Spring 2024

visionary

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Teamwork makes Maggie's dream work

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HOPE IN SIGHT
GIVING DAY
10 October 2024

Sharing a unified vision

In our latest edition of Visionary, we spotlight the strides being made in the lab and through clinical trials – all possible through the power of teamwork.

This issue is focused on inherited retinal diseases (IRDs) – a diverse group of conditions leading to vision loss due to genetic factors – including retinitis pigmentosa, choroideremia, Stargardt's disease and Usher syndrome.

In our lead story, para-triathlete Maggie opens up about the challenges of living with Usher syndrome, and the opportunities it's presenting.

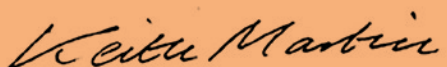
We also delve into our cutting-edge research aimed at developing new treatments for IRDs. Discover the latest from our Genetic Engineering team on RNA editing, our collaboration to identify new genetic causes of IRDs and the advancements made by our bionic eye research team.

Excitingly, we introduce Cerulea Clinical Trials, our new not-for-profit centre that will expand access to new treatments, including gene therapies, through clinical trials.

Finally, this Spring edition sees the launch of our fifth annual **Hope in Sight Giving Day** appeal, which culminates on World Sight Day on 10 October.

It takes teamwork to make the dream work. That's why, once again, every gift CERA receives during the appeal will be tripled up to the total value of $150,000. That means a donation of $50 transforms into $150 towards our groundbreaking research into improved understanding of and treatments for IRDs.

Thank you to the generous anonymous donor and CERA Foundation who are providing matched funding for the appeal. Together, with your support, we can put hope in sight.



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Better together: Maggie running with her guide, Lauren.

Maggie Sandles' Paralympic dream

Teamwork is powering Maggie Sandles through challenges and towards her dreams of Paralympic gold.

Maggie Sandles, a 22-year-old para-triathlete, was hoping to compete in the 2024 Paris Paralympics.

At the final qualifier Maggie just missed out, but she shrugged off the disappointment.

"My next challenge is the World Championships in Spain," Maggie says.

"Ultimately the goal is to podium at the 2028 Los Angeles Paralympics. That is my new dream."

Maggie is as optimistic, determined and driven in sport as she is in life, and Usher syndrome isn't holding her back. She sees her condition as a remarkable opportunity.

Born with Type 1C Usher Syndrome, the most common genetic form of deaf-blindness, Maggie was profoundly deaf at birth.

Through childhood, she developed balance problems and the gradual onset of retinitis pigmentosa – a condition associated with Usher syndrome.

Retinitis pigmentosa affects the retina, the light-sensitive layer of tissue in the back of the eye. As a result, Maggie has decreasing peripheral vision and trouble seeing any details at night.

While complete blindness is uncommon, Maggie is expecting her sight will continue to deteriorate.

(Continued Page 4)

"The diagnosis was hard," Maggie says.

"Initially, I could only focus on the fact I was going to be blind by the time I was 30. Whilst this isn't true for everyone, that's what the ophthalmologist told me.

"My diagnosis was perhaps not delivered gently, but we handled it great as a family. My mum was very supportive, and my dad dove into the research."

Positive focus

While Maggie is unfailingly positive, she admits daily life can be a struggle. Currently, she has around 15-20 degrees of peripheral vision, compared to a normal 120.

"This means I cannot drive. I am a hyper-independent person, so it's one of the hardest things about Usher syndrome," she says.

In sport, Maggie says she found both an outlet for her energy and a coping mechanism.

"Sport was a place where I didn't feel very different. There was always a bigger challenge, whether it was performance pressure or a hard training session."

Maggie says obstacles, like not hearing her coach on the megaphone or a wobble climbing onto her bike, were soon forgotten.

"Sport taught me resilience and dedication, which are now integral values in my life.

"While this isn't how I imagined my life would go, there is a world of opportunities available that weren't before. I'm travelling the world and aiming for the Paralympics and World Championships. I think that's pretty cool."

