Macular Society

Let's Beat Macular Disease

PhD impact report

Explore Macular Society-funded PhD projects from 2013 to 2025

“Research gives me hope”

Sian was diagnosed with Best disease as a child, but it wasn’t until decades later that her condition began to cause problems, not only for herself but her young son, Archie.

“I took him for a routine eye test – he was seven and a half at the time. ‘Don’t panic,’ the optician said. But we were urgently referred to the hospital. They looked at the back of his eyes, ran all sorts of tests, and then said, ‘Is there something in the family?’ And that was the lightbulb moment. Archie had Best disease too.”

“I really wasn’t prepared for it,” Sian admitted. “I knew I had macular disease, but I never even thought about passing that gene on to my children.”

Sian’s sight

While visiting the hospital with Archie, the consultant asked Sian about her own eye health and told her to go for an appointment. Sian was devastated to hear that her eyesight had deteriorated.

“It hit me like a tonne of bricks,” she said. “I’d been so focused on Archie; I’d completely forgotten about my own eye health.”

“I was referred to the hospital, where the consultant said: ‘The lights you’re experiencing aren’t migraines, it’s the macular disease. There’s not really much we can do. You’ll end up with big black spots in your eyes, and you will lose your central vision’. I walked out of that clinic, thinking that my life was over. But then I kept thinking about Archie.”

Hope for the future

Talking about Archie, Sian said: "He's a little lightning bolt... He's playing football, or cricket, running around, always outside on his bike, or a scooter... just one of those really busy, active children. That will all change if he can't see."

In the face of uncertainty, Sian has found hope in funding medical research.

"I keep thinking, by the time Archie gets to 40, the world will have completely changed," she said.

"When I was nine there were no iPhones; the world was so different. Medical science is improving the quality of life for everyone. Maybe it can change Archie's life; maybe mine. For my son, for our children's children, if there's anything we can do to stop this, we absolutely must do it," Sian shared.

The impact of the Macular Society's support for early-career researchers

Introduction

The macula is a tiny area of the retina at the back of the eye, about the size of a grain of rice. It is responsible for our central vision, most of the fine detail of what we see, and a lot of our colour vision too.

Diseases of the macula affect 1.5 million people in the UK, young and old, and are the biggest cause of sight loss globally. In 2020 macular disease affected 196 million people worldwide, a figure which is projected to rise to 288 million by 2040.

The Macular Society's research has a single aim: to Beat Macular Disease, by finding a cure and improving the lives of people affected.

One of the strategic goals of our Research Strategy for 2020-2030 is to build and support the scientific workforce. We want to increase the number of scientists involved in macular research to meet the scale of the challenge and support them to start collaborations and enhance their research ideas.

This will ultimately lead to more high-quality research that finds new treatments and cures for macular conditions, improving the lives of millions of people affected worldwide.

PhD studentships

Supporting the next generation of research leaders

PhD studentship grants enable vital research and help give scientists the best possible start to their research careers.

Each PhD studentship grant provides up to £120,000 to cover the student's stipend (salary), university fees, training, travel to research conferences, and all the consumables and equipment they'll need for three years.

PhD studentships boost macular disease research in many ways:

- For people interested in a career in macular disease research, PhD studentships are the first step on the career ladder – helping to create the next generation of research leaders.
- PhD studentships attract promising scientists to start their research careers in macular disease, bringing new people and new ideas into the field.
- New researchers from diverse backgrounds bring fresh perspectives, which can deliver solutions to old problems that haven't yet been solved.
- Providing students with a stipend allows them to dedicate time to focus on their research, instead of fitting it around other paid work.

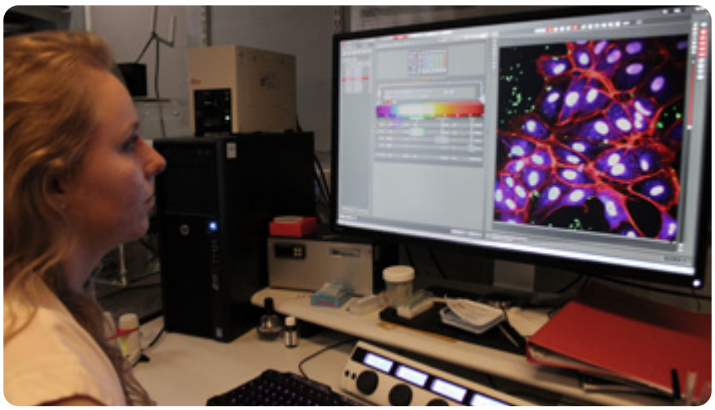
Like all our research grants, applications for PhD studentships are reviewed by medical and scientific experts, as well as people affected by macular disease. This rigorous process ensures we only fund high-quality research that could have a real impact for people affected by macular conditions.

