(MUSIC AND VIDEO PLAYS)

PROF KEITH MARTIN:

What drives us at CERA is improving the quality of life of the people affected by vision loss. So, CERA has the ability to look at all of the major diseases that cause vision loss and blindness. That's unique in Australia.

PROF ROBYN GUYMER AM:

At CERA we have a very large research program into macular disease. We cover really the basic science area, so trying to understand what causes AMD, all the way through to clinical trials.

PROF LAUREN AYTON:

Inherited retinal disease is the most common cause of blindness in working-aged Australians. So, we're very interested in learning more about those conditions and developing some new treatments.

DR ANNA WANG:

There are many people suffering from glaucoma worldwide and in Australia.

DR FLORA HUI:

My job is to diagnose glaucoma earlier so that we can prevent vision loss in people. And we can actually tailor treatments for them instead of just using the one treatment to treat everyone.

DR LUIS ALARCON-MARTINEZ:

Our research is trying to understand the communication between the cells that are located in the retina. And we are investigating these cells, how they talk to the blood vessels.

DR ANNA WANG:

If we understand this, we can work on getting new therapies out there.

PROF LYNDELL LIM:

Diabetes is becoming more and more common in Australia. One in five of those people actually develop diabetic eye disease. A lot of the treatments that we have are for late stages, where you've already lost vision. So, what we really need to look at is being better at detecting early eye disease.

PROF KEITH MARTIN:

We've had incredible advances in our ability to image the eye in incredible levels of detail.

PROF PETER VAN WIJNGAARDEN:

We're seeing things that we could not see through any other imaging method available currently in the clinic. Changes in the brain and in the eye for Alzheimer's disease develop up to 20 years before the onset of memory impairment.

DR CEECEE BRITTEN-JONES:

Genomics is changing the way that we diagnose, treat and understand different eye diseases.

PROF KEITH MARTIN:

Gene therapy has been a game changer for eye disease. For most of my career, I've been telling patients with inherited retinal diseases that there's absolutely nothing we can do to improve their function. And that is now starting to change.

PROF RAYMOND WONG:

My lab focusses on using stem cells, so we are developing a gene therapy to regenerate the photoreceptor to restore vision in the patient.

PROF GUEI-SHEUNG LIU:

Currently, young patients living with Usher syndrome, there is not any cure. So, with the latest genetic technology, my team is developing gene therapy that can be fundamental to cure this disease.

DR HEATHER MACHIN:

Tissue for research helps provide understanding to our researchers here at CERA and elsewhere about the eye.

PROF MARK DANIELL:

And the idea is that we will develop a tissue-engineered cornea. This will mean that we won't need to use donors for every single case. We'll be able to use one donor and amplify that to 50 different corneas.

PROF ROBYN GUYMER AM:

I'm really excited about the future of CERA. Talented researchers with new ways of doing things. We're right at the cusp of that big transformative step forward.

SPEAKER:

Centre for Eye Research Australia. Cerulea Clinical Trials. Lion's Eye Donation Service, Melbourne. Hope in sight. cera.org.au, Donate today.

(VIDEO ENDS)

PROF KEITH MARTIN:

Well, good evening, everyone, and I hope you enjoyed that little flavour of some of the work that we do hearing from our researchers. My name is Keith Martin. I'm managing director of the Centre for Eye Research Australia and a Ringland Anderson Professor of Ophthalmology at the University of Melbourne. And I'm also chair of CERA's not-for-profit clinical trial centre, Cerulea. I'd like to start by acknowledging the traditional custodians of the land where we're meeting now. And that's the Wurundjeri and the Boon Wurrung people of the Kulin Nation and I pay my respects to their elders, past and present, and to their families and I extend my welcome to any Aboriginal and Torres Strait Islander peoples here today and other First Nations people from around the world. And I acknowledge that First Nations people are disproportionately affected by vision loss and blindness. And that's something that we and others in the eye research and health sector are actively working together with First Nations communities to address.

And I'd highlight the efforts of many of our research and clinical colleagues to close the indigenous eye health gap, especially CERA's founder, Melbourne Laureate, Professor Emeritus Hugh Taylor, who's here with us tonight in the front row, who established the University of Melbourne's Indigenous Eye Health Unit a few years ago now. So, it's fantastic to have so many of you here for the 2025 Gerard Crock Lecture. And we've got a few welcomes just to thank many of our supporters and people who have come tonight. So, I'd like to welcome Brendon Gardner as CEO of the Eye and Ear Hospital and members of his executive team. We've got a hospital board director, Dr Susan Sdrinis, who's also an alternate director on the CERA Board. CERA Board Chair Duncan Peppercorn is joining us online from Sydney tonight. And we've also got Suwanee Dharmalingam and Professor Andrew Cuthbertson, who's also deputy vice chancellor of the University of Melbourne, in addition to his position on CERA's board. We have Hugh Taylor, of course, here as well, and we welcome him along with other stalwarts of our community.

We have one of our Honorary Governors, Bob Williamson, who's joining us. And we also have another Honorary Governor, Professor John Funder joining us online. Welcome also too Alexandra Grimwade, chair of CERA's Philanthropy and Engagement Committee, who's done an enormous amount to help support our research, and she's here with Fred Grimwade as well. So, thank you, Alex, for all you've done. (APPLAUSE) And welcome, too, to Associate Professor Julian Rait, and he and Jane are here tonight. And Julian is a renowned ophthalmologist and one of the ambassadors for the Philanthropic CERA Eye Research Alliance, which is another important new innovation which we've recently set up. And another ambassador and a long term supporter, Noel Alpins, is also here. So, welcome to Noel as well. And thank you to our valued philanthropic supporters. And I'd like to make a special shout out today for some people who've made the trip up as guests from Gippsland who are here with us tonight. That's Sharon Oates and Kevin Oates.

And many of you may not know that over the last three years, Sharon and her sisters, Kerry and Leesa, also known as Team Sisters, have raised more than $100,000 for CERA as part of the Lions' Ride for Sight. (APPLAUSE) So, a huge, a huge thank you to them and to Sharon and family for their amazing fundraising efforts. I'd also like to welcome Professor Robyn Guymer's family here. So, Graeme is here tonight, and Graeme is joined by Gillian and Andrew, the kids and Robyn has been lent to us by the family, you guys, for many years now. And you've grown up with CERA. You've had CERA all over your kitchen table, I know, for your entire lives, you two. So, where Robyn does most of her, most productive work, I think, at home. So, great you can join tonight. And also the dedicated staff and students of CERA are here. And most importantly, the Crock family. So, we've got a number of representatives of the Crock family who are here tonight to honour Professor Gerard Crock's legacy and his innovation in eye research.