Better experiences

"Maggie sets an incredible example for young people living with inherited retinal disease," says Associate Professor Lauren Ayton – a clinician-scientist at CERA with a strong research interest in IRDs, gene therapy and clinical trials.

← *Bigger dreams: Lauren and Maggie working together.*

"But even she admits that life with Usher syndrome is not what she expected.

"Although there's currently no treatment for Usher syndrome, breakthroughs have put many treatments for previously untreatable conditions in reach."

Gene therapy, stem cell research and regenerative medicine offer avenues for repairing damaged sensory cells – potentially restoring or improving hearing and vision.

"CERA's Genetic Engineering Research Unit is working on a treatment to prevent vision loss from Usher syndrome," Associate Professor Ayton says.

"And the work of myself, Dr Tom Edwards and our team is focused on clinical trials as a tool to improve awareness, support networks and advocacy efforts for people living with Usher syndrome.

"This is vital to improving access to resources, funding research initiatives and enhancing the quality of life for individuals and families affected by Usher syndrome.

"Our ultimate goal is seeing a world where all people with complex conditions such as Usher syndrome receive best-practice multidisciplinary care."

Bigger dreams

Maggie says she hopes to be a role model to "inspire others with Usher syndrome to dream big".

"I want to go to more than one Paralympic Games and see the world as much as I can before my sight deteriorates. I hope for driverless cars. I hope for research breakthroughs that lead to effective treatments and, ultimately, a cure.

"Inherited retinal diseases affect millions worldwide, causing vision loss and impacting quality of life.

"The incredible work by CERA researchers using stem cell technology and gene-editing techniques offers a beacon of hope for those of us living with conditions like Usher syndrome."

Follow Maggie's journey on Instagram: @maggie_sandles

Your support will help us champion research to treat and cure IRDs, so more people like Maggie can chase their dreams.

Donate and triple your impact with the form enclosed with *Visionary*, or online using the QR Code or at: **charidy.com/HopeInSight**

Photo: Anna Carlile

Preventing blindness at its source

Researchers at CERA are working to expand gene therapy technology to increase the number of treatments for blindness-causing genetic disorders.

In recent years, breakthroughs in genetic research have opened the door to treating inherited retinal diseases (IRDs), such as retinitis pigmentosa, Usher syndrome and Stargardt's disease.

Only a few years ago, being diagnosed with one of these IRDs meant a gradual loss of vision was all but a certainty, but treatments for these diseases are now on the horizon.

One gene therapy is now available for a rare form of retinitis pigmentosa, and treatments are being developed for a range of other conditions.

Collectively, IRDs are the most common cause of blindness in working-age Australians. But despite sharing a name, the genetic mistakes that cause each IRD are different. A treatment that works for one of the 250 genes known to cause IRDs will not work for another.

Satheesh Kumar is a graduate researcher in CERA's Genetic Engineering Research Unit. He is working with Associate Professor Guei-Sheung (Rick) Liu to develop new ways of treating disease that would mean more treatments for different IRDs.

Editing vs replacing

A person's DNA includes all the instructions that cells need to operate – and mistakes in this sequence are what cause a person's body to not operate properly.

In the case of IRDs, this means vision loss.

"Before starting my PhD, I was an honors student in Queensland and became interested in gene editing, because there

← *Targeting IRDs: (from left) Satheesh Kumar, Kristin Ariel and Associate Professor Guei-Sheung (Rick) Liu.*

are now a lot of new technologies that are trying to treat genetic diseases," Kumar says.

These tools are safe viruses which carry a correct version of the gene, but they aren't suitable for every type of disease.

"In traditional gene therapy, a new gene is introduced without fixing the root cause," Kumar says.

"The mutated gene is still in the cell, which can sometimes be harmful. And for a lot of IRDs, the tools we have just aren't suitable."

The Genetic Engineering team is using a technology called RNA base editing to try and correct these mistakes instead.

While DNA is the instruction booklet for cells to function, it is RNA that carries out these instructions by transmitting their message to build the different parts of our cells.

