide baseline figures for eye disease prevalence.

In 2015, researchers from CERA travelled all across Australia to survey people from urban, regional, rural, remote and very remote locations.

Researchers ask the participants questions about their eye health and medical history, as well as conducting eye tests such as visual acuity testing, anterior segment assessment (to assess general ocular health), visual field testing (to assess side vision) and fundus photography (to assess the health of the retina).

According to the project's lead investigator, Dr Mohamed Dirani, the National Eye Health Survey is progressing extremely well. "This project is an extraordinary example of an effective collaboration between the Australian Government, the eye health sector, industry sponsors, local stakeholders and volunteers," he said.

"Most importantly, it will form the basis of ongoing health policy and research, to ensure that all Australians have the best possible eye health now, and in the years ahead."

The National Eye Health Survey is supported by funding from the Australian Government under the Chronic Disease Prevention and Service Improvement Fund, with other contributions coming from CERA, OPSM, Novartis, Zeiss, Brien Holden Vision Institute, Optometry Australia, NACCHO and Royal Flying Doctors Service.



CERA's Dr Mo Dirani and Vision 2020 Australia's Jennifer Gersbeck watch as The Hon Ken Wyatt MP receives an eye test. Image courtesy of Vision 2020 Australia.

WHO COLLABORATING CENTRE FOR THE PREVENTION OF BLINDNESS



Under the Directorship of Prof Mingguang He, the World Health Organization (WHO) Collaborating Centre for the Prevention of Blindness aims to help countries in the Asia-Pacific region, particularly underdeveloped countries, to develop their research capacity and improve eye care delivery. Prof He also hopes to use the WHO Collaborating Centre as a vehicle to collect global data.

One current project focuses on collecting cataract surgical rates globally. "This is important because cataract surgical rates are one of the three indicators for successful eye care service provision in the new WHO Universal Eye Health global action plan," Prof He explained.

The researchers found that China has significantly lower cataract surgery rates compared to developed countries such as Australia. It even has lower rates than

other developing nations such as India, despite being more economically advanced. "We know that China has a similar rate of cataract occurrence to the rest of the world, but there is poorer eye healthcare in place there, hence less surgeries," said Prof He.

Prof He's team developed a new model of care, which will be piloted in a Chinese hospital soon. A private hospital will take over operation of the eye clinic in a public hospital, funded by the Chinese Government. "They are more efficient and can treat more cases than the public clinics. It's a win for the private hospital because they are generating revenue and the patients win because more are treated," explained Prof He.

AUSTRALIA-CHINA RESEARCH ACCELERATOR PROGRAM

Prof He and his colleagues also initiated a project called the Australia-China Research Accelerator Program, endorsed by the Victorian Government. The aim of the program is to help China establish a research platform for clinical research and to build a research consortium. In 2016, 10 Chinese hospitals are signed up to participate in the program with hopes that number will increase to 50 the following year.

"The program will standardise a data collection system and train hospital staff to conduct clinical research and collect data," said Prof He. This will enable the hospitals to run multi-centred trials and encourage more investigator-initiated trials. One of the big benefits to this program is the ability to collect data on rare diseases. "Each hospital sees 200,000 - 300,000 patients per year so if you have 10 hospitals participating, you have access to up to three million people! This has never been possible before."



Prof Mingguang He

RESEARCH COLLABORATIONS

International collaborations strengthen CERA's behavioural research

Dr Gwyn Rees and her Behavioural Research in Ophthalmology team spent the majority of 2015 building strong international research collaborations around psychological well-being and vision loss.

In February 2015, Dr Rees met with fellow researchers from the UK and the Netherlands. "We found we were all working around similar trials in problem-solving and depression, all taking slightly different approaches. We decided that once all our trials were completed, we would pool our data to enable us to answer questions that we couldn't answer in our individual data sets," said Dr Rees.

This will enable the researchers not only to determine more widely the effectiveness of their interventions, but also understand who the intervention works for and who it doesn't, and also understand reasons why study participants might drop out of a trial. The next phase of the collaboration is that as the teams design new studies, they will collaborate with each other to include similar measures so that they can pool their data and do a more powerful analysis.

"My ultimate aim is to prevent depression. I want people who experience vision loss to have access to early intervention or prevention services to help them adjust and avoid depression," said Dr Rees.