So, it's great to have you here. And for those of you who are new to the CERA community, Gerard Crock was appointed to the University of Melbourne as the first Ringland Anderson professor at the age of 34. And his appointment was the first medical speciality chair of any discipline in Australia. And he was only the second chair of ophthalmology in the British Commonwealth at the time. That was back in 1963. And Professor Crock established the University Department of Ophthalmology and much of the Eye and Ear Hospital as it is today. And his drive to discover better ways to save sight have left a strong legacy and been a real influence on future generations of eye researchers. So, each year, the Crock Lecture celebrates innovation in eye research and commemorates the contribution of Gerard Crock to that. So, tonight, we're going to hear from someone who also exemplifies innovation and has a huge desire to make a difference to people living with eye disease. And Robyn Guymer AM, is a global leader in macular disease research.

She's had an enormous research input and output as well and in her international collaborations and her leadership roles globally, she's run many pivotal studies in eye disease worldwide. And she has really been an inspiration. But her achievements are more than just about publishing and getting grant funding. It's about changing the lives of people living with age-related macular degeneration. And that's what she's really dedicated her career to. So, to share a little bit more about Robyn's impact, I'll now invite Dr Colleen Lewis to the stage. So, Colleen is one of the founding members of CERA's Consumer Advisory Group and she has lived experience of macular degeneration, having lost the central vision in her left eye due to the condition. And she brings really rich personal and professional experience to her consumer role at CERA. So, she's an honorary professor at the Australian Studies Institute, an associate of the Centre for Public Integrity, a member of the Accountability Roundtable and a member of the Australasian Study of Parliament Group's Victorian Executive.

So, her expertise areas are around public policy and politics and policing. And she's the author of a book on the politics of complaints against the police and co-editor and contributor of seven other books spanning social science disciplines. So, join me in welcoming Dr Colleen Lewis. (APPLAUSE)

DR COLLEEN LEWIS:

Thank you, Keith. I, too, would like to acknowledge the traditional owners of the land on which we are meeting this evening and pay my respects to their Elders, past and present. My suspicion that I had a problem with my eyes started when straight lines started to become wavy. So, I took myself off to what I thought was a specialist eye clinic and the attending doctor did the necessary scans and came out and said to me, you have dry macular degeneration. So, I said, well, what's that going to mean for me? And his reply was, and I quote, you will be blind in ten years. You can imagine the horror that I felt with that news and the way it was delivered. And my horror was compounded by the fact that a very distant relative of mine had macular degeneration as a teenager. And by the time they were in their 40s, couldn't cope with the fact that they'd really lost their vision and very sadly took their own life. So, I kept on thinking, what is my future going to be?

And then I got my act together, and I made an appointment with my GP, and she then referred me to an eminent specialist in the area of eyes. And he said, look, macular degeneration is not my area of expertise, but I know exactly who you should be seeing. And her name was Professor Robyn Guymer AM. I've been Professor Guymer's patient now for some 20 odd years. She had seen me through the loss of vision in my... central vision in my left eye and which developed into a blister and whilst I'm very fortunate that I can still see very well really out of my right eye, a couple of years ago I developed wet macular in that eye. So, I've got both of them, the wet and dry. And eye injections really aren't the most pleasant thing that you can contemplate in life. But I have never feared them, even from day one. And the reason I have never feared them was my complete and utter trust in Professor Guymer. I know from personal experience that she has her patients' very best interests at heart. It was my experience as Professor Guymer's patient that made me apply to be a member of the community advisory group at CERA.

And as a social science researcher, I believe that much more can be gained from involving people who are the consumers of research than not doing so. We consumers of research are really wanting to just help find a cure for eye diseases. We certainly don't want to take over the research process. That is not what we're about. But what we are about is helping the brilliant, dedicated researchers to achieve their goal, which is the same goal as ours, which is finding a cure, in my case, for macular degeneration, but much more than that for every eye disease. So, really, that's why I'm on the committee and, so far, it's been one of the best experiences I have ever had on any committee. And I say that quite genuinely and from the heart. I think we will make a difference. Professor Guymer is more than a brilliant, internationally acclaimed expert in the treatment of macular degeneration, wet and dry. Early in her career, Professor Guymer was caring for patients with age-related macular degeneration.

And at the time, very little was known about how we might deal with it, whether there would ever be a cure. So, it was this idea that she thought to herself, maybe I need to spend less time saying the same things to each patient as they come in and actually concentrate on trying to find a cure, which is one of the reasons that Professor Guymer went into research. And she thought that she could actually make a difference. And I think what I'm going to quote here shows you really the humanitarian nature of this wonderful woman. And she said, and I quote, I could do research and help find a treatment that could change the lives of an infinite number of people. So, that's what she went into, to the research side. Her decision to opt for research epitomises Professor Guymer's humanitarian approach in her research and in her clinical practise. I now have the privilege of introducing CERA's Deputy Director and its Head of Macular Research, Professor Robin Guymer AM. She is also Professor of Ophthalmology at the University of Melbourne, Senior Retinal Specialist at the Royal Victorian Eye and Ear Hospital, and an inaugural Fellow of the Australian Academy of Health and Medical Science.

Time only permits me to mention but a few of the honours that have been bestowed on Professor Guymer. They include being the recipient of the NHMRV's 2016 Elizabeth Blackburn Fellowship for the Top Ranked Female Research Fellowship in Clinical Medicine. Being inducted to the Victorian Women's Honour Roll in 2021. Being routinely ranked among the world's top researchers for macular research. And for the past two years, being named the top researcher in optometry and ophthalmology by The Australian Research Magazine. Please join me in welcoming Professor Robyn Guymer AM to the podium to deliver the prestigious 16th Annual Gerard Crock Lecture titled, 'How Will We Know When We Are There?' (APPLAUSE)

PROF ROBYN GUYMER AM:

Terrific. Thank you very much, Colleen. There's certainly not much wrong with your eyesight, as far as I can see. I think I've done a very good job. Thank you, Keith and Colleen, for that lovely introduction. It's a great pleasure to be able to give the 2025 Crock Lecture. I would first like to also acknowledge the traditional owners of the land in which we're meeting, and Elders past and present, and also anyone in the audience that's an Aboriginal or Torres Strait Islander. So Gerard Crock, as we heard, was an inspiration to us. He was definitely an innovative surgeon, but also a very compassionate clinician. I actually didn't have the honour to work with him here, but I certainly was the beneficiary of his registrar training program that he set up at the Eye and Ear Hospital, because I trained here in the early 1990s and certainly appreciate that opportunity to do so. But I actually knew about the Crock family long before I actually started in ophthalmology, because his niece, Carmel Crock, and I went to high school together.