"Gene editing that targets RNA enables us to directly correct the mistake causing the disease," Kumar says.

"We aim to correct the genetic errors responsible for these diseases at the molecular level, which could lead to new treatments in the future."

To the clinic

Kumar is hopeful that IRDs once believed to be untreatable will eventually have therapies, thanks to improved understanding of the genetic causes and better tools to produce working genes.

"At CERA, when we do research, we are always asking 'how do we turn this into a tool for the clinic?'

"When I'm working with Associate Professor Liu, we want to dive deeper into our understanding of these tools – and alongside many other people around the world we are constantly learning new things about them.

"We aim to correct the genetic errors responsible for these diseases at the molecular level."

– Graduate researcher Satheesh Kumar

"Learning more about the basic mechanisms of these tools means we can improve them, so they can be useful for even more diseases."

The team's work requires significant collaborations with others.

"Associate Professor Liu and I work with a lot of collaborators to make sure these tools are clinically relevant – especially as some of these tools might also be helpful not just for vison loss but also for hearing loss," he says.

"I'm excited about the new treatments for many conditions that our research is working towards."

Associate Professor Liu's RNA editing research is supported by an NHMRC Ideas Grant.

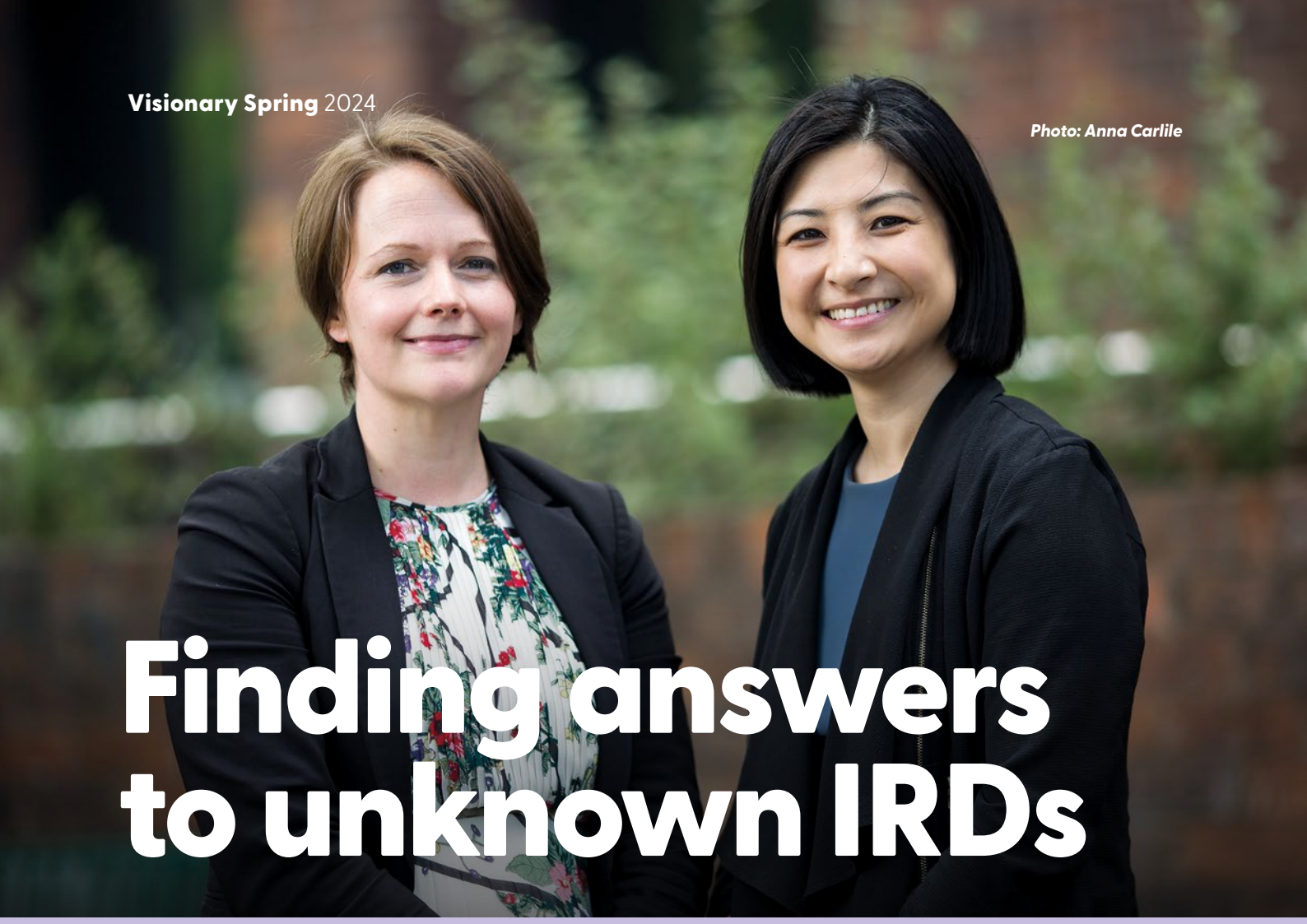

Photo: Anna Carlile

Finding answers to unknown IRDs

New research is working to find the specific cause of not-yet-understood inherited retinal diseases.

The exact cause of Inherited Retinal Diseases (IRDs) – such as retinitis pigmentosa and Stargardt's disease - are locked within a person's DNA.

Specific genes in a person's genome – the instructions manual that the body follows to operate – have mistakes that, in the case of IRDs, lead to vision loss.

While the genetic source of a number of IRDs have been identified, 40 per cent of people who are diagnosed with an IRD still cannot be told the precise genetic cause.

New funding is supporting researchers from CERA and the University of Melbourne to find answers for this 40 per cent, and has the potential to find targets for breakthrough treatments and help people access future clinical trials.

"Until quite recently there were no treatments at all for inherited retinal diseases, so all we could offer people would be things like canes, guide dogs and extra mobility training," Associate Professor Lauren Ayton says.