Dr Gwyn Rees

Personalising eye consultations for Diabetic Retinopathy patients

Dr Rees is lead researcher on a new study that is investigating the effect of personalised eye consultations on outcomes for people with Diabetic Retinopathy (DR). The project, funded by a Diabetes Australia Research Trust Millennium Grant and Lions Ride for Sight involves a large number of collaborators and stakeholders, including the University of Melbourne, the Royal Victorian Eye and Ear Hospital, Baker IDI Heart and Diabetes Institute, St Vincent's Hospital, Alfred Health, Austin Health, Australian College of Optometry, OPSM. The Australian Centre for Behavioural Research in Diabetes and HealthChange Australia.

The project aims to support and help people with DR manage their condition and is open to people with early stage DR, type 2 diabetes and sub-optimal blood glucose. "There is already a lot of interest in this project and the potential to use the findings. I am in talks with researchers in Singapore and China to continue research on this program overseas," said Dr Rees.

NOVEL POLYMER COULD HELP DELIVER DRUGS TO THE EYE



Dr Peter van Wijngaarden

Dr Peter van Wijngaarden and former CSIRO scientist Prof Roshan Mayadunne have developed a reverse thermoresponsive polymer that is liquid at room temperature and solidifies at body temperature to form a gel. The researchers are hoping to use this polymer as a sustained release drug delivery system for anti-VEGF drugs in the eye.

"At the moment people with wet Age-related Macular Degeneration need injections up to every four weeks – the health system is not coping and it's not ideal for patients either," explained Dr van Wijngaarden.

"The process we plan to follow is to mix the anti-VEGF with the liquid polymer and inject this into the eye as is currently done. Once inside the eye, the liquid becomes a gel and the drug slowly diffuses over time. The gel is biodegradable and eventually disintegrates and is broken down by the body. Early experiments suggest that this sustained release could last about 140 days, but potentially much longer. This would most likely mean less injections and less hospital visits for the patients," explained Dr van Wijngaarden.

This research was supported by a grant from the CASS Foundation.

A NEW EXPLANATION FOR AMD: REDUCED PHAGOCYTOSIS

In 2015, researchers began investigating a novel explanation for Age-related Macular Degeneration (AMD). They hypothesised that as we age, the retina may stop cleaning up after itself, resulting in a build-up of debris and waste. 'Phagocytosis' is a cleaning process whereby scavenger cells swallow up and destroy debris or unwanted cellular matter.

As we age, it appears the rate of phagocytosis decreases and this is associated with a build-up of drusen (fatty deposits) in the retinal cell layers. This excess waste prevents nutrients and oxygen from reaching the retina and may induce an inflammation response, which can lead to cell death and the development of AMD.

CERA's work in this project is led by Prof Robyn Guymer, in collaboration with Dr Ben Gu at the Florey Institute of Neuroscience and Mental Health. Patients currently enrolled in AMD trials at CERA are invited to donate a blood sample to assess their phagocytosis function. Dr Gu conducts the phagocytosis function analysis and CERA researchers combine these results with eye tests, including vision tests, functional tests and multimodal imaging of the retina.

Additionally, Prof Paul Baird at CERA drives the genetic analysis for defects in genes that affect phagocytosis and Prof Erica Fletcher at the University of Melbourne looks at preclinical models where phagocytosis is deficient.

INDUSTRY AND PRIVATE SECTOR

INTRODUCING OCCURX, OUR 'STARTUP-IN-RESIDENCE'

"Progression seems more possible in an institute such as CERA. We are more agile and results focussed." Prof Darren Kelly

Prof Darren Kelly



As CEO of start-up company OccuRx, and Head of Strategy and Mentoring at CERA, Prof Darren Kelly is in a unique position to offer valuable insight into how medical research institutes can work alongside industry and private sector companies.

Prof Kelly started OccuRx as a spin-off company from Fibrotech Therapeutics, the company he sold to Shire PLC for more than USD\$550 million. OccuRx aims to commercialise his research on anti-fibrotic drugs to treat fibrosis of the retina in patients primarily with diabetes. "We started with a small molecule called 'tranilast' which has been on the market for some time in Japan and is off-patent. It had some toxicity issues but we redesigned the molecule to remove this toxicity and make it more potent. Essentially we tweaked the molecule and then looked at its biological responses," he explained.