And so whilst I was a year older than Carmel, I was certainly well aware of her existence at school, and her leadership qualities were shining back then, and she ended up being in the leadership group of elected students in her final year. And so she came to be the director of emergency here at the Eye and Ear Hospital, and so I've known her for a very long time. And just perhaps a fun fact, our very own newly minted professor of ophthalmology, Lyndell Lim, entered the school several years after us. I won't tell you how many after us, but clearly there was something in the drinking water at our school that pointed us in the direction of ophthalmology. So tonight I've entitled my talk, How Will We Know When We Are There Yet? It was both cryptic and enticing to get you all to come and have a listen, but what I wanted to do was to take you on a journey so that you can gain an understanding of the challenges faced when we take a chronic disease of aging, like Alzheimer's disease, but today age-related macular degeneration.

And if you want to intervene early in the disease to prevent or at least slow down the progression of the long-term consequences of that disease, that can take decades from the first signs and symptoms that are recognised, how can we prove that we've got an intervention that works? So it's very opposite to something like an infective disease. Let's take COVID. No treatment, you get a viral illness, a percentage of the population will die, you then discover an antiviral or a vaccine, and in a very short amount of time, you will know that you have a treatment that works, and then you can sell that treatment. It's very opposite for a chronic disease of aging. Ideally, you want to intervene early in the disease. You don't want to have to wait for someone to have the chronic outcomes. And like we see this in Alzheimer's disease all the time, you wait till there's memory loss, you try a trial, it doesn't work, it's probably too late. But there are examples like cardiovascular disease where we don't want to wait for the stroke or the heart attack.

We know that there's a risk factor, blood pressure, you intervene early, you treat blood pressure, and you hope to reduce the long-term consequences. But so far in age-related macular degeneration, we wait for vision loss, and then we try to make the most of a bad situation. And this is not good. We really want to try and intervene much earlier. And often in AMD, there's decades that you have to intervene, if only you knew how. The problem is pharmaceutical companies or venture capital funds don't want to have to wait years for the outcome of their trial. They want one, two, or maximum three years to know that their drug is working so that they then can get regulatory authorities to agree that they can sell it. And herein lies a very major problem. How do we know and prove to ourselves and others that we can make an impact on the outcome of a chronic disease in a practical time frame if we want to intervene early? And we don't want to have to wait years to find that proof. So I wanted to take AMD as an example of a chronic aging disease and to go through the issues we face and how we're trying to tackle these.

And I'm particularly happy to do so because it gives me the wonderful opportunity to be able to tell you what we actually do in the Macular Research Unit at the Centre for Eye Research Australia and what occupies us every day. So I started the Macular Research Unit 28 years ago. And this is a picture from our 25th anniversary picture. And I just thought this was an opportunity to show the immense amount of expertise we have accrued over the years in the Unit. And we're not basic scientists. We don't use petri dishes and test tubes. And we no longer run pharma clinical trials in the MRU. That now goes over to our clinical trial centre, Cerulea. So what we do instead is develop a really deep understanding of the disease, AMD. And what we want to do is to understand who's at risk, who's progressing, how might we slow that progression, and how might we intervene early and design a study so that we can prove we're actually making a difference. And so I wanted to take you through the daily life of a participant in the Macular Research Unit.

So first of all, you would come along and you would have your vision done the same as you would when you went to an optometrist where you would read the chart. We would then turn down the contrast because we'd want to see how that impacted on your vision. We'd ask questionnaires, quality of life, general health, diet, lifestyle questionnaires. We'd then turn the lights out and see what you can see in the dark. And then we want to know what's called functional vision, so how well you do at reading, what sort of size print, how fast you can read. And then we'll sit you on a machine and we'll give you a buzzer, and we'll shine light in the eye at various places in the retina and ask you to push a button when you can see the light. And we might do that once, twice, or three times depending on the study. And then we'll do the same again in the dark. So we'll turn the light off and we'll make the light really dim, and we'll ask you to push the button. And hopefully, not like me, you don't fall asleep in the middle of the test.

And this could take one or two hours, and you think you've finished, but then we want to do all the imaging. So then you'll get a fundus photo, which is really what I see when I look into someone's eye. And then we have what's called an OCT machine, which really can take really histological level detail of the cross-section through the retina. And then we can do an autofluorescence image that will tell us dead cells from living cells in the back of the eye. We might use a hyperspectral camera that's being developed here to shine different wavelengths of lights in to see if that gives us different information. It's now possible without any dye in the eye to actually look at the blood's flow and the blood supply at the back of the eye. And then finally, you'll get to see someone that will look in and actually tell you what they see. And that can be two or three or four hours after you've been with us. So whilst you're in with us, we will also do a few things. We will take blood. And whilst we're not basic scientists, we will actually enable our basic science colleagues to do their work.

So blood DNA will go to WEHI at the moment to look at genetic risk factors for AMD. We'll take a skin biopsy. And that will go to Alice Pebay at the university, who will take skin, make stem cells, and then make retinal cells, and then interrogate them in a dish. We'll send fresh blood to Erica Fletcher at Melbourne Uni, who together with us is interested to understand the underlying cause of the disease. And at the moment, we're thinking it's an immune disease. And so she looks at the white blood cells. We will have well-characterised that patient. And so if they're suitable, we'll send them to the clinical trials unit to be involved in some of the state-of-the-art research trials. And because of the beautiful imaging and functional data that we will have, our data is in demand for artificial intelligence. So we will share with many researchers and industry around the world all our images and data so that we can develop algorithms to better help us understand and interrogate this disease.

And whilst we're sending all that to our collaborators, what are we actually doing? Well, we take the images and the data, and we process them. We clean them in our image data centre. And we have our students and our senior researchers doing some work. But really, the true magic happens here with the Associate Professor Zhi Wu, whom you'll meet later. And he somehow takes information that comes into that computer and translates it into truly meaningful, clinically relevant translational information, which then we have the opportunity to go and stand in front of posters and write papers. And somebody's got to travel the world and tell everybody what we're doing. So that falls to me. So I get to tell people what we've found and also get invited to these working groups and think tanks to try and understand and take AMD a lot further. But also invited to advisory boards of pharmaceutical companies and biotechs to help them plan their trials in age-related macular degeneration. So now let's just move on to AMD.

