

SHINE *the* LIGHT

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BREAKTHROUGH THERAPIES

From bench to bedside: Audrone Lapinaite sees promise in gene-editing therapies

Biochemist Audrey Lapinaite, PhD, has trained at some of the world’s most prestigious laboratories and with a Nobel laureate. The new assistant professor of ophthalmology at the UC Irvine School of Medicine aims to use that training to help develop breakthrough gene-editing treatments for patients with vision loss.

Raised in a small town in Lithuania, Lapinaite was the first in her family to go to college, studying biochemistry and earning a doctoral degree from the world-renowned European Molecular Biology Laboratory in Heidelberg, Germany. Ultimately, she came to the United States to conduct research with UC Berkeley biochemists Jamie H.D. Cate, PhD and Jennifer A. Doudna, PhD, who won the 2020 Nobel Prize in chemistry. They sparked Lapinaite’s interest in translational research.

“Working with these visionaries and pioneers, I learned not only research techniques but also the way they think, lead and interact with others,” Lapinaite says of her five years as a post-doctoral fellow at Berkeley. “They inspired what I’m

doing in my own lab now, which is to first understand the molecular mechanisms of gene editing, then translate it to biomedicine and eventually use that knowledge to improve people’s lives.”

As a core researcher in the newly established Program in Precision Genome Editing, which will be housed in the Falling Leaves Foundation Medical Innovation Building, Lapinaite will be ideally positioned to bridge the gap between basic scientific research and leading-edge gene therapies. Already, she’s engaging with physicians who are treating patients at the UCI Health Gavin Herbert Eye Institute to gain insight into their needs.

“One of the things that is so exciting about being part of the Gavin Herbert Eye Institute is that it brings together scientists like me, from a basic research background, with clinicians to work jointly to address patient needs,” Lapinaite says. “To be honest, I have not seen a collaboration this strong anywhere else.”

Lapinaite's precision gene-editing work relies on the fact that all DNA is coded with just four building blocks, known in scientific shorthand as A, G, C and T. Just a few letters off — or even one — in a lengthy series that makes up a strand of DNA can cause disease. Precision gene editing aims to use biological tools to target the exact DNA error and fix it, not unlike the "find and replace" computer function.

Advancements are coming fast. In just 12 years since the publication of Doudna's groundbreaking research showing that CRISPR-Cas9 could edit genes, four clinical trials of precision gene-editing tools in humans are underway.

Lapinaite aims to modify existing editing tools to ensure that they are safe, with the goal of advancing the science from test tubes to patient treatments. She will work closely with Krzysztof Palczewski, PhD, the Irving H. Leopold Chair in Ophthalmology and Distinguished Professor. He is developing gene-editing therapies for the eye as director of the Precision Genome Editing Program at the UC Irvine Center for Translational Vision Research.

"Recruiting Audrey is not only a personal delight, but it also strengthens our approach to genome editing, which encompasses many projects in the School of Medicine," says Palczewski. "Audrey is also extremely precise, which is important in developing precision medicine."

The inherited retinal diseases currently in Lapinaite's crosshairs are Stargardt disease, a rare and inherited form of juvenile macular degeneration, and age-related macular degeneration (AMD). Editing the genes responsible for these disorders could not only treat the symptoms of blurry vision, dark spots and loss of eyesight, but also potentially prevent them in the first place.

"We are really at the forefront of developing and improving existing precision gene-editing tools to be safe enough to treat people — not in the distant future, but now," says Lapinaite. "This is an exciting time and I am hopeful that within the next decade, we will reach the point where precision genome editing is an off-the-shelf treatment."

Lapinaite may have the opportunity to see this happen first-hand at the eye institute.

"Being a scientist, you can dream about discovering a treatment pathway that at some point might change the life of people who have a specific disease," she says. "But here, interacting with clinicians and patients, we will have the opportunity to actually see it happen someday — and that's the most exciting part."



Audrey Lapinaite, PhD

Lapinaite feels a special connection with the nearly half of UC Irvine undergraduates who are the first in their families to earn a degree. Like them, she faced many unknowns in pursuing higher education. She credits her success to both her family and the advisors who championed her along the way. Now, she hopes to pay it forward to the next generation as a faculty member dedicated to the UC Irvine School of Medicine and its mission: Discover. Teach. Heal.