This process produced hundreds of molecules, which were then ranked in terms of safety and efficacy. From these hundreds of potential new drugs, Prof Kelly selected the top two drug candidates – one for the front of the eye and one for the retina.

The next step is to manufacture enough compound to test in animal models. Once the research shows that the drug is safe, OccuRx will move into Phase I clinical trials in humans to show safety and efficacy with principal investigators from CERA leading the trials.

Prof Kelly and his OccuRx colleagues joined CERA researchers at the Baker IDI campus in 2015, with the intention to further develop OccuRx's research projects with help from the CERA team. CERA's researchers benefit by having experienced commercial partners on site, to act as mentors in this area and offer new opportunities to learn how a commercial research business operates.

CERA researchers collaborating with Prof Kelly include Dr Peter van Wijngaarden, Prof Jonathan Crowston, Dr Vicki Chrysostomou and Prof Robyn Guymer. The CERA staff assist with clinical design as well as running the experiments.

COO of OccuRx, Ms Ann Hamer believes collaborations such as this are the secret to success in medical research. "You can't keep your research to yourself anymore! Research is almost always a team effort, whether that be collaborations within your organisation or with external partners," she said.

USING ARTIFICIAL INTELLIGENCE TO HELP DIAGNOSE EYE DISEASE

Prof Mingguang He received a grant from the BUPA Health Foundation in 2015 to translate an automated algorithm for detection of Diabetic Retinopathy (DR) and glaucoma to the Australian community, by developing a website and iPhone app.

Prof He and his colleagues developed a system that uses Artificial Intelligence to categorise patients by eye disease and stage of disease, based on a 45 degree fundus photo. "Reading scans is a very time-consuming task and takes up a lot of manpower. This computer system is capable of reading 20 images per minute and provides a reliable guide to diagnosis," said Prof He.

While only a clinician can give a definitive diagnosis, the software is able to classify results as risk factors, meaning that it can assess a patient as having a

particular risk of a certain stage of disease. "For example, it will not be able to say a patient has stage four DR but it will say his chance of stage four DR is 80%. At that time, the results will be reported and patient referred for treatment," said Prof He. If the results are ambiguous, they will be referred for manual grading by a specialist.

By developing the website and iPhone app to store and access results, Prof He hopes to keep all healthcare providers for the patient in the loop. It will also enable the healthcare providers to view a patient's reports chronologically over a number of years to record the disease progression.

SEAGULL HAS LANDED AT CERA

Seagull Technologies and CERA have partnered to develop and trial Seagull Technologies' SonoEye device - a revolutionary non-invasive ocular drug delivery system. The SonoEye device eliminates discomfort as well as the significant risks associated with injections directly into the eye.

CERA has proven that the SonoEye device is able to deliver drugs safely in humans. Animal studies have shown successful intraocular distribution.

Seagull Technologies and CERA aim through their collaboration to demonstrate clinical efficacy of using the SonoEye device to treat ocular diseases such as Diabetic Macular Oedema, wet Age-related Macular Degeneration and keratoconus.

INDUSTRY AND PRIVATE SECTOR

PREVENTING VISION LOSS IN MACULAR DISEASE

Laser intervention in Early Age-related Macular Degeneration (LEAD)

Since 2012, Prof Robyn Guymer and the Macular Research team have worked closely with medical technology company Ellex R&D Pty Ltd in the Laser intervention in Early Age-related Macular Degeneration (LEAD) study. The study is a world first, multi-centered, randomised, controlled trial of nanosecond laser intervention in high-risk, early Age-related Macular Degeneration (AMD).

In April 2015, recruitment for the LEAD study officially closed. The researchers will continue collecting data until all patients have completed the full course of treatment, by mid-2018.

24-month follow-up results from the initial pilot study showed that patients who received the laser treatment continued to exhibit reduced drusen (fatty deposits on the back of the eye).

Identifying high risk factors for vision loss in AMD

Assoc. Prof Chi Luu, Prof Guymer and PhD student Dr Rose Tan are working with medical technology (perimeter) company Medmont to test a novel piece of equipment that can measure the ability of the retina to respond to very subtle spots of light by testing people under pitch dark conditions. They hope to use this perimeter to measure the very earliest changes in the health of the retina, before it is possible to see any change on retinal imaging.