"Now we are actually at the precipice of a whole raft of new treatments, and with new support, we're now going to be able to learn more about these people and their genetic differences, hopefully target new treatment options, and identify people who could go into clinical trials."

Genetic discoveries

The Advanced Genomics Collaboration (TAGC) – a partnership between biotech company Illumina and the University of Melbourne – is supporting a team led by

← *Genetic mysteries: (from left) Associate Professor Lauren Ayton and Dr Ceecee Britten-Jones are improving diagnoses of IRDs.*

Associate Professor Ayton and Dr Ceecee Britten-Jones to access cutting-edge technology.

The support from TAGC will allow them to access a world-leading genomics hub to build a comprehensive genetic database of these IRDs and drive towards new treatments and clinical trials.

Finding the gene that cause these conditions means that work towards potential therapies can start.

"Genomics is transforming healthcare," Dr Ceecee Britten-Jones says.

"It's revolutionising our ability to be able to understand the causes of different diseases.

"For the inherited diseases we work with, it helps give us information about family planning, but also gives those affected the ability to understand what is causing their conditions – and that knowledge is powerful."

Funding for the 2024 TAGC Innovation Projects has been made possible with the support of Invest Victoria.

Innovation leadership

Associate Professor Ayton, who is Head of the Vision Optimisation Unit in the Department of Optometry and interim Associate Dean of Innovation and Enterprise in the Faculty of Medicine Dentistry and Health Sciences at the University of Melbourne, was appointed to CERA's executive team in August 2024.

As part of her appointment, she will build collaborations with other research organisations, industry and consumer groups.

Associate Professor is excited by the potential to link more people with IRD to clinical trials through Cerulea Clinical Trials, CERA's new not-for-profit clinical trials centre (see story on page 12).

"There has never been a more exciting time to be involved in inherited retinal disease research."

– Associate Professor Lauren Ayton

"I am proud of my long involvement with CERA and its commitment to translating the research that happens in the lab into treatments that make a real difference for patients," she says.

"There has never been a more exciting time to be involved in inherited retinal disease research.