"At the end of the day, future scientists, future medical doctors, future clinicians don't just appear, they have to be nurtured," she says. "As scientists and clinicians, this is one of the most important roles we play."

Her advice to aspiring scientists, whether pursuing basic research or medical practice, is this:

"Find your supporters, people who advocate for you — who are truly invested in your success. Surround yourself with people who are ambitious, who are motivated and who try to help each other. Not everything in your career will be straightforward, but the people you meet along the way will stay in your life, and that's what matters most."

2024: A remarkable year

As 2024 draws to a close, we reflect on yet another remarkable year of expansion at the Gavin Herbert Eye Institute. Our growth was fueled by the opening of two new operating rooms, a remodeled surgical waiting room for patients and families, and an expanded staff-and-surgeon lounge.

We are profoundly grateful to sisters Stephanie and Lisa Argyros for their generous naming gift of the two new operating rooms, allowing us to dramatically increase our surgical capacity and provide vision-saving treatments to more patients than ever before. We are also deeply appreciative for the support and commitment from UCI Health leaders who have continued to believe in the eye institute's mission.

Looking ahead, we are excited to be extending our reach beyond our two primary clinical centers with our first satellite vision care center in Yorba Linda. When it opens in summer 2025, it will bring world-class eye care closer to patients in the region.

Meanwhile, directly across from the eye institute in Irvine, we've been watching the Falling Leaves Foundation Medical Innovation Building take shape. Designed for collaborative bench-to-bedside research, it will be home to 12 high-impact interdisciplinary research programs. We recently learned that the top floor will be occupied by the Center for Translational Vision Research and the Genome Editing Research Program, both led by our own Krzysztof Palczewski, PhD, the Irving H. Leopold Endowed Chair of Ophthalmology and Distinguished Professor.

We are also delighted to welcome two researchers who will contribute to both programs. Joining us are Rui Chen, PhD, a world-class ocular geneticist from Baylor College of Medicine, and Audrone Lapinaite, PhD, an expert in genome editing who trained under biochemist Jennifer A. Doudna, PhD, who shares the 2020 Nobel Prize in Chemistry for developing the CRISPR gene-editing technology. Chen and Lapinaite will play key roles in continuing to advance our groundbreaking vision research initiatives.

On the clinical side, we welcome former ophthalmology fellow Dr. Seanna Grob to our faculty. She completed her fellowship at UC Irvine after a residency in ophthalmology at Harvard Medical School. She has spent the last five years

on the faculty at UC San Francisco. We are delighted to have her back at UC Irvine.

We are also proud to announce that several of our ophthalmology researchers were recently recognized by their peers. Gulab Zode, PhD, professor of ophthalmology, received the prestigious Research to Prevent Blindness Stein Innovation Award, which will fund his leading-edge glaucoma studies. Additionally, the Alcon Research Institute awarded Andrew Browne, MD, PhD, its young investigator grant to support his research on macular adaptation to photobleaching and its senior research grant to Krzysztof Palczewski, PhD, for his work targeting the light-sensitive protein rhodopsin.

Finally, I congratulate Dorota Skowronska-Krawczyk, PhD, associate professor of ophthalmology, and Anna Kiker, associate director of the Center for Translational Vision Research, for spearheading the Historically Black Colleges and Universities (HBCUs) Summer Research and Clinical Program at UC Irvine. This was a fantastic educational experience for 20 undergraduate students who spent 8 weeks in research labs and shadowing clinicians across all departments at the UC Irvine School of Medicine. We are proud of our team's leadership in this effort and grateful to our campus supporters, including medical school Dean Michael J. Stamos, MD; Coleen Cunningham, MD, chair of pediatrics; and medical school Chief Diversity Officer Ursula Worsham, EdD.

As we approach the season of giving thanks, I want to extend my sincere gratitude to our patients, our faculty and staff, our philanthropic community and our leadership team. In particular, Dean Stamos and Chad Lefteris, president and CEO of UCI Health, have been incredible partners, facilitating the Gavin Herbert Eye Institute's ongoing growth and advancing our mission to provide world-class eye research, teaching and patient care here in Orange County.