The new technology also tests the time it takes a person to adjust to different lighting conditions. "We shine a very bright light in a participant's eyes and then time how long it takes for them to see again in the dark. This tests their dark adaptation response (how well they can see in the dark) and how quickly their eyes respond to a bright light after being in the dark," said Prof Guymer.

The researchers believe that this data will indicate functional markers for AMD, before structural damage occurs. It will also measure the progression of early AMD to geographic atrophy. This time is very prolonged in many people with AMD.

Three new drugs for dry AMD

For the first time, researchers began conducting clinical trials on new treatments for dry AMD (Geographic Atrophy). The new clinical trials, sponsored by pharmaceutical companies Allergan, Roche and Apellis, involve placing treatments into the vitreous cavity of the eye, either as regular 4-8 weekly injections, similar to the anti-VEGF injections for wet AMD, or as slow release encapsulated technology, releasing the active drug over many months.

Prof Robyn Guymer

LIONS EYE DONATION SERVICE

The Lions Eye Donation Service (LEDS) is a joint venture between the Lions Clubs of Victoria and Southern New South Wales, the Centre for Eye Research Australia, the University of Melbourne and the Royal Victorian Eye and Ear Hospital.

2015 Highlights



Provided 419 corneas across Australia and New Zealand and 159 scleras across Victoria and Tasmania

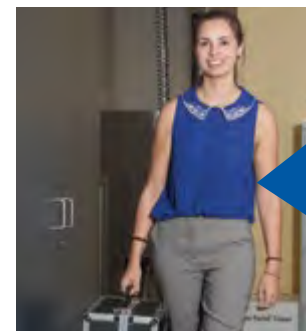
Welcomed corneal researcher Dr Karl Brown to the team



Participated in DonateLife week



Successfully met all Therapeutic Goods Administration requirements for listing ocular tissue on the Australian Register of Therapeutic Goods list



Transplant Coordinator Adrienne Mackey attended a training program in Italy in order for LEDS to provide another type of pre-cut tissue preparation for surgeons and waiting recipients

Eye Bank Association of Australia and New Zealand (EBANZ)

The Lions Eye Donation Service led and participated as members of the Eye Bank Association of Australia and New Zealand on:

- Ratifying EBANZ's first Bioethical Framework on human Tissue for Ocular Application.
- Hosting the first e-continual professional development program for Australia and New Zealand eye bankers, featuring guest speakers from CERA (Dr Eva Fenwick and Dr Sophie Rogers) and the Royal Victorian Eye and Ear Hospital (Dr Mark Whiting).

Global Alliance of Eye Bank Associations (GAEBA)

The Lions Eye Donation Service led and participated as a member of the Global Alliance of Eye Bank Associations on:

- Developing foundation steps towards wider goals to support local, regional and global eye banking practice.
- Raising funds through Lions Clubs to support eye bankers from developing countries to attend the first Global Alliance of Eye Bank Association meeting in San Diego.

bright SPARKS



Frisca
PhD graduate

I completed my PhD with the Neuroregeneration group under Assoc. Prof Alice Pébay in 2015. I enjoyed my time at CERA very much as the academic and research environment was very conducive to undertaking productive research. My research was about the phospholipid signalling in neurogenesis (nerve growth) using both *in vitro* and *in vivo* models. This research resulted in a first-author manuscript and a few other co-author manuscripts.

“I am passionate about the research technology and how it translates in the clinical practice.”

Frisca, PhD graduate

Currently I work at PT Roche Indonesia in the medical affairs team, where I manage a few products in the Roche pipeline. I am conducting scientific communications and medical education activities to all stakeholders with the ultimate goal of improving access to the patients.

The skills I gained during my PhD training in CERA (which I believe are transferable in many aspects) assisted me in adapting well to my new career in the pharmaceutical industry.