Since the inception of our PhD programme in 2013, the Macular Society has funded 31 PhD studentships, worth a total of £3,052,966, including five on macular dystrophies jointly funded with the charity Retina UK.

Many of these studentships have been supported by generous donations from individuals, charitable trusts and foundations and, would not be possible without their support.

PhD studentships – the researchers' stories

Here are the stories of just some of the researchers whose PhD studentships have been funded by the Macular Society.



Dr Ellie Keeling, University of Southampton

Dr Keeling's research has improved our understanding of how high-fat diets contribute to age-related macular degeneration (AMD), which could lead to new options for preventative treatments.

Ellie Keeling was looking to continue research after her undergraduate degree but hadn't settled on a specific disease area. "I knew I wanted to do something cell culture-based and in neuroscience, but I was quite open to what it was. I was more looking at what techniques will I learn? What is that going to give me to continue my career in the future?" A PhD studentship funded by the Macular Society caught her eye and started her specialism in macular conditions.

Ellie's PhD research focused on retinal pigment epithelial (RPE) cells, which provide support to the light-detecting photoreceptors of the retina. However, problems with these cells are also thought to contribute to AMD.

In her PhD project, Ellie made new discoveries about how high-fat diets cause problems with RPE cells. Crucially, her research highlighted potential opportunities to target this disease process with treatments. This work has subsequently received further funding and could eventually lead to new treatments to prevent AMD.

In addition, the techniques that Dr Keeling developed to study AMD, using cells grown in the lab, has since been used to test potential drugs. One such drug is now in a clinical trial for dry AMD.

Ellie also used cutting-edge imaging techniques to obtain new insights into the structure of the retina, which will help

scientists make new discoveries in other areas of vision science and ophthalmology.

Dr Keeling plans to continue her research career in eye diseases and eventually lead her own research team. The Macular Society-funded PhD has been "instrumental" in these plans, she said. "Because it's so well-funded, having the opportunity to do lots of different techniques and all of the conference experience really set me up for a good transition into post-doc life", she explained. "I think my career would look very different had I not got the Macular Society PhD."

Ellie's message to Macular Society members and donors is "thank you so much. Your help and support go a long way into helping find treatments [...] without it, there would be no hope."

Dr Poullette Oduor, Ulster University

Dr Oduor developed a cutting-edge method to deliver drugs to the macula without injections, making treatments for eye conditions easier and accessible for all.

After finishing her pharmacy degree, Poullette Oduor stayed at Ulster University to do a PhD to develop new ways to deliver drugs to the back of the eye.

The standard method for getting drugs to the macula is an injection into the eye – but these are uncomfortable for patients and come with side-effects. Most drugs are not suitable for being delivered by eye drops, as the drug sits on the surface of the eye only to be washed away by tears and blinking.

During her PhD project, Poullette helped develop a tiny 'nanoparticle' package that can penetrate through the surface of the eye to deliver drugs to the macula and could be given as an eye drop. Dr Oduor and her supervisor are applying for a patent for the nanoparticle delivery system. If successful, this could lead to a new method of drug delivery, meaning a range of improved treatments for macular diseases and other eye conditions too.

The funding from the Macular Society allowed Poullette to focus entirely on her PhD research during the week, working as a pharmacist only at the weekend. For her, it made a huge difference "having somebody give you the opportunity and then fund it – giving you the time to explore that opportunity and take advantage of it to the fullest."

Poulette has since changed career to work in a company developing new therapies for skin cancer. Working in the pharmaceutical industry is "how our shelves in the pharmacy become bigger," she says. "That PhD studentship literally opened a door that I would've never gotten without it."

Dr Owen Jones, University College London

Dr Jones's research has contributed to the development of innovative cell therapies, which in the future could reverse damage to the macula and restore sight.