Baruch D. Kuppermann

Baruch D. Kuppermann, MD, PhD

*Director, UCI Health Gavin Herbert Eye Institute
Chair, Department of Ophthalmology,
UC Irvine School of Medicine*

Our team

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Cataracts, cornea, external disease and refractive

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Marjan Farid, MD

Vice Chair, Diversity, Equity, and Inclusion

Sumit (Sam) Garg, MD

Vice Chair, Clinical Ophthalmology

Sanjay R. Kedhar, MD

Vice Chair, Clinical Research

Olivia Lee, MD

Kailey Marshall, OD

Matthew W. Wade, MD

Comprehensive ophthalmology

Alpa Patel, MD

Glaucoma and cataracts

Austin Fox, MD

Ken Y. Lin, MD, PhD

Director, Medical Education

Sameh Mosaed, MD

Vice Chair, Faculty Development

Andrew Smith, MD

Low vision

Karen Lin, OD

Nilima Tanna, OT

Neuro-ophthalmology

R. Wade Crow, MD

Lilangi Ediriwickrema, MD

Vivek Patel, MD

Vice Chair, Academic Affairs

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Ocular oncology

Kapil Mishra, MD

Oculoplastics

Lilangi Ediriwickrema, MD

Seanna Grob, MD

Jeremiah Tao, MD

Ophthalmic pathology

Maria Del Valle Estopinal, MD

Optometry

Joseph Bui, OD

T. Scott Liegler, OD

Pediatric ophthalmology

Charlotte Gore, MD

Stephen B. Prepas, MD

Annabelle Storch, OD

Donny Suh, MD

Kimberly Walker, OD

Retina and vitreous

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Vice Chair, Education

Mitul C. Mehta, MD

Kapil Mishra, MD

Mohammad Riazi, MD

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(adults and pediatrics)

Vivek Patel, MD
(adults)

Stephen Prepas, MD
(pediatrics)

Annabelle Storch, OD
(pediatrics)

Donny Suh, MD
(adults and pediatrics)

Kimberly Walker, OD
(pediatrics)

Uveitis

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Olivia Lee, MD

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Andrew Browne, MD, PhD

Rui Chen, PhD

James V. Jester, PhD

Tibor Juhasz, PhD

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Director, Center for Translational Vision Research

Eric Pearlman, PhD

Magdelene Seiler, PhD

Dorota Skowronska-Krawczyk, PhD

Gulab Zode, PhD

An eye for aesthetics: Oculoplastics specialist

Dr. Seanna Grob



Dr. Seanna Grob joined the UCI Health Gavin Herbert Eye Institute's oculoplastics team on July 1, 2024. Grob studied and trained at UC Berkeley, UCLA, UC San Diego and UC Irvine. She completed her ophthalmology residency and served as director of ocular trauma

services at Harvard Medical School, where she co-authored a book on managing eye trauma. Most recently, she served as the academic director of Oculofacial Plastic and Orbital Surgery Services at UC San Francisco and medical director of the UCSF Berkeley Outpatient Ophthalmology Clinic. We recently sat down with Grob to learn more about her.

Q. As an oculoplastics specialist, what conditions do you treat most often?

Many of the conditions we treat in oculoplastics fall into four broad categories. First are eyelid conditions, such as droopy lids or skin cancer of the eyelids or periocular area. Next are orbital problems, such as trauma to the eye socket, an orbital tumor or anophthalmic socket surgery. Third is lacrimal surgery, which involves the tear drainage system. Finally, we also perform aesthetic rejuvenation of the face and periocular area.

Q. What other medical teams do you often work with?

Oculoplastic surgeons often collaborate or co-manage patients with our fellow specialists in cornea conditions, neuro-ophthalmology, pediatrics, uveitis, ocular oncology and ocular pathology. We also work closely with neurosurgeons, surgical oncologists, head and neck surgeons, rhinologists and dermatologists who perform Mohs surgeries to treat various conditions that overlap our respective specialties. We collaborate a lot with other UCI Health physicians, which I really enjoy.