2015 graduates

- **Felix Aplin, PhD**
Blind feline model for retinal prosthesis
- **Karl Brown, PhD**
Improved corneal tissue engineering
- **Frisca, PhD**
Lysophosphatidic acid signalling in neurogenesis and the establishment of midline axis
- **Annie McCauley, PhD**
Biomarkers in diabetic retinopathy: genetic and proteomic profiling
- **Jonathan Noonan, PhD**
Luminance flicker-induced vasodilation in humans with and without type 1 diabetes
- **Sanjeewa Wickresmasinghe, DMedSc**
Predictors of anti-vascular endothelial growth factor treatment response in neovascular age-related macular degeneration

Research Higher Degree students

Under the leadership of Prof Paul Baird, CERA streamlined applications and processes for Research Higher Degree students, bringing us in line within the Eastern Hill Academic Precinct, which includes University of Melbourne students at CERA, St Vincent's Institute, Department of Medicine at St Vincent's Hospital, Bionics Institute and O'Brien Institute.

There were 18 Research Higher Degree students engaged in ophthalmology research through the University of Melbourne in 2015.

CERA student wins international 3MT competition

PhD student Dr Eamonn Fahy was crowned the winner of the international Universitas 21 Three-Minute Thesis (3MT) competition in 2015. After winning the University of Melbourne event and subsequent Trans-Tasman title, Dr Fahy competed against fellow students from leading universities in Asia, North America and Europe.

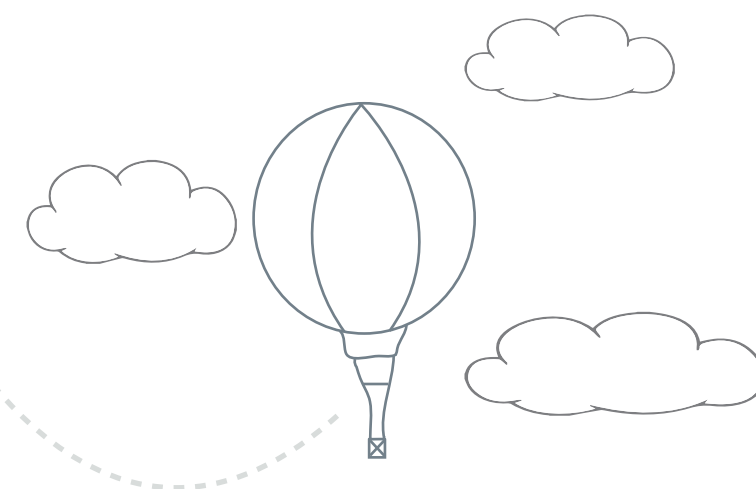
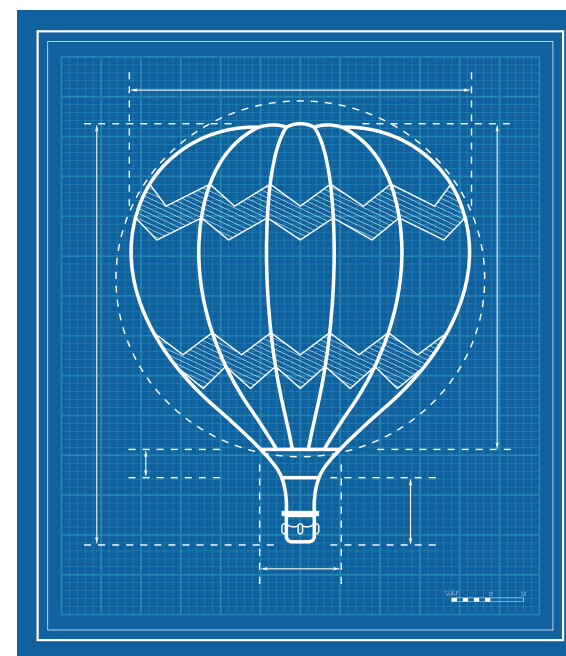
The challenge of the Three-Minute Thesis competition is to condense a PhD student's work into a three minute oral presentation, aimed at a general audience. Eamonn's presentation, titled 'Catching the sneak thief of sight', explained his PhD research on detecting early symptoms of glaucoma.

Dr Fahy received a bursary of US \$2,500 to visit a U21 university of his choice for research or professional development purposes.



Image courtesy of University of Melbourne.

RESEARCH support



COMMUNITY ENGAGEMENT INITIATIVES

Volunteering for clinical trials a breeze with 'Web Sight'

CERA's new online Clinical Trial Registry known as 'Web Sight' was launched in late 2015. This online portal allows members of the public to register their interest in participating in eye research trials with CERA and records important information including demographics, medical history and eye care provider's details. Potential participants are also encouraged to upload recent scans or images of their eyes to assist the researchers in determining their eligibility for a trial.