So the way I like to think of it, and it is the most common cause of poor vision of people over 50. So it's very common, and indeed there's people sitting with us tonight that have AMD. So early on in the disease, you often have no symptoms, but you develop these fatty, lipid-rich deposits at the back of your eye called drusen. And they don't necessarily cause any symptoms, but increase the risk of you running into trouble later on with what's called late macular degeneration. And there are two types, which Colleen alluded to, the wet one where you get this sudden bleeding of blood vessels at the back of the eye with a really quite profound loss of vision. And then a much slower, what's called geographic atrophy, or dry AMD, where cells just bit by bit die and photoreceptors are no longer there to receive the light. So dry and wet macular degeneration. And when I started training, there really was no treatment for either form. And so you ended up with these big patches in the middle part of your vision that did not work.

So either total loss of the cells or this big fibrotic scar as a result of the bleeding form of macular degeneration. And so what that does is completely reduce someone's quality of life. So reading, recognising faces, and driving are the big three things that become very difficult or impossible. This increases the risk of falls and depression. So I'm sorry that some of that stuff you cannot see for some reason. But anyhow, what it says is there are a few obstacles to overcome. So a few. We don't know the cause. We don't know how to stop people getting it. And if you've got it, we don't know how to stop you losing vision. So my daughter, who's an organisational psychologist, is very important to have positive reinforcement in the workplace. So we've been lacking some for a while. But I think that goes to the tenacity and perseverance of the macular research unit that we're still here, 28 years later, trying to solve this problem. But it's not all negative. We have made big inroads into the treatments of the late form of macular degeneration.

So let's just go through those initially. So what pharma has been doing is trying to initially reduce the devastating consequences of the wet form of macular degeneration. So let's say you have a treatment that you can use by putting injections in the eye very frequently in the long term. Is it possible to change this outcome from this terrible scar that you can see at the top? So if I give this treatment, can I make a difference to this patient? And here you can see on the OCT scan this terrible amount of blood under the retina. And these drugs stop bleeding. And they return the retina pretty much to the way it began. And so with those treatments, we really had a miraculous outcome. So in the pivotal trials in the 2000s, the end point of these studies was actually to improve vision. So you can see there in the blue, the sham arm or the natural history is for someone to very dramatically lose significant lines of vision on the eye chart that you would see in the optometrist practice. And so with the treatment, not only could you improve the vision a little bit, but it stayed quite stable over a two-year period.

And so the regulatory authorities said, OK, you've improved vision at least three lines on the chart. Terrific. You can have that drug. And so the minute that it was introduced in 2006, we really halved the rate of blindness with those treatments. And this is some data from a country, Denmark, that actually records the number of people who are legally blind. And you can see very dramatically this quite miraculous outcome from trying to make the best of this bad disease when you had bleeding. But the problem is with wet macular degeneration, we do OK for a little while. And then we see this slow deterioration of vision over time. And what tends to happen, we're treating the bleeding blood vessel, but not the underlying disease. So we haven't done anything to address why that blood vessel bleed in the first place. So what we tend to find is that the eye becomes the dry form of macular degeneration. So even though we've done a great job with the wet, people still lose vision. So the unmet need there is to try and find a treatment for the fibrous scar, but also the atrophy.

So now we then move to the other late form of disease, the dry geographic atrophy. And we say, well, can we find a treatment that can improve vision like we did in wet macular degeneration? Can we use visual acuity as our endpoint to prove that those drugs are also working? And so really, this has been work over the past few years, these trials for dry AMD, for which we've had no treatment to this point. And this picture really shows you the coloured photos, what I see when I look in an eye. And the black and white one tells you the difference between living cells and missing dead cells. So the black areas are patches missing. And I tell patients this is like having moth-eaten holes in your vision. But interestingly, even though I think we would all agree this is not a good look, the patient actually sees 6-6. The patient actually sees normally, because that little bit in the middle is still working fine. And so the problem in this disease is, hopefully, you can see that over the three-year period, this person's patches of photoreceptor cells that take the light are increasingly missing.

But the vision remains the same. And so even though this person will think that there's something wrong, they stop driving at night, they're missing letters on either side when they're trying to read, they lose their line, if they come to a study that has vision as the outcome, this person has normal vision throughout. Yet we know that this is the commonest cause of poor vision in our community. And we know eventually this person will lose vision. But in the time that you might do a study, this person appears to be functioning quite normally. And so for these studies, what has been agreed is that rather than prove that the vision got better, why not show that you can change the slope of the growth of those holes? So the aim of these studies that are currently ongoing are that you can change that trajectory so that the slope of the growth of the holes is less. So that's good. And so the very first treatment that was shown to be beneficial was this drug called Pegcetacoplan. The company was called Apellis.

And they gave injections every month or every other month for two years in an eye. And you can hopefully see if the sham group is the grey slope there, we've slightly reduced the rate of growth of those holes with this treatment into the eye. And so it's a modest benefit, but it is the only treatment that we've got at the moment that will slow the growth of those holes and presumably save vision. But as expected, as we intimated, the visual acuity was no different. So despite injections in the eye, for two years, they were unable to show a benefit to vision with this drug. The FDA, however, the American authority that approves drugs says, that's fine. You can have this drug. And indeed, all the press at the time, which is in 2023, so two years ago, were saying this is the most important event in retinal ophthalmology in more than a decade. And Wall Street analysts said that probably this will translate to $3 billion of peak sales for the company. So it's looking good. Small pothole along the way is that, so the European Union said, no, you can't have this drug.

You can't market it because it did not lead to a clinically meaningful benefit to the patient. And the UK and Canada similarly said, no, we can't have this drug. We are concerned about whether a meaningfully improved patient's ability to see and manage their daily tasks during this trial period. So we're stuck with the situation now where the world is divided in many ways, you might argue, but for tonight, in who can have the drug and who can't. So in 23, America said, yes, sure, you can have the drug. Everywhere else in 24 said, no, you can't. And surprisingly, at the beginning of this year, Australia said, well, yes, we can also have access to the drug. So the dilemma here is that the world agrees the drug slows down the growth of the holes, but most of the world didn't see the benefit in doing that for the patient. And herein lies this.

A major problem in understanding what's called a surrogate endpoint. So a surrogate endpoint is essentially a substitute. So we want to use the size of the hole for the real thing we're interested in, which is visual acuity. And that will enable us, hopefully, to get a quicker result and then get the drug approved. And it's just really whether or not people understood the use of this surrogate. And so the FDA had data from 30 years ago, this old paper, where they could shine a light in the bits of the retina that were missing and were able to prove the person couldn't see, as you might expect. And they're called deep sensitivity losses, or scotomas. And so the FDA argued slowing the growth of the GA area is an acceptable endpoint for a trial, since slowing the growth reflects evidence of slowed photoreceptor loss, and you need photoreceptors to see. So they sort of got it. And so this is the current state of affairs. Yes, for USA and Australia, we understand that slowing the rate of the cells dying, the retinal cells, the photoreceptors, is a good thing, so you can have the drug.