Q. What do you enjoy most about oculoplastics?

Oculoplastics is a mix of some of my favorite medical specialties — ophthalmology, dermatology and head and neck surgery. I especially enjoy the variety of conditions and surgeries and caring for patients of all ages. On any given day, I may do a cosmetic surgery, a fracture repair, an eyelid lift, an orbital tumor removal and a tear drainage surgery. I also appreciate the artistic aspect of eyelid and periocular surgery. There is definitely an art to what we do, whether

it's cosmetic surgery or reconstructing an eyelid after a skin cancer is removed. All surgeries we do as oculoplastic surgeons, even if they are functional, are still cosmetic because they involve a patient's face. An aesthetically pleasing result is always our goal.

Q. What attracted you to ophthalmology?

From the time I was in kindergarten, I knew I wanted to be a doctor. I still have a drawing I made in kindergarten of myself as a doctor. I was just always drawn to medicine. My mother had a big impact on my connection to ophthalmology, though. She lost vision in one eye from a car accident as a very young child, so she always made me very aware of the importance of vision and eye safety. During college, I shadowed some ophthalmologists and after college, I worked for a glaucoma specialist. By the time I started medical school, I already had a very strong interest in ophthalmology. In my fourth year of medical school, I did an oculoplastics rotation and I have been hooked ever since!

Q. In addition to your clinical work, what interests you academically?

My academic interests include research, educational and leadership pursuits. Research topics of interest include eye and orbital trauma, periocular cancers and the use of artificial intelligence in oculoplastic surgery and ophthalmology generally. I also enjoy improving processes in medical training. I have made "Applying to Ophthalmology" handbooks for most of the institutions I have been a part of, and most are still used by medical students. I have served on admission interview committees and residency program committees at different institutions, as well as an academic senate committee at UCSF. I also serve as chair of the American Society of Ophthalmic Plastic and Reconstructive Surgery's young professionals committee.

Q. How do you feel about returning to UC Irvine?

I did my oculoplastics fellowship at UC Irvine, so I spent two years training here. Dr. Jeremiah Tao, the chief of Oculofacial Plastic & Orbital Surgery, was one of my preceptors. I feel very fortunate to be joining him and Dr. Lilangi Ediriwickrema on the oculoplastics service here at UCI Health and I am excited to be part of the faculty of this excellent Department of Ophthalmology.

Thank you to our donors

We are grateful to our dedicated supporters — friends, patients, faculty and staff — for your incredible generosity. Your contributions have helped advance our mission to develop leading-edge technologies for diagnosing and treating eye diseases, providing our patients with the most advanced medical and surgical eye care, and supporting educational programs that prepare the next generation of ophthalmic leaders. (Supporters listed contributed \$2,000 or more between July 1, 2023, and Sept. 1, 2024.)

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Kathy Prough and Steve Prough

A family approach to vision care

Steve Prough is used to running into family members at the UCI Health Gavin Herbert Eye Institute. His two sisters and one of his cousins are patients, as is his wife, Kathy. They laugh when they cross paths in a hallway or spot each other in a waiting room.

The family's connection with the eye institute started more than a decade ago when his mother, Nancy Sattler, became a patient of Dr. Baruch Kuppermann, who is now the Roger F. Steinert Professor and Chair of the UC Irvine School of Medicine's Department of Ophthalmology. The whole family trusted Sattler's choice — she'd been married to a Mayo Clinic ophthalmologist for 20 years and always did her research before choosing any doctor.

Sattler sought eye care because her vision was significantly affected by age-related macular degeneration (AMD). Prough often drove her to appointments with Kuppermann long before the eye institute was built on the UC Irvine campus.

AMD, like their family's blue eyes, is partially hereditary. Now Prough and both of his sisters are being treated for the condition, as is a cousin. It's not only his mother's endorsement that keeps him coming back. He, too, holds Kuppermann in high regard.

"Quite frankly, when you talk to him, you realize he is brilliant and has a sense of humor," says Prough, who enjoys joking with the doctor — especially about shots he receives to control his AMD, which causes straight lines to appear wavy.

"I appreciate that he's not always pushing medicine," says Prough. "Dr. Kuppermann really looks at my situation each month, where my eyes are in the process, and then determines if I need a shot or not. He's very conscientious in that way."