Spearheaded by the Macular Research team, the registry had over one hundred volunteers sign up in its first week. Researchers hope that this database will become a valuable resource for all staff to use when recruiting patients for clinical trials.

Community information forums

CERA hosted four community information forums in 2015 on common eye diseases; glaucoma, macular degeneration, diabetic retinopathy and keratoconus.

Featuring expert speakers from CERA and the wider eye research community, these events attracted record crowds as CERA supporters flocked to hear the latest in eye research news.

Alcon Visiting Professor Program

CERA welcomed leaders in ophthalmology research from all over Australia and overseas as part of the Alcon Visiting Professor Program.

We thank Alcon for their continued support of this important educational lecture series.

- Prof Robert Casson, Department of Ophthalmology & Visual Sciences, Adelaide University
- Dr Tim Henderson, Eye Department, Alice Springs Hospital
- Prof Douglas Jabs, Icahn School of Medicine, Mt Sinai, US

Gerard Crock Lecture

The Centre for Eye Research Australia's Gerard Crock Lecture continues to grow in popularity, with 130 guests attending the seventh annual lecture on 7 October 2015.

Prof Jamie Craig, Professor of Ophthalmology, Flinders University, delivered an engaging presentation on how 'techno tools' can be used to predict and prevent glaucoma blindness.

The Head of the Melbourne Medical School, University of Melbourne, Prof Geoff McColl was in attendance to introduce Prof Craig at the event which honours the memory and contributions of renowned Australian ophthalmologist and inaugural Ringland Anderson Professor of Ophthalmology, Prof Gerard Crock AO.

Prof Crock's wife, Jacqueline Crock, brother, Harry Crock AO and several other members of the family were present and expressed their admiration of Prof Craig's presentation.

CERA Scientific Exchange and Awards

The CERA Scientific Exchange and Awards were held on 20 May 2015. Over 100 guests including staff, students, stakeholders and donors enjoyed the opportunity to get 'up-close' with some of our best and brightest researchers.

CERA Board member Ms Brigitte Smith presented the annual CERA Awards, which recognise outstanding achievements and contribution from staff and students in 2014/2015.

The award winners in each category were:

- Excellence in Research – Assoc. Prof Alex Hewitt and Assoc. Prof Alice Pébay
- Excellence in Research Support – Dr Hayley Waugh
- Excellence in Teaching & Training – Ms Gina Kennedy
- Excellence in Community Engagement and Knowledge Transfer – Ms Heather Machin
- Outstanding contribution of a student – Dr Zhichao Wu
- CERA Award – Ms Maggie McNeil



Prof Jamie Craig, Prof Geoff McColl and Prof Jonathan Crowston with the Crock family

2015 CERA Award winners



Dr Nathan Kerr presenting at the Glaucoma Community Information Forum



Assoc. Prof Mark Daniell, Ms Alexandra Wardle (Alcon), Dr Tim Henderson, Prof Jonathan Crowston