Europe, UK, Canada say, we understand that the drug slows down the loss of the cells, but we need to see that there's a benefit for the patient within the trial that you are conducting. So how are we going to do that? So that then brings us to this machine called a microperimetre. And this is the one where we get the patients to sit there and push a button when they see a light. And we increase the brightness of the light until a person sees it. And if it goes as bright as the machine can do and they can't see it, basically it's a bit of dead retina. It's like a, it's called an absolute scotoma. Patient cannot see. And here is a video of that task, which isn't the easiest thing in the world to do. Hopefully, you can see that the patient needs to push a button when they can see that light. And so the normal microperimetry, you want to take about six minutes, because after that, patients lose interest and they're not so reproducible, the results. And so a normal perimeter would look at these points in the retina and they would measure how bright the light is to be able to see it.

And the study that I've been talking about, they did do this. And what they did was they looked at all the points and just took the mean of all the points. And also, they just counted the number of spots that were black. How many spots could the patient not see? And unfortunately, despite doing that, two years down the track of all those injections, no difference. So they were unable to show a benefit when we did this quite sophisticated test. However, the absence of evidence of a benefit is not the same thing as evidence of absence of the benefit. It could just be we did the wrong test, yeah, or we had the wrong trial. It was just a two-year study. GA is a very slowly progressive disease. If only we had awaited three years or four years, we wouldn't be in this situation, but the company only did a two-year study. But when they looked at function, there was no benefit to vision, no better to reading speed, looking in the low light, no difference. And that perimetry test, when they just did an average of all those points, no difference.

And so, will we be able to show that there's a difference? Is there a way of proving in a feasible timeframe, one or two years, that increasing the growth of those holes, which is a structural change, is associated with more bits of the retina that don't see, so a functional change? And this is where we call in the cavalry, we call in Zhi Wu again, and we ask him for his help. Can he think of what to do? And so he has this strategy called defect mapping microperimetry. So he says, we don't really care what level of vision someone sees, we really just care can they see it or can they not see it in these spots. So if only you ask, can you see it or can't you, you can probably do many, many more spots over the same sort of time interval of six minutes. And so we would expect to see that as the GA area grows, there would be a corresponding enlargement of the number of spots that you can't see. And so the research question he wanted to answer was, could he come up with a testing strategy that was optimised to look at the extent of those deep sensitivity losses and provide an effective means of capturing this progressive visual function decline over time in geographic atrophy.

So the first thing he had to do was ask the company, could he please fiddle with their machine? Could they give him the ability to tinker around with the back, which they said sure, but only on the machines here. And so in a six-minute test, he was able to change 68 points to 208 points. And we had Emily Glover, our coordinator's job was to get 50 people in to do this test twice every three months for 30 months. And then Erin Gee, who's in charge of very painstakingly overlying the image of the hole with the function so that you could look at the structure function correlations in all these tests. And so what we found was a very, what we might expect, a very significant association between the number of spots missed and the percentage of spots that were in this, the percentage of area that was in this geographic atrophy. So we published that last year. And then if you follow people over time and you looked at the probability of a spot worsening, going from seeing to not seeing, it was significantly associated with the change in the percentage of overlap with the patches of not working retina.

And this is a very beautiful example. If you have a look here, this is the same eye in example one. Over a period of time, the geographic atrophy increases by 18% and the number of spots that you don't see increase by 17%. And another example, the atrophy increased by 20%, and the number of spots missed also increased by 20%. And so this part, this work seemed to confirm that the change in the GA extent is associated with a functional change, the number of spots you don't see, as you would logically expect, but no one had ever been able to show that before. And the findings highlight that the expected functional relevance of GA progression demonstrates a potential effectiveness of micro-perimetry, that test, to capture that change in function. And so this strategy would be useful for capturing treatment effects on preserving function in clinical trials of geographic atrophy, aiming to slow the growth of those holes. And so we pleaded and we harassed the company and we said, could you please make this software fix available because now there are many trials underway and ones in planning that really want to take on this modification.

And they have said there's regulatory constraints so they can't do that, but guess what? We've made a new perimeter available this year and they will put his strategy as a standard testing strategy on that machine. And pharma appear confident that reducing the number of spots that do not see is an acceptable functional endpoint that we should be able to get the regulators to agree. And so we think that was good. We think, yay, we've done something useful, and we certainly hope that the NHMRC reviews that are going to look at Zhi's fellowship application this year can see what a major impact that test should make. For many people, we should be able to push all those naysayers over to the yes, so that have this drug available to everybody in the world and also all the new studies coming up should be able to use that test. So fantastic. So what about just before we finish, what about where we started with, which was, well, why not intervene early, which is where we would like to play, we would like to stop people getting those later stages of the disease.

And so when I was a fellow at Moorfields, now many years ago, we took the laser that was in the clinic to treat diabetes and we were able to show that we could actually reduce that drusen burden that we started with, that risk factor by applying this laser to eyes. But it wasn't a fit-for-purpose laser, and so there's this laser company in Australia called Ellex, which is now called Nova Eye, that makes really good lasers. And so they made what was called a nanosecond laser that took the good parts of the laser that we had sitting around and made it specifically designed to get rid of that deposit at the back of your eye. And so we did a very small pilot study with money from the Victorian Government and we could show that we could get rid of that deposit that drusen, that risk factor. But as we've been saying, the visual acuity was good at the beginning and the end, so I can't use that as an endpoint. There's no geographic atrophy to measure the rate of growth, so I can't use that as an endpoint.

So, how am I going to prove that this laser actually reduces the risk of vision loss down the track? And so we come back to this original photo, it's this journey, how am I going to stop needing years to be able to show that this or any other intervention early in the disease makes a difference? And I think you're probably wondering what this photo is. What are my children doing staring into the distance in the Scottish Highlands? Well, it's as you would, you try to reproduce the James Bond Skyfall photo, and I think we probably did a very good job. We didn't have the panache of the Aston Martin, but other than that, we did a good job. But anyhow, getting back to AMD. So here we have a high-risk drusen eye, and a few years later, you can hopefully see that there's a patch of atrophy developing in this eye. But we can't wait this long for this to happen. So fortunately, there's been advances in the imaging of the retina, and this is the OCT scan that I told you that we did on our patients. And it really allows us to see the underlying pathology much better and much more granular change over time.