"When I began my career, there were no treatments for inherited retinal disease. Patients were told there was nothing that could be done for them.

"But now we are seeing a wave of new treatments such as gene therapy moving into clinical trial – providing new hope that we can prevent or reverse vision loss.

"With Cerulea Clinical Trials, we can now attract more of these trials to Melbourne and give more patients access to emerging therapies."

Bionic eye trial reveals vision gains

A clinical trial of Australia's 'second generation' bionic eye has shown 'substantial improvement' in participants' functional vision and quality of life.

The latest results published from the bionic eye trial, led by CERA, Bionics Institute, University of Melbourne and The Royal Victorian Eye and Ear Hospital, have shown a substantial improvement participants' daily activities.

The new findings, published in *Ophthalmology Science*, add to previous results showing the second-generation bionic eye developed by Australian company Bionic Vision Technologies provided significant help for four patients with blindness caused by retinitis pigmentosa.

Retinitis pigmentosa is an inherited retinal disease (IRD), which is one of the leading causes of vision loss in working-age people.

The bionic eye includes an electrode array – a type of antenna – designed by the Bionics Institute and CERA that is surgically implanted behind the eye.

The electrode receives signals from a video camera mounted on glasses, which stimulate the user's retina.

The user can then see flashes of light which helps them to identify edges, obstacles, shapes and movement. This helps them navigate the world and perform daily activities such as folding washing.

Ongoing improvement

The new study tracked the patients from the time they received the implant surgery in 2018 to 2021.

The findings demonstrate the device is stable and durable over many years, with the device staying in place behind the retina without complication, and 97 per cent of the electrodes still working 2.7 years after implant.

Photo: Anna Carlile

Encouraging results: (from left) Dr Matt Petoe formerly of the Bionics Institute, participants Sefa 'Sam' Kuzu, Mark Boyd, Colleen Knowles (with guide dog Freeman) and Scott Nixon, and Associate Professor Penny Allen.

Principal Investigator and vitreo-retinal surgeon Associate Professor Penny Allen said patients showed significant improvement in their navigation, mobility and ability to detect objects – in clinical tests, at home and in the community.

"The bionic eye enabled blind patients to locate doorways, avoid obstacles and find items on table-tops," she said.

"They reported greater confidence in navigation, were more likely to explore new environments and had reduced need for assistance when travelling to the local shops."

Associate Professor Allen said participants reported the bionic eye supplemented long cane and guide dog use, provided safe navigation around people and obstacles, and allowed them to detect waypoints such as trees and lamp posts along navigational routes.

"Patients were also able to locate their spouse in a café and detect people moving at a train station – things they could not do without using their bionic eye."

Bionic Vision Technologies' team is continuing to refine the vision processing capabilities and usability, as well as the wearables, of the bionic eye system.

Dr Ash Attia, CEO of Bionic Vision Technologies, said: "We are encouraged by the excellent results of the generation 2 bionic eye trial.

"We are looking forward to finalising the development of the Generation 3 bionic eye and enter the worldwide pivotal trial and ultimately gain regulatory approval.

"Regulatory approval will allow us to make this important technology available to RP patients, which will positively impact their lives."

Boosting access to sight-saving trials

Cerulea Clinical Trials, CERA's new clinical trials centre, will bring people living with vision loss and blindness early access to sight-saving therapies.

Cerulea Clinical Trials – a fully owned, not-for-profit subsidiary of CERA – has now opened and is bringing new, sight-saving treatments to more people.

The new centre was launched by Victorian Deputy Premier and Minister for Medical Research the Hon Ben Carroll on World Clinical Trials Day in May.

Cerulea will collaborate with pharmaceutical and medtech companies from around the world and be the home of clinical research conducted by scientists from CERA and ophthalmology researchers with the University of Melbourne's Department of Surgery.

It will test new therapies for eye conditions such as age-related macular degeneration, diabetic eye disease, glaucoma, inherited retinal disease and other rare genetic eye conditions – with a major focus on trialling new therapies for diseases that currently have no treatment or cure.