Owen Jones developed an interest in the neurones (nerve cells) of the eye during his undergraduate degree. He went on to work for Anthony Nolan in the charity's research labs, working with stem cells found in the blood. But his long-term goal was to "be in the driver's seat" and direct his own research that combined his interests in neuroscience and stem cells.

A PhD studentship funded by Macular Society stood out to him because of its practical applications. "Basic research is very important, but personally, I'm driven by seeing a tangible impact of what I do in the lab," said Owen.

The light-detecting cells of the retina, known as 'photoreceptors', often become damaged in macular disease. Scientists are developing cell therapies that could replace damaged photoreceptors with new ones grown from stem cells. During his PhD, Dr Jones improved the techniques that help scientists grow photoreceptors in the lab.

But for such a cell therapy to improve sight, the new photoreceptors must connect to the neurones that are already in the eye. In his project, Dr Jones used high-powered microscopes to observe and measure this process and found drug-like molecules which could boost these connections.

Dr Jones's research has improved our understanding of how photoreceptor cells connect to neurones in the retina – crucial for the success of future cell therapies. Much more research is needed before a cell therapy is ready to test in humans. But if successful, it could improve and restore sight for thousands of people with macular diseases.

Owen has since been awarded a prestigious fellowship jointly supported by Harvard University and the pharmaceutical company Roche. As part of this work, he is developing a method to study age-related macular degeneration (AMD) using stem cells, which he hopes will "benefit not just industry, but anyone who's working on that disease – that's really the goal."

Dr Jones believes that the Macular Society funding allows brilliant, passionate scientists to pursue a research career, no matter their background or financial circumstances. A more diverse research community means a wider range of perspectives, accelerating progress towards beating macular disease.

"I am immensely grateful to the Macular Society, genuinely, because I probably wouldn't have been able to do a PhD if I wasn't funded to do it by the Macular Society."

Dr Andrew Miller, Anglia Ruskin University

Dr Miller worked with people affected by AMD to understand their views of vision enhancement technology, which is influencing how technology is designed to better support people in their daily lives.

During his 30-year career as an optometrist, Dr Andrew Miller has always been interested in research, particularly how technology can help people with sight-impairment.

He especially wanted to make sure that people affected by macular disease like age-related macular degeneration (AMD) had a say in how technology was developed. Andrew said: “From my point of view, I think it’s really important to embed the participants in the process.”

An opportunity to do a PhD funded by the Macular Society came up at Anglia Ruskin University in Cambridge, and Andrew jumped at the chance for a career change.

During his PhD, Andrew focused on Wearable Electronic Vision Enhancement Systems, or wEVES. These are head-worn devices that use cameras to magnify and enhance images, which are then displayed on screens held in front of the eyes.

Dr Miller set up a trial involving 34 people with AMD to test how wEVES helped people with everyday tasks and gather their views on the devices. The Macular Society helped Andrew recruit people to his trial. “Without that support, the timeframe would’ve just slipped, and I would probably still be an aspirational PhD student waiting to finish.”

Dr Miller’s research highlighted the many factors that influence whether someone is willing to use technology to improve their vision. It also pointed to key problems that developers should concentrate on solving.

Following the PhD project, Andrew has now taken up a lecturer position at Aston University in Birmingham, mixing clinical teaching with further research into how older adults with visual impairment use technology. Andrew has also joined the Macular Society’s Research Committee, bringing his expertise to help assess funding applications from other researchers.

He believes the studentship from the Macular Society was pivotal in his research career. Andrew said: “Without the Macular Society, it just simply would not have been possible.”

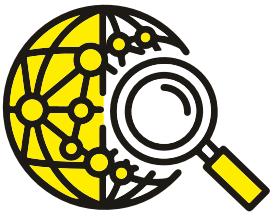
“I feel a huge debt to Macular Society members for supporting me, and I genuinely hope that the work I’ve done and work I will continue to do will pay off some of that debt.”

“PhD funding gives early-career researchers the time and freedom to develop as scientists.”

Geraldine Hoad, Macular Society head of research grants

Travel grants

Sharing research with the world and building global collaborations.



The Macular Society funds travel grants to help early-career researchers from the UK cover the costs of attending the annual meeting of the Association for Research in Vision and Ophthalmology (ARVO) in the USA or other leading scientific conferences in Europe. Attending these conferences allows scientists to share their research within the eye health community and receive feedback from leading international experts. They are also a great opportunity for researchers to meet other scientists, leading to collaborations and sparking new ideas for future research.