And so in this eye, if we do the OCT scan, we can see when there is just the drusen, you can see these lumps, which are the drusen. And then hopefully, you can see on the right side, this patch where half the retina is missing, the photoreceptors, the supporting cells of the photoreceptors have gone. And so the question was maybe if we followed these changes over time, we might be able to identify the very first time when the retina starts to have cells dying. And so could we identify changes on the OCT indicative of the very first signs that cells are dying that preceded the bigger patches of cell death? And that could act as that surrogate that we talked about before as an early endpoint that we could use in early studies before all those cells were dead. And here, we enter PhD student, Zhi Wu, who more than 10 years ago now was given this as a task. And so he had to bring in patients, 181 patients, and he saw them every three months for 30 months. And his task was to follow the change of the drusen over time.

And if you see this video here, so it's the same patient, three monthly coming into the clinic. And hopefully, you can start to see as the drusen and materials start to go away, you get this collapse of the outer retina and total loss of those photoreceptors. And so he was able to report to us there were signs that he kept seeing that would predict the outcome of atrophy. And so we called that nascent geographic atrophy because it portend the development of atrophy. And our publication was highly cited and way above the usual citation index of publications in ophthalmology. And actually, Zhi won the Dean's Prize for his PhD looking at this work. So it also was the backbone of a new classification system for AMD. And so a very niche little group that I belong to is called the Classification of Atrophy Meeting Group. And we're trying to redefine AMD based on all that modern imaging. And really, that picture there shows our pictures, which people spent hours looking and trying to come to some consensus about a new classification system, which really has been adopted worldwide.

And in the meantime, we were back at home trying to prove that nascent GA was a true surrogate of GA by showing what the risk of progression was. And indeed, if you have nascent GA in two years, more than a third of people will go to GA. And in 30 months, more than half the people will go to this geographic atrophy. So if you have nascent GA, your risk of progression to that late stage is 78 times someone who does not. So we think nascent GA is a very nice surrogate endpoint that you could use in clinical trials. And so we were able to go back to that laser study that we talked about and use the Australian-made laser and do a very large study of almost 300 people, mainly in Australia, and look at randomising people to laser or not to see if we could slow progression. And we used, for the very first time, nascent GA as the endpoint. And indeed, it remains the first and only study to actually have that as an endpoint, as well as later stages of the disease. And what we were able to show that in the vast majority of people, so 3 quarters of the people with the common form of macular degeneration, we could slow that progression fourfold with the laser.

And so, as I said, someone's got the trouble of having to go around and tell everybody. So I was able to present this work as late-breaking news, both in Europe and America. And there was a lot of interest. The results are promising. They do need to be validated. And NovaEye, the laser company, still continues to seek investment to try and replicate that study. And in that study, we used nascent GA as our endpoint. But the problem is the FDA currently does not look favourably upon an event-based outcome. They prefer a continuous outcome, such as the change in the slope, which we talked about with geographic atrophy. So even though we think that you should be able to stop a study here, the FDA does not want these incident endpoints. And so what do you do? You go on a sabbatical. So in 2020, I went to a big pharma company, Roche in Basel, who also owns Genentech in the US. And one of my goals was to convince them that they needed to have an early endpoint, because why would you have a discovery unit in your big pharma company if you couldn't prove that your drugs were working?

So they needed to be happy with an early endpoint. And then together, we could go to the FDA, no point us trying to go to the FDA. So they put in $40 million US for an observational study, which is unusual for a big pharma company, to look at the progression of the intermediate AMD to try and validate these early endpoints we've been talking about. And so the study is called the HONU Study. And its primary objective is to assess AMD progression and rates of conversion from nascent GA to GA. And we're using another one of these protocols, which looks at these tiny little spots, to see how we can measure change in function over time. We have 400 people fully enrolled over 72 sites in six countries. And our aim really is to get the regulatory authorities to accept this nascent GA as a primary endpoint to enable pharma and all biotech to be able to start to run these early intervention studies. And so not just stopping there, we also need more consensus, the FDA-like consensus. And so last year I had the opportunity to run a working group to try and our task was to plan the next generation of intermediate AMD studies.

And we sort of compromised in this publication. And we said, well, we'll have multiple endpoints. We'll do yours and ours. We'll do an incident endpoint as well as a change in growth of a slope endpoint. And so the idea is to keep feeding the FDA all this consensus documentation to help them make up their minds. And so what if they're not going to accept nascent GA? What if they want to go a bit further along in the disease process, a little bit of GA? What would that look like? And so we went back to this self-proclaimed expert group of the CAM group. And we said, can we get you to agree on when could we stop a study? How much atrophy would you need to be happy that a drug was working? And we actually got consensus on two things. One, that they agreed that you should be able to have the onset of atrophy as an appropriate clinical endpoint to evaluate an intervention. And they also agreed that that endpoint could be structural. So anatomy, it didn't have to be functioned. But had to have at some point in the past a study showing that the anatomy correlated with the function.

So, exactly the sort of work that we do. So very important to get that consensus. It's called a Delphi Exercise. And that was published this year. And again, just trying to nudge the regulatory authorities towards allowing us to do earlier studies. So what now? So I think we continue to advocate for a structural endpoint in these early intervention studies. There's still concerns that perhaps reducing the number of spots that someone doesn't see isn't thought to be clinically meaningful. And so we're about to embark on doing some questionnaires, what are called quality of life questionnaires, to try and link quality of life issues, driving, reading, with the growth of GA, which is going to be very hard. But we'll try to do that. We want to highlight the devastating consequences of GA. So with Apellis and Bonn, our researchers in Bonn, we're looking at the percentage of people with geographic atrophy who have lost the ability to drive and read by the time of their death. And with Astellas, we've got this time trade-off study going where we're going to ask the number of years of life with poor vision.

Someone would trade for less years of full vision. And then we're going to try and continue to help the laser company raise their money for their definitive trial, because actually, that might actually work. And so I hope I have been able to show you the work that we do in MRU and the role we play in the international community. There is this website called Expertscape. And this year with a snapshot, it said that we were leading the world in intermediate AMD and Zhichao and I are up there at the end, one in four, the middle one, the second one is a retired lady, so we don't need to worry about her. And the other is an Italian, so we don't need to worry about him. So, we've pretty much cornered that market. And so it just leaves me to thank the entire MRU team. We're quite small now, but very dedicated and effective. So, Zhichao Wu, Emily Glover, Erin Gee, Carla Abbott, Emily Caruso, and Elizabeth Baglin. And really, without the coordinators who managed to convince patients to come in, we really would have nothing to talk about. And through the 28 years, many people have gone through the unit.