Prough was also treated by another ophthalmologist from the eye institute. Dr. Marjan Farid, who performed cataract surgery on both Prough and his wife.

Since her surgery this summer, Kathy Prough says she now sees everything in vivid color and can fully appreciate the sweeping view from her Corona del Mar home to Malibu, 75 miles away. During the operation, Farid was training two residents.

"There are always a lot of other doctors around, and they want to learn from the best," says Kathy Prough. "Dr. Farid really is very, very talented."

The Prough family is so grateful for the vision care they have received at the eye institute that in 2023 they made a major gift to support ophthalmology. Now the institute's second-floor patient lounge is named the Stephen and Kathleen Prough Family Waiting Room.

"It's incredibly important to have this kind of resource in our own backyard," says Prough. "There's no reason to drive anywhere else. From our experience, Gavin Herbert Eye Institute is the best in its class."

Lighting the way for a new generation in children's eye care



Dr. Suh and Dr. Graether

Dr. John Graether gives \$1 million to establish a pediatric ophthalmology fellowship

After five decades as a pioneering ophthalmologist and medical innovator, 94-year-old Dr. John Graether is passing the torch to the next generation with a \$1 million endowment to train pediatric ophthalmologists at the UC Irvine School of Medicine.

Graether, a cataract specialist, is best known for developing several commonly used surgical tools, including the Graether collar button iris retractor, which inspired a group of narrow necked tools for smooth and gentle manipulation of the iris. He also was the first to publish the continuous circular capsulotomy with serial photographs of the technique. His successful

1981 lens implant in Iowa Gov. Robert D. Ray helped to establish the value and safety of a what was then a very controversial operation.

The Irene and John Graether, MD, Endowed Vision Fellowship will support ophthalmologists for a year of training in pediatric eye surgeries — ranging from treating preemies with detached retinas to teens and adults with crossed eyes, known as strabismus. They will be mentored by the pediatric ophthalmology team led by Graether's protégé, Dr. Donny Suh, chief and professor of Pediatric Ophthalmology and Strabismus at the medical school and the Gavin Herbert Eye Institute. This distinctive specialty, Suh says, "beautifully intertwines the precision of ophthalmology with the compassion of pediatrics."

Essential at any age, good eyesight is especially critical in childhood when vision problems can impact normal developmental processes, from honing fine motor skills to learning to read and write. The endowment, which provides funding in perpetuity, will enhance the pediatric ophthalmology fellowship program and help attract some of the most talented eye doctors from around the world to train and treat patients at UCI Medical Center, the Gavin Herbert Eye Institute and Children's Hospital of Orange County (CHOC).

"Donny Suh's dynamism is so well received," says Graether. "He gets people enthusiastic about pediatric ophthalmology and has the unusual ability to attract the highest quality candidates. There's absolutely no doubt that his talent has enlivened the entire specialty."

Graether has admired Suh's passion and energy since 2000, when Suh first joined him as a clinician at Iowa's largest ophthalmology practice, Wolfe Eye Clinic. There, the two shared a passion for both patient care and medical innovation, with Graether mentoring and encouraging the younger doctor. Suh eventually developed ophthalmic tools, including the Suh muscle hook for strabismus surgery and a patented precision syringe that allows doctors to deliver eye injections to infants more easily. Even after Suh left Iowa to pursue academic medicine, the two physicians and their wives have remained good friends.

"Dr. Graether is not just an extraordinary surgeon — he's a visionary, a problem solver and an inventor who thrives on challenges," says Suh. "His passion for life, his dedication to his patients and his relentless curiosity are qualities I deeply admire. As one of my most significant mentors, he has been a guiding star, a steadfast friend and an unwavering supporter throughout my career."

Graether believes the fellowship program will not only develop world-class clinicians but also physicians who will follow in his and Suh's footsteps to develop innovations that improve vision care. Together, they aim to brighten the future for aspiring pediatric ophthalmologists and the children they will serve.





Rui Chen, PhD

Unraveling the genetic mysteries of vision loss

More than 5 million people worldwide have inherited retinal diseases that can lead to significant vision loss or blindness. Great strides have been made to identify the genetic mutations responsible for many of these conditions, but for about 25% of the disorders, the cause remains a mystery — one that molecular geneticist Rui Chen, PhD, aims to solve.