In the next year, Cerulea expects to begin new clinical trials on gene therapies for retinitis pigmentosa and Stargardt's disease.

Cerulea will also boost local research, ensuring that new eye treatments and devices developed in Australia are first trialled here where they can benefit local patients.

New views

The state-of-the art centre, which houses next-generation eye photography and imaging suites, vision lanes, and laser and treatment rooms in which therapies can be administered and monitored, is located at The Royal Victorian Eye and Ear Hospital in East Melbourne.

← *Celebrating Cerulea Clinical Trials: Clinical research participant Kate (centre) spoke at the Cerulea launch. She is pictured with (from left), her husband Chris, daughters Abigail and Aurora, Minister for Medical Research Ben Carroll, CERA Managing Director Keith Martin and Cerulea Chief Executive Officer Michelle Gallaher.*

Cerulea Clinical Trials CEO Michelle Gallaher said the new centre would harness the growing investment in the global ophthalmic research market to bring more clinical trials to Australia.

"There is a growing pipeline of discovery with new medicines and devices being developed around the world and Cerulea Clinical Trials provides the perfect location to conduct these trials.

"Our aim is to build a specialist clinical trial centre that cements Victoria's reputation as a world leader in preventing blindness and reducing the impact of vision loss.

"Cerulea aims to provide the best possible experience for patients, researchers, clinicians and industry partners."

Professor Keith Martin, Cerulea Clinical Trials Chair, CERA Managing Director and University of Melbourne Professor and Head of Ophthalmology, said investment in the new centre was a major boost for eye care and eye research in Australia.

"Cerulea will support the work of lab-based scientists to develop innovative new treatments to prevent vision loss and restore sight,' he said.

"It will also benefit local eye care professionals who will be able to improve the quality of care they provide to their patients by providing them access to emerging treatments in clinical trials.

"The support of so many donors has helped us get to the point where we could receive this critical investment, and I'm grateful to everyone who has made this outstanding centre possible."

"Our aim is to build a specialist clinical trial centre that cements Victoria's reputation as a world leader in preventing blindness and reducing the impact of vision loss."

– Michelle Gallaher

Minister for Medical Research Ben Carroll said: "We're backing life changing research and therapy for eye disease which is a testament to Victoria's world class medical research sector. This will be developed locally for the benefit of Victorians and patients around the world."

Learn more about Cerulea Clinical Trials

To learn more about how you can get involved in clinical research, visit: **ceruleaclinicaltrials.org.au**

Community impact

Keith Teirney, 74, lives with glaucoma, leads an active life and supports CERA through community fundraising.

"I was diagnosed with glaucoma about 20 years ago," Keith says.

"Fortunately, I found out early and it doesn't affect my daily life. I just have to remember to put my eye drops in every night."

Glaucoma, the leading cause of irreversible blindness, causes optic nerve damage.

There is currently no cure, but prescription eye drops, laser therapy and surgery can help slow or stop vision loss.

CERA's researchers are investigating how glaucoma can be better treated.

Just two examples include Professor Keith Martin's research into gene therapies that aim to protect the optic nerve, and Dr Flora Hui's research to determine whether vitamin B3 (nicotinamide) can support glaucoma treatments.

Community minded

In March, Keith attended CERA's community forum to learn about the latest research and treatments being trialled for glaucoma.

"It was also a great chance to talk to others with glaucoma about how they were coping," he says.

Local hero: Keith Teirney rallied his community to support eye research at CERA.

Afterward, Keith recommended that proceeds from local fundraising activities at Carnegie Lions Club and Malvern Theatre Company go to CERA.

Professor Martin says CERA is grateful for their support.

"Community fundraising, alongside individual donations, plays a critical role in enabling us to advance our research."

Learn more about our community forums

Register for our upcoming community forums and events: **cera.org.au/events**

Be a star that shines on

By leaving a gift in your will, no matter the size, your generosity helps protect future generations from vision loss and blindness.