This is just a snapshot of some of them, all of whom have contributed to the work that we've done. And certainly our collaborators the support staff at Centre for Research Australia are our collaborators within CERA, particularly the Ophthalmic Neuroscience Unit and the clinical trial site. Our local collaborators, particularly Erica Fletcher and this bigger Melbourne collaboration with NHMRC Synergy Grant and then our international collaborators as well. And finally, I think all of MRU would like to thank the patients who so willingly give us a lot of their time with really no benefit to themselves. We're not offering them a treatment. They're basically coming in to help us understand this disease. And then the funders nationally and internationally, our industry support partners and also philanthropy and everybody that gives an individual donation to CERA and to us. And then finally my family, Graeme, Andrew and Gillian, for their unwavering support. And that finishes me, and now I think we have a panel discussion.

Thank you.

PROF KEITH MARTIN:

Thank you, Robyn. What a tour de force, and it just shows you how determined you have to be to actually make changes in the real world. And Robyn has this incredible ability to persevere through all of the challenges and to answer the critics and to build a new way of thinking about AMD and now to build new ways to treat it, off the back of that to get these new treatments through, to muscle through global clinical trials that are actually going to make a difference. And with the laser treatment, hopefully some of that's going to prevent people getting late stage disease in the future. So, I think that's absolutely incredible. And I know many of you will have questions for Robyn. So, we've organised a panel. So, I'll ask Robyn to have a seat as she has done. And joining her on the panel are a few other people. So, first up, it's my pleasure to introduce someone you've seen already quite a lot tonight. This is Associate Professor Zhichao Wu, and I've got about three pages, which I'm not going to read because we've heard all about the sort of great stuff that he does.

He's a spectacularly effective researcher, Head of Clinical Biomarkers at CERA. And is really one all manner of award and is doing great work taking this work forward and helping move it into the real world. So, Zhichao, can you come and join us on the on the panel? And next we have Olga Maxwell. So, Olga lives with geographic atrophy, which you saw pictures of tonight and has been a participant in clinical studies led by Robyn at CERA for the last 16 years. So, Olga, please, please join us. And finally, I'd like to introduce you to Emily Caruso. So, Emily is an orthoptist and senior clinical trials manager in the Macular Research Unit. She's worked with Robin for more than 13 years, I think, and has been part of many of the pivotal trials, including the global study on the laser that you heard about today. So, Emily, come and join us. So, the panel are going to kick off with a short discussion. If you have questions in the audience, please raise your hand and Mat or Mandy will be running up and down the sides with microphones.

And so you can ask your question and if you're watching online, Callum is moderating the questions. So type in your questions and we will address those. But I'll pass over to Zhichao to take charge.

A/PROF ZHICHAO WU:

Great, thanks very much, Keith. And thanks, Robyn once again for your talk. I too am quite wowed by hearing you present and explain that work so impactfully. So, and I want to thank all of you for being here again tonight. And I just want to kick off the discussion tonight in this panel by actually directing the first question to Olga and Emily. Because Olga and Emily, you've both been with the Macular Research Unit for a very long time, Olga, for about 16 years as a research participant, and Emily for about 13 years as a research staff. So, can you tell us a little bit about why you have kept stay with us for all this time? Why are you not sick of us yet? And what has kept you staying with us? I might start with you, Olga, if you can tell me.

OLGA MAXWELL:

About I find it quite gratifying to be able to contribute to society by being in the clinical trials and also by assisting the scientists who are working so in such a dedicated manner and for such a long time, to try and find not only just a treatment, but a cure for people like myself. I was diagnosed when I was just, I just turned 50 when I first saw Robyn. And it's very supportive to have such a great team behind me and to be able to know the condition, how it's changing and to be explained what's going on. And also the advances that are being made and like I said I feel quite fulfilled that even though I have dry macular, that I can actually contribute to their work. So, yeah, that's me. And, and they're a great team and they're a lot of fun to work with. So, that's why I keep coming back.

A/PROF ZHICHAO WU:

Yeah, and we love having you. Thanks. And what about you, Emily?

EMILY CARUSO:

For me? Well, definitely actually, the patients make it wonderful. So, the people that we work with, just as Olga said, have been with us for a long time, and they really have just got such an altruistic view. And realistically, some of these trials that we work on don't affect them directly, but they do it for future generations, for their kids and grandchildren. And for the future of medicine and for research. And so when we work together, we were together for two to three hours, as Robyn said, multiple times a year. So, we get to know each other very well. And for me, it's an absolute privilege. Privilege because I get to be their first point of contact. If they're worried about their eyes, they know they can ask questions, we have the time to talk about it. We can look through their results. And so if they're worried or concerned at home, they know who to call. And we work together very well, which I really, really value. But also working with people like Robyn and Zhi for such a long time, working with Robyn for 16 years.

And it's incredible to be part of this amazing research and working on it and finding the progression and trying to help people with vision loss, and trying to find ways to help people with the treatments, with macular degeneration. And I think with everyone in our team, we have a common goal of trying to help slow the progression or prevent people from having vision loss, which definitely keeps me coming back.

A/PROF ZHICHAO WU:

That's amazing. And look what you guys are doing as the research participants and as the staff is so foundational in the backbone of that impactful research that Robyn's describes for us. And so I might now open the floor to questions. I'm sure many of you might have itching questions for Robyn, and there'll be a roaming mic across two sides of the galley. So, if there's anyone out there and Lahiru perhaps will be first to take us off.

DR LAHIRU GANGODA (AUDIENCE MEMBER)

A question for Robyn. How early can you give Pegcetacoplan? Can you give it to a patient at a nascent GA stage or like, do you have to wait until the hall's dead patches appear?

PROF ROBYN GUYMER AM:

That's a very good question. So, in America, they basically said, you can have it for anybody. And what happened there was they started to go earlier and earlier, but then there were some quite significant side effects so people stopped. In Australia it's not on the PBS yet. So, they've said, yes, you can have the drug and there will be some criteria around those most at risk of losing vision that it's likely maybe to be paid for. We don't know that yet. So, you can start as early as you like. The problem is, there are risks associated with sticking a needle in your eye every eight weeks for forever. And in this particular drug, perhaps one or two more risks than what were you aware? What we're used to for the wet AMD. So, the hope, the real excitement is that we now can impact that cell death. And so all we need to do now is work out how to give it in a safer way. And perhaps not so often. And then we can start to do it earlier.

A/PROF ZHICHAO WU:

Fantastic. Thank you. I think there might have been another question over there.

AUDIENCE MEMBER:

Thank you. So, this is again about the nascent GA. The images were interesting but kind of part of the story. Are you starting to understand what the bio molecular basis of these changes might be, You know, is it lipid oxidation or do you have any leads on that?