Our PhD studentship grants include funding for the student to travel to ARVO. On top of this, since 2023 we have funded nine supplementary travel grants for researchers who aren't funded by the Macular Society – helping to support the wider macular research community.

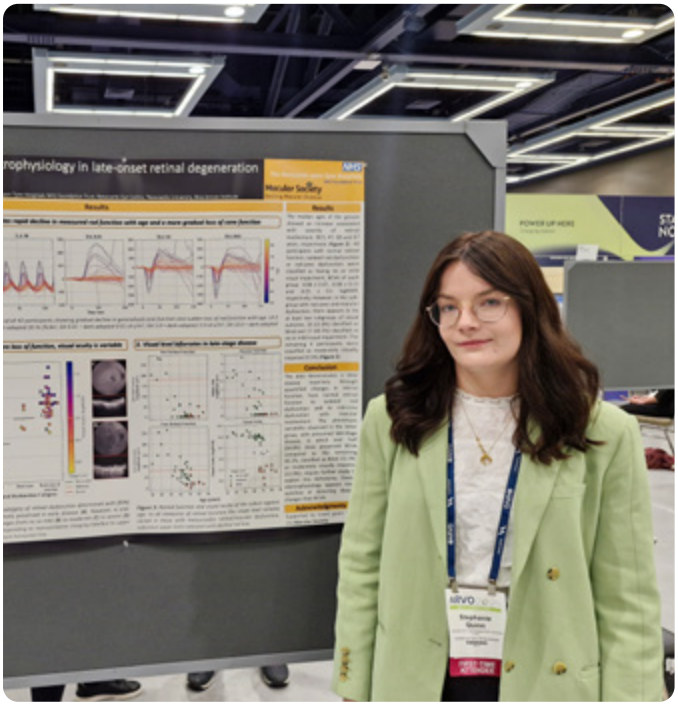
Feedback from Macular Society travel grant recipients:

Dr Hanagh Winter, Queens University Belfast, travel grant recipient for ARVO 2023.

"The response to [my] research was very positive and the audience asked thought-provoking questions and offered valuable insights. [...] Presenting my research amidst an international community of vision scientists was invaluable in the final months of my PhD project."

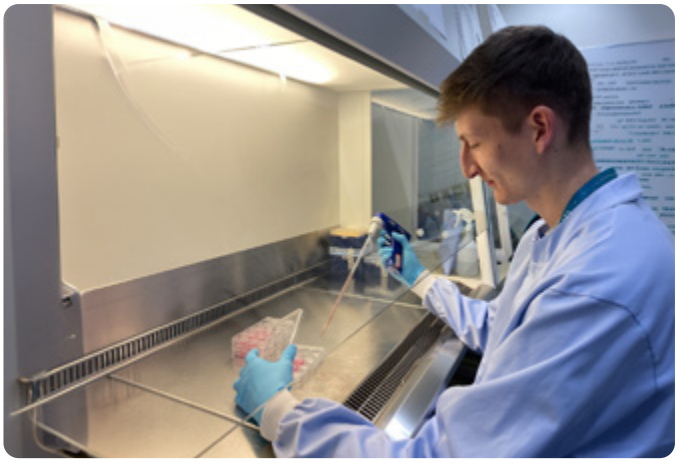
Dr Paul Roberts, City St George's, travel grant recipient for ARVO 2023.

"I was able to meet a number of existing collaborators in person, in many cases for the first time, and to form new collaborations with researchers I would not otherwise have come across. [...] Conferences such as ARVO are vital in growing and developing our community, accelerating the rate of research and the development of new treatments."