GRANTS AND FELLOWSHIPS

New and successful grants awarded in 2015

FUNDING BODY	SCHEME	INVESTIGATOR
Artificial Vision Symposium	Travel Grant	Lauren Ayton
Association for Research in Vision and Ophthalmology Foundation	David Epstein Award	Jonathan Crowston
Australian College of Optometry	Travel Grant	Lauren Ayton
Australian Scholarships Foundation	Scholarship	Emily Woodhams
BrightFocus Foundation	Research Grant	Robyn Guymer
BrightFocus Foundation	Research Grant	Paul Baird
Bupa Health Foundation	Research Grant	Mingguang He
CASS Foundation	Travel Grant	Lauren Ayton
Childhood Eye Cancer Trust	Research Grant	Sandra Staffieri
Friedreich's Ataxia Research Alliance	Keith Michael Andrus	Alice Pébay
Ian Potter Foundation	Medical Research Grant	Robyn Guymer & Lyndell Lim
Juvenile Diabetes Research Foundation	Travel Grant	Jonathan Noonan
Macular Disease Foundation Australia	Research Grant	Chi Luu
Menzies Foundation	Allied Health Sciences Grant	Zhichao Wu
National Health and Medical Research Council	Early Career Fellowship	Zhichao Wu
National Health and Medical Research	Early Career Fellowship	Lyndell Lim
National Health and Medical Research Council	Project Grant	Hitesh Peshavariya
National Health and Medical Research Council	Research Fellowship	Robyn Guymer
National Health and Medical Research Council	Postgraduate Scholarship	Sandra Staffieri
National Health Service	Scholarship	Lauren Hodgson
Ophthalmic Research Institute of Australia	Research Grant	Jennifer Fan Gaskin
Ophthalmic Research Institute of Australia	Research Grant	Isabel Lopez Sanchez
Ophthalmic Research Institute of Australia	Research Grant	Nicole Van Bergen
Ophthalmic Research Institute of Australia	Research Grant	Raymond Wong
Ophthalmic Research Institute of Australia	Research Grant	Zhichao Wu
Sylvia and Charles Viertel Charitable Foundation	Clinical Investigatorship	Peter van Wijngaarden
University of Melbourne	Dean's Prize	Zhichao Wu
University of Melbourne	Early Career Grant	Isabel Lopez Sanchez
University of Melbourne	Early Career Grant	Srujana Sahabjada
University of Melbourne	Therapeutic Technologies Research Initiative	Raymond Wong
veski	Victoria Fellowship	Lauren Ayton
Victorian Optometrists Training and Education Trust	Training and Education Grant	Lauren Ayton
William Angliss Charitable Foundation	Grant	Lauren Hodgson



FUNDRAISING

2015 was another great year for philanthropy at CERA. In an increasingly tough funding environment, philanthropy plays a critical role in ensuring our research continues to make an impact on patient's lives.

Bequests

We are always humbled and honoured when supporters of CERA choose to continue their legacy of support for medical research by leaving a gift in their wills.

In 2015, 11 people made the generous decision to leave a bequest for eye research in their wills. These gifts totalled over \$460,000 and will make a huge difference in the fight against blinding eye diseases.

Tax Appeal

Our mid-year appeal raised over \$270,000 for research into low vision and depression. As a result of this outstanding result, Dr Bonnie Sturrock is kick-starting a guided self-help program for vision-impaired people. Participants will learn practical cognitive and behavioural techniques to combat poor mental health and enhance their quality of life.

Lions Ride for Sight

Fifty cyclists. Four days. 373 kilometres. The result? \$50,000 for sight saving research. Funds raised from the 2015 Lions Ride for Sight funded two trials in CERA's Behavioural Research in Ophthalmology team; one to help people at risk of losing their sight to diabetic retinopathy and one to help vision impaired people who have early symptoms of depression.

Christmas Appeal

Last year CERA supporters were introduced to the Prain family, whose mother and three daughters are all affected by Leber's Hereditary Optic Neuropathy (LHON). Thanks to our generous donors, we raised over \$85,000 for Assoc. Prof Ian Trounce's research into developing a treatment for this devastating disease.



Faces of the 2015 Christmas Appeal, Sue Prain (far right) and her daughters (L-R) Claire, Llewellyn and Meredith.



ABRIDGED AUDITED FINANCIAL STATEMENT

The Centre for Eye Research Australia (ABN 72 076 481 984)
for the year ended 31 December 2015.

STATEMENT OF COMPREHENSIVE INCOME	2015	2014
Revenue		
Federal Government	4,326,781	5,374,021
State Government ⁽ⁱⁱⁱ⁾	1,080,226	1,026,230
Charitable contributions & Other Income	9,533,268	9,477,282
Total Revenue from operating activities	14,940,275	15,877,533
Less Expenditure on operating activities	16,759,214	15,858,706
Surplus/(Deficit) on operating activities	(1,818,939)	18,827
Net Financial Income	346,645	375,724
Capital Grants	0	-
Net Surplus/(Deficit)⁽ⁱⁱⁱ⁾	(1,472,294)	394,551

STATEMENT OF FINANCIAL POSITION		
Current Assets	9,260,492	9,199,703
Non-Current Assets	2,056,327	2,232,657
Total Assets	11,316,819	11,432,360
Current Liabilities		
Trade and other payables	3,522,402	2,287,203
Employee Benefits	844,811	858,978
Total Current Liabilities	4,367,213	3,146,181
Non Current Liabilities	396,336	260,915
Total Liabilities	4,763,549	3,407,096
Net Assets	6,553,270	8,025,264
Asset Replacement Reserve ^(iv)	0	5,000,000
Accumulated Funds	1,940,479	3,025,564
Research Reserve ^(iv)	4,612,791	0
Total Equity	6,553,270	8,025,564