ROBYN GUYMER:

So, as I said, we don't know the cause of AMD yet, but there are many theories. And some of them are oxidative damage to the photoreceptors. Some are so one of the genes that are associated with lipid pathway genes. And so it could well be that this is lipid build up in some people, which stops oxygen getting through to the photoreceptors. But at its core there's a layer of cells called the retinal pigment epithelium that support the photoreceptors. And they're dying. And you only get one lot of those when you're born and they get old and they accumulate debris within those cells. And the point of that laser study was actually to rejuvenate those cells or indeed cause them to divide. And so you get new ones. And that's the they're the cells that you need to save. And a lot of the treatments at the moment are just trying to save the photoreceptors. But that's not the cell that causes the problem. So, we do we all know that. We think it's the retinal pigment epithelium that is sick. But whether it's sick from damage, from oxidative damage, sick from lack of blood supply, sick from lipidy deposits that stops stuff getting through or from inflammation as a result of build up of debris.

Inflammatory cells come in and then cause this very inflammatory milieu that the cells don't like.

A/PROF ZHICHAO WU:

Fantastic. Thanks, Robyn. Anyone else up the back there, sir?

AUDIENCE MEMBER:

Yeah, question for Robyn. As we know, AMD has a strong genetic component. Do you think it's gonna be possible to identify people when they're very young, who are at high risk or low risk of developing AMD using DNA?

PROF ROBYN GUYMER AM:

Thanks, Bob. So, AMD is really sort of the pin up poster boy of the genome project, because it was a chronic disease for which they found a lot of genes associated with the the risk. And so it's not like cystic fibrosis where there's like one gene. And you if you've got that you're going to get the disease. It's a complex disease where there's now up to, I think, 63 different variations in the genetic information that increases or decreases your risk. And unfortunately, about half of us have those risk factors. So, it's not quite as simple as just finding a risk score. And indeed some of these work is to show that actually if you add the genetics to the what you can see, it really doesn't predict progression any more than if you just look at the risks that you can see in the structure. So, I don't at the moment we've got a good handle on the little changes that cause AMD, and unfortunately they're fairly common within us. So, it's not gonna be the exact answer that we need.

A/PROF ZHICHAO WU:

I think we're just spoilt by great imaging that we have available. I'm just cognisant that there may be questions online as well. Callum, is there one? Or if there's one back there?

CALLUM:

Thank you. Yes, we do have some questions online. Jeffrey says thank you for a wonderful presentation. Would it be useful to use anti-amyloid treatments to target drusen and affect nascent GA?

PROF ROBYN GUYMER AM:

So, amyloid is as a deposit that we know about for Alzheimer's disease. And there are very there are a lot of similarities between those two diseases. And indeed you can find amyloid in the retina. And so potentially it may have a role, but it doesn't seem to be a major role in the deposits that we know as these drusen. They tend to be much more lipid based. And so at the moment, don't know, but certainly the eye and looking at that amyloid may be a very useful window into Alzheimer's disease, which of course, a team at CERA and the Florey are certainly interested to look at.

A/PROF ZHICHAO WU:

Absolutely, great question. I've just been given the indicator that we only have space for one more question, and I don't want to auction it off, but the first bit has gone straight on there, go for it.

AUDIENCE MEMBER:

First of all, I'd like to say thank you to Robyn for the beautiful speech. And you have a lot of, like, fantastic team working alongside. I think I have a question for Emily, just out of curiosity. You've been dealing with a lot of clinical trials, and you have a lot of different patients. And patients vary from, you know, many like very diverse and different skills as well. And there are a lot of tests involved in the clinical trials. May I ask if there's any like, limitations in the aspect of like literacy, for example, like reading. Does that come across as a limitations between patients to patients, and how do you overcome that or you know.

EMILY CARUSO:

Yeah, of course great question. So, in our trials, I think from a language point of view, most of them are English speaking, just from an ethical point of view and consenting and things like that as well. There is always an element we can bring in if we need interpreters. In regards to the testing we've been doing for a long time, and we practised on one another to make sure it's as clear as possible. And a lot of them, it's about concentration. So, from a skill level, as Olga will definitely know, it's more about a tiring how tiring the test can be, which is where the biggest limitation can be. But from a skill level, it's across the board. And I suppose it's more physically the comfort, you know, sitting on a lot of equipment can be, uncomfortable over two to three hours. But we have time, we have breaks. We can do it over multiple days and things like that. So, we were working with the patients because we're very grateful for them to contribute their time to our research. So, we accommodate to them.

But yeah, it's not easy testing by any means. It's a lot of work for them. So, we're very grateful for their help and their for them to volunteer with us.

A/PROF ZHICHAO WU:

I wonder, Olga, if you wanted to come in from the patient. The research participant experience, how you found what is it aligned with what Emily's described?

OLGA MAXWELL:

Yes, it can be tiring. And I always find that my eyes are quite tired by the time we're finished, particularly if it's a long session every six months. It sort of takes three hours or more. And every other three months, it's sort of a little bit shorter. Takes two hours, because there's bloods that are also taken every six months. So, you have to be prepared to, you know, give away dozens of little tubes of blood and a bit of skin and, you know, and have sore eyes and the odd headache, but it's worth it in the end. It's worth it. So, yeah.

A/PROF ZHICHAO WU:

Yes, well, we're very thankful, Olga, for people like yourself. And I just want to say a big thank you once again to our panel, Olga, Emily and Robyn, if you could, especially Robyn for tonight's lecture.

PROF KEITH MARTIN:

Just echoing the thanks Zhichao. Great job in sharing, you've obviously missed yet another vacation there. And great panel, thanks, Olga. Thanks, Emily. And just to conclude the evening, I'd like to invite Robyn back to the stage. Robyn, that was an inspirational lecture. You brought to us a real vision for the future, I think, and how we're going to beat this disease down the line with the help of a great team that you've brought together. And your work both locally and nationally and internationally to, to crack this problem. So, congratulations again. And I'd just like to invite Peter Crock, who is Gerard Crock's son, and Alexandra Grimwade, who's chair of our Philanthropic and Engagement committee, to come and present a small token of our appreciation for a wonderful lecture. Thank you.

PROF KEITH MARTIN:

Great, so that concludes the evening. Thank you so much for joining us. Thank you for your support of CERA in so many different capacities. It's great to see so many of our partners here from various organisations University of Melbourne, the hospital and many other partners around who really help us to do the work that we do. Thank you for that. Feel free to stay around and chat to our, our researchers and then safe home. Thank you.