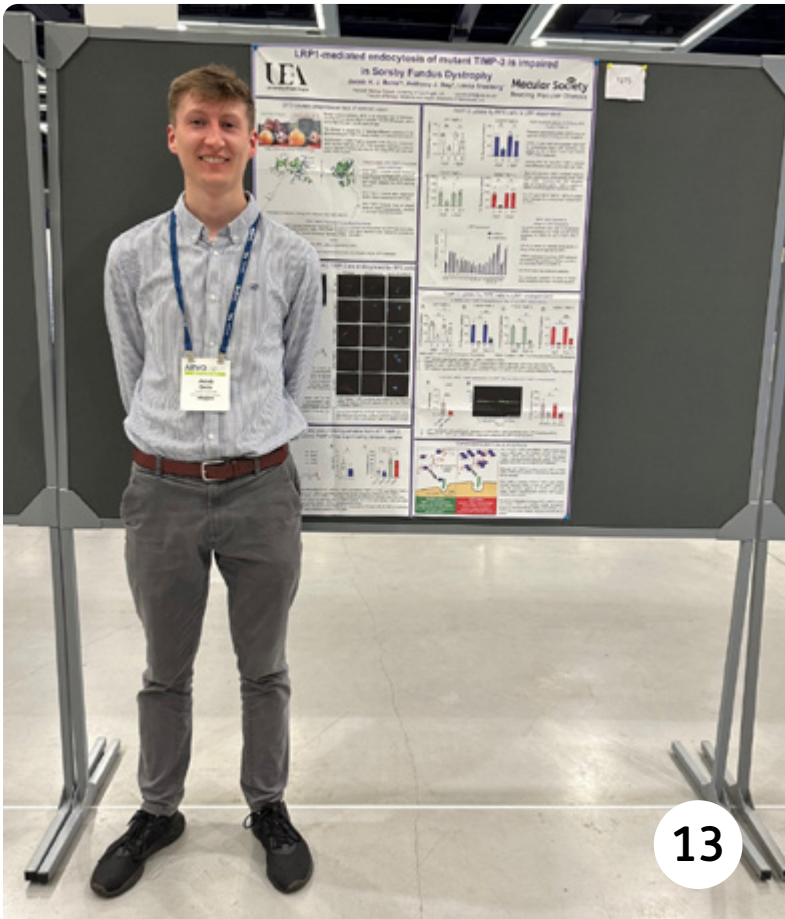
Dr Stephanie Quinn, Newcastle upon Tyne Hospitals NHS Foundation Trust, travel grant recipient for ARVO 2024.

"Overall, this experience was invaluable. It has allowed me to get useful feedback on my current research, and it has influenced my future research ideas, hopefully leading to better outcomes for patients."



Dr Jacob Betts, University of East Anglia, travel grant recipient for ARVO 2024.

"I would like to thank the Macular Society and all its members for supporting and enabling me to attend this event. It has afforded me the opportunity to present the work we do and discuss its implications for patients, as well as meet and be inspired by other researchers and clinicians working on ocular diseases."



Conclusion

The Macular Society's support for early-career researchers goes beyond funding high-quality science.

Our PhD studentships are developing the next generation of scientists who could become future leaders in macular disease research. PhD studentships attract promising scientists from all backgrounds to start their careers in macular research, bringing in fresh perspectives.

Our travel grants for ARVO and other conventions allow more researchers to share their work with their peers and get feedback and new ideas from world experts. These conferences are also a key place for people to meet, helping to start new collaborations for future research.

Our plan is to carry on funding high calibre PhD studentships within the UK alongside continued travel grant funding, providing crucial opportunities for researchers in the early years of their careers. By supporting the development of future researcher leaders, and strengthening the research community, the Macular Society is improving both the quantity and quality of macular disease research. This will help bring new treatments to millions of people, sooner, and bring forward the day we finally Beat Macular Disease for good.

Geraldine Hoad, Macular Society head of research grants.