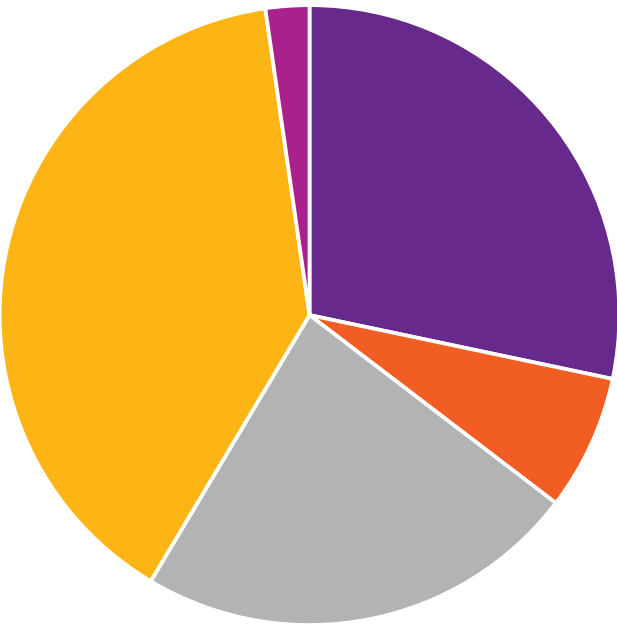
(i) This abridged audited financial statement has been extracted from the full, audited financial statements which include more detailed disclosures on notes and balances.

(ii) CERA receives Operational Infrastructure Support from the Victorian Government.

(iii) The year resulted in a deficit of (\$1,472,294). On a cash basis, adding back depreciation and unrealized loss on financial assets, of \$841,414 and \$416,234 respectively, the deficit is reduced to (\$214,646). The deficit was largely due to strategic expenditure and laboratory expenses exceeding budgeted expenditure for the year; and less Federal Government grant income. CERA is operated as a not for profit organization. Accordingly, prior years' accumulated surpluses are held in the form of working capital and fixed assets to support research projects and operations.

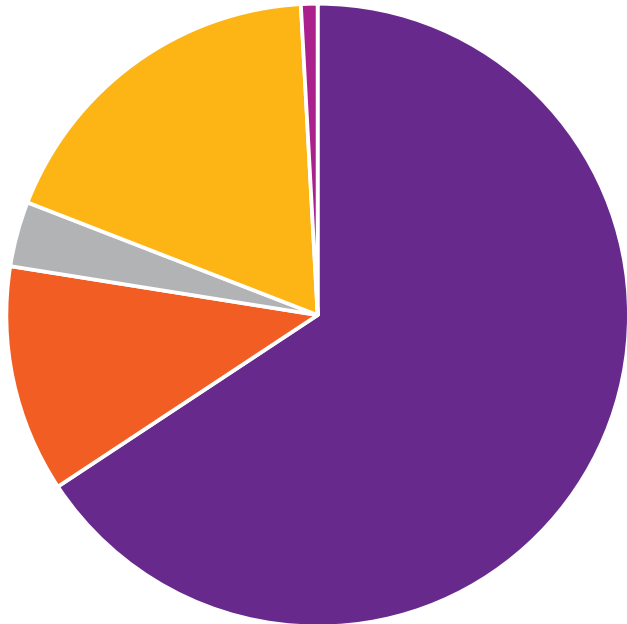
(iv) Transfers between reserves occurred in 2015, to more accurately reflect reserve funds status.

INCOME 2015



Federal Government Grants	4,326,781	28%
State Government Grants	1,080,226	7%
Clinical Trials/Research Contracts & Other Income	3,545,883	23%
Donations/Bequests/Research Foundations	5,985,358	40%
Investment Income	348,672	2%
Total	15,286,920	100%

EXPENSES 2015



Direct Research Expenditure	11,013,148	66%
Laboratory Support Expenditure	1,977,199	12%
Buildings/Facilities Expenditure	566,651	3%
Administration	3,058,027	18%
Other	144,189	1%
Total	16,759,214	100%



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