Chen recently joined UC Irvine as a professor of ophthalmology after more than 20 years at Baylor College of Medicine in Houston, Texas, where he earned his doctorate and completed a post-doctoral fellowship in genetics, focusing on the retina's DNA. In 2019, he was among a team of national experts tapped to map the human retina and all of its cells for the Human Cell Atlas, a \$68-million international project funded by the Chan Zuckerberg Initiative.

Chen's expertise will significantly enhance UC Irvine's Center for Translational Vision Research and a new

Program in Precision Genome Editing, where he now leads a project to pinpoint every genetic cause of inherited retinal diseases.

For Chen, the eye is the ideal focus for genetic study: it's complicated enough to inspire a lifelong fascination, yet small enough to be a manageable research target. "The eye system is almost like a mini brain," he says.

In the early years of genetic testing for eye conditions, Chen's lab helped develop DNA panels to give patients a clearer understanding of their prognosis — whether they would gradually lose vision over decades or experience more rapid changes. With those tests now widely available, he has turned his attention to identifying genetic mutations that have yet to be discovered.

Not every gene implicated in inherited retinal disease drives the condition. Chen uses mice and lab-grown retinal cells to study suspected mutations and determine

exactly which ones cause specific types of vision loss. Once identified, the genes can be targeted for new treatments, including future gene-editing therapies.

Ultimately, Chen envisions establishing a genetic program that would develop clinical trials to benefit patients at the UCI Health Gavin Herbert Eye Institute.

While most genetic eye mutations are found around the globe, some are limited to specific populations. For example, one RP1 gene mutation, which leads to an aggressive, early-onset form of retinitis pigmentosa, occurs exclusively among individuals of Kuwaiti descent. Chen is working to develop gene-editing therapies specifically targeting this group as part of his broader research, exemplifying the principles of precision medicine.

Already, patients from around the world seek Chen's expertise, hoping his research may lead to new treatments for their condition. Because many of these diseases affect only a small number of people, they are often overlooked by pharmaceutical companies. Instead, these patients rely on academic medical researchers to find answers and possible therapies. To support these individuals, Chen frequently helps them create patient support groups to raise awareness of their shared condition and explore more research opportunities.

For people with more advanced vision loss for whom gene-editing therapies will not be an option, Chen is exploring regenerative medicine pathways with grant funding from the Foundation for Fighting Blindness.

"In cases where the disease has progressed to the point where the patient no longer has photoreceptor cells to target with gene therapies, we are pursuing some very interesting leads to regenerate neurons that may have wonderful success," Chen says.

Chen's research team will eventually move into the Falling Leaves Foundation Medical Innovation Building. There, he expects his work on the genetic causes of inherited retinal diseases to be amplified by collaborations with other vision scientists also pursuing bench-to-bedside research.

Together, he hopes they will find therapies for the millions of people affected by vision loss.



Sumit (Sam) Garg, MD, named a Healio honoree

Gavin Herbert Eye Institute Medical Director Dr. Sumit Garg is one of 15 U.S. ophthalmologists recently recognized for excellence by Healio.

He is among 50 U.S. physicians named a 2024 recipient of the medical media company's peer-to-peer recognition program, Healio Honors.

"Igniting Medical Excellence" is the 2024 Healio Honors theme and this year's honorees have positively influenced that educational mission, said Dr. Richard L. Lindstrom, chief editor of Healio's publication, Ocular Surgery News.

Garg was cited for his "dedication to patient-centered care and his innovative treatment strategies [that] have profoundly impacted the field of ophthalmology, elevating the standard of care for patients with complex corneal conditions."

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Latest updates in cataract surgery technology
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Feb. 4, 2025

What is it and how do I know if I have it?
Lilangi Ediriwickrema, MD
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The aging eye

March 4, 2025

How to mitigate change in your vision relating to age
Andrew Smith, MD

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The importance of annual eye exams and new lens technology
T. Scott Liegler

Glaucoma

May 13, 2025

Latest treatment updates in glaucoma management
Austin Fox, MD

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June 3, 2025

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