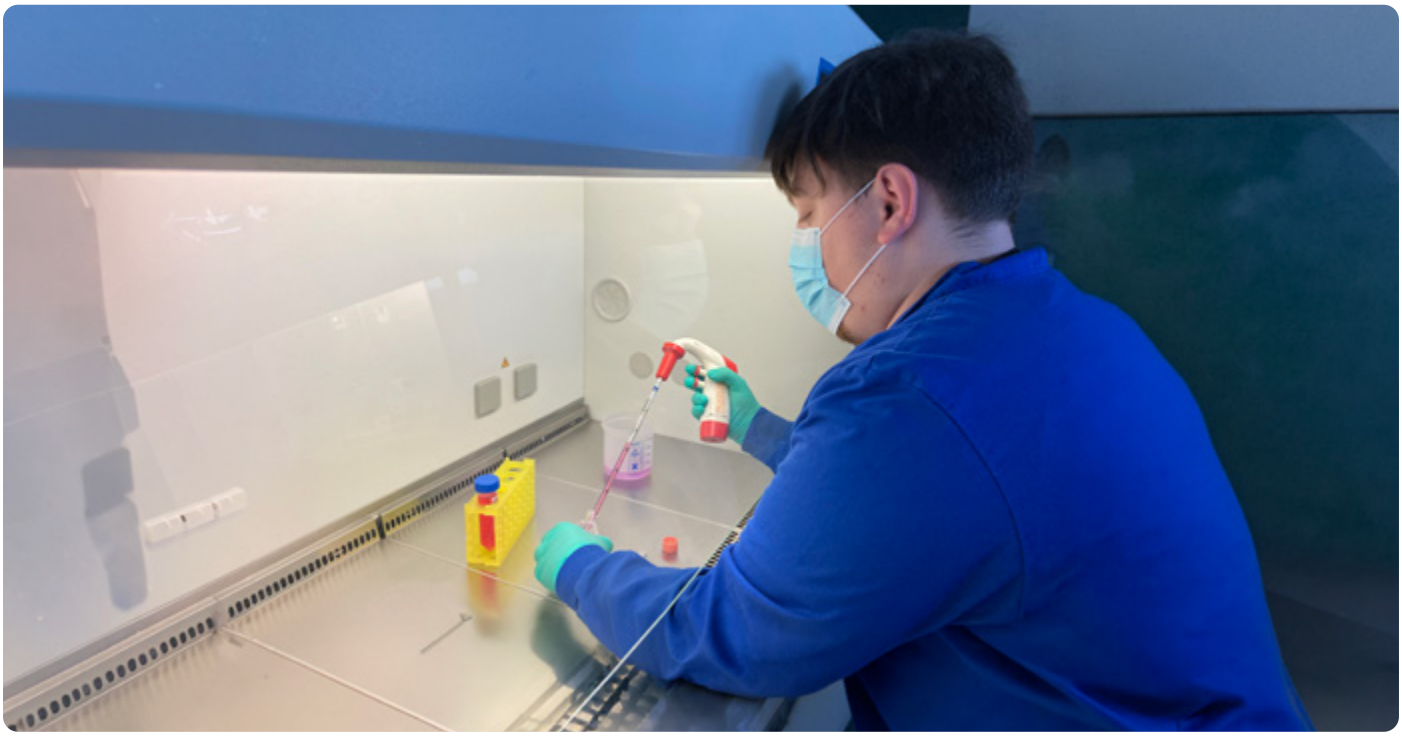
"The benefit of PhD funding is to give early-career researchers the time and freedom to develop as scientists. Having this creative opportunity and time to build skills in a range of research techniques sets researchers up for productive careers over the long term. We support candidates from a range of disciplines and backgrounds, because the most interesting work rarely stays within a single field.

"We are delighted that so much of this work has resulted in new treatment opportunities, advances in delivery systems, and genuinely novel technology."

Dr Arjuna Ratnayaka from the University of Southampton, PhD supervisor for Dr Ellie Keeling (page 6)

"The discoveries made by Ellie during and after her PhD (she undertook a postdoc in my lab afterwards), would not have happened without this initial support from the Macular Society. Ellie's talent enabled us to make new discoveries in other areas in vision science and ophthalmology. This included obtaining new insights into the structure of the retina using cutting-edge imaging techniques, uncovering the important effect of an unhealthy diet in developing age-related macular degeneration (AMD). She worked with a drug-discovery firm several years afterwards that eventually led to an AMD clinical trial.

"Funds initially invested in PhD studentships have high returns to the funder, the research community, and importantly to patients... in recent years, the number of funding streams supporting PhD studentships have become fewer in number... It is therefore critical that the Macular Society continues to support UK PhD programmes."



Together we will Beat Macular Disease

Professor Ian Pearce, director of the Clinical Eye Research Centre, Liverpool

"There are a multitude of potential opportunities and developments, so this really is a time that you want to be involved. I was thinking of retiring a few years ago, but now I'm so excited about the treatments we can offer patients, I'll probably stay another few years!

"The future is bright with hope, but we need people to fund more research to bring a cure closer. Macular disease is growing every year, as we've got an ageing population – it's getting worse.

"We've got the potential and opportunity to save peoples' eyesight."

Get in touch

Thank you to all the generous supporters who have helped us to nurture and grow our early career research programme. If you are interested to learn more about the programme and discuss how you can get involved, please contact **trusts@macularsociety.org**

To find out more about the latest in macular disease research, visit **macularsociety.org/research** or contact **research@macularsociety.org**

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