For more information
Visit **cera.org.au/shine**
Email **giftsinwills@cera.org.au**
Call **1300 737 757**

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Every dollar you give will be tripled by a generous anonymous donor and the CERA Foundation

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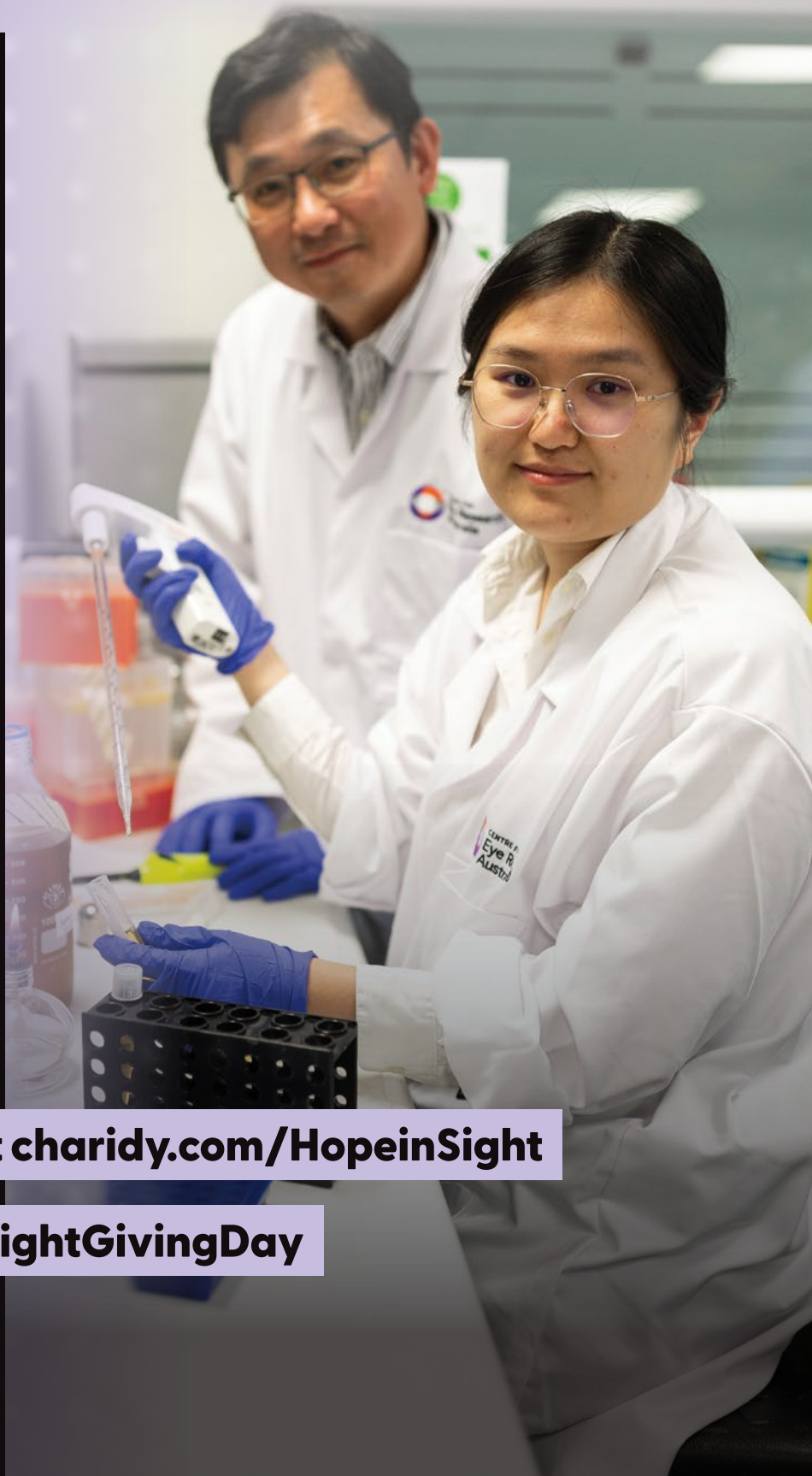
$50 → $150
$100 → $300



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