annual report 2018

scheie vision

Penn Medicine | Department of Ophthalmology

Leading the Fight Against Macular Degeneration:

Gene Therapy Reverses Disease in Canine Model

IN THIS ISSUE

CONTRIBUTORS

Managing Editors and Writers: **Rebecca Salowe, Kristen Mulvihill, Nora Laberee**
Contributing Writer: **Marquis Vaughn**
Editor: **Benjamin Kim, MD**
Art Director: **Sai Merriam**
Designer: **Caren Goldstein**
Photographer: **Brian Holmes**

Cover design: **Sai Merriam**
Cover design depicts the photoreceptors of dogs with Best disease pre-gene therapy (left) and post-gene therapy (right).

If you would like to add/remove your name from this mailing list, or would like to receive our electronic newsletter, please email **Kristen.Mulvihill@uphs.upenn.edu** or call **215.662.9892**.

A MESSAGE FROM THE CHAIR

Welcome to the annual edition of *Scheie Vision*!

This past year was filled with discovery and progress. Three faculty members received the Champalimaud Vision Award, which is a 1 million Euro recognition given to scientists with the greatest contribution to vision reserach worldwide. This achievement was the product of 25 years of rigorous research led by Drs. Jean Bennett, Samuel Jacobson, and Albert Maguire. Today, children and adults blind from a specific mutation in the eye can have their vision restored through gene therapy. We are incredibly hopeful that this knowledge will lead to similar therapies for other eye diseases in the future. For example, in this edition, we explore a new gene therapy for macular degeneration that has shown efficacy in a canine model.

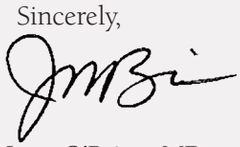
This level of innovation can be seen throughout the entire Department. In 2018, our physicians conducted 117 clinical trials testing investigational therapies in patients with blinding eye diseases. You can read about one of these trials, the Dry Eye Assessment and Management (DREAM) study, in this magazine. The DREAM study was published in the *New England Journal of Medicine* and has been the subject of national media attention.

Having a thriving research program ensures that we provide the most up-to-date treatments to our patients. In 2018, our physicians saw more than 125,000 patient visits in 17 sub-specialties. This issue of *Scheie Vision* tells the story of two of these patients, who both received a life-changing corneal transplant. We also detail the impact of our vision loss support group, which provides valuable information and emotional support to dozens of patients each month. Finally, we shine a spotlight on our oculoplastic and elective services, describing unique options offered for patients.

Our physicians are also passionate about caring for underserved populations, traveling throughout Philadelphia and across the world to provide free eye care. In this edition, we highlight the outreach of Dr. Graham Quinn, who has traveled to numerous countries to care for babies with retinopathy of prematurity.

I would like to express my sincere gratitude for the colleagues, trainees, and patients who make the Scheie Eye Institute such an extraordinary place. I could not be more proud to lead and represent this outstanding team. I wish you all a very happy and healthy holiday season!

Sincerely,



Joan O'Brien, MD

Corneal Transplants

Transforming Lives at All Ages

By Kristen Mulvihill

Ryan in April 2016, before the corneal transplant

The expression “age is just a number” may have some tangible truth after all, at least for Ryan Cochran and Lloyd Patton. In 2016, the 3-year-old and 71-year-old, respectively, underwent the same transformative surgery to improve their vision: a corneal transplant.

Ryan Cochran was born with congenital glaucoma, a rare condition occurring in infants and young children that causes increased intraocular pressure, which damages the optic nerve. His glaucoma caused corneal edema, or swelling of the cornea. Ryan was blind until he was 18 months old.

At only ten days old, Ryan had his first surgery at the Children’s Hospital of Philadelphia (CHOP). By the time he reached his first birthday, he had undergone multiple operations.

After receiving tube implants in both of his eyes, Ryan’s right eye started to respond well to the treatments and eye drops. However, the vision in his left eye remained cloudy.

“He couldn’t do anything. It was a challenge to get him to try anything,” recalled Ryan’s mother, Erin Cochran. “He had no interest in trying new foods, no interest in walking, no interest in crawling.”

Erin and her husband Nick Cochran enrolled their son in Pennsylvania’s Early Intervention program, which offers services to support families raising young children with developmental disabilities and delays. Ryan received a variety of therapies, including occupational, speech, physical, and vision therapy.

As Ryan’s limited vision continued to pose challenges to his development, Nick and Erin considered the possibility of a corneal transplant for their son. The operation requires the removal of all or part of the damaged or diseased layers of the cornea. The layers are then replaced with healthy corneal tissue from a donor.

Dr. Monte Mills, a pediatric ophthalmology and glaucoma specialist at CHOP, referred the Cochrans to Dr. Stephen Orlin, a cornea specialist at the Scheie Eye Institute.

“We definitely get funny looks when we go see Dr. Orlin because everyone in the waiting room is much older than Ryan,” Erin said. “It’s such an unusual and rare instance that a child this young would require a transplant.”

At the age of one, Ryan received a partial corneal transplant in his left eye. However, due to the complexity of Ryan's condition and his age, the partial transplant operation was not successful.

Two weeks later, Dr. Orlin performed a full corneal transplant on Ryan's left eye at CHOP. The results were striking.

"In the year and a half that we've had since the surgery, he's grown leaps and bounds. Now, he can walk, crawl, climb, eat just about anything, and grab a pen. I mean, you take a lot of those things for granted," Erin explained. "Without that transplant, there would've been no way for him to learn at that pace."

Ryan is not the only patient who benefited from a corneal transplant. During the summer of 2016, Lloyd Patton's right eye suddenly became severely inflamed, causing him pain and irritation. "I basically just stayed indoors and sat in my darkened living room and listened to the TV, not really watching it," he recalled. "It was a tough summer."

Lloyd had glaucoma and was seeing Dr. Prithvi Sankar, a glaucoma specialist at Scheie, for treatment. After a glaucoma surgery, Lloyd developed corneal complications. Like Ryan, Lloyd's condition resulted in corneal edema, the source of his discomfort. He required a corneal transplant in his right eye.

However, Lloyd had very low pressure in his eye, making

Ryan with his parents in October 2017, after receiving a corneal transplant

the transplant more complicated. Before he could receive the transplant, Lloyd had to wait for his eye pressure to normalize.

When Lloyd's eye pressure finally stabilized, he was immediately matched with a suitable donor and prepped for surgery. Along with cataract surgery, Dr. Orlin performed the corneal transplant in September 2016.

Following their operations, both Ryan and Lloyd endured extensive recovery processes. Ryan required both treatment for his glaucoma and for his transplant. He also struggled to comprehend the reasons behind the numerous doctor visits and treatments.

"I can't rationalize what we're doing to him because he's so young. So he doesn't understand why people are looking at his eyes, or why he has to do eye drops ten times a day, or why he would require going to the doctor's office maybe more than most children his age," Erin explained. "So, it was difficult getting him acclimated to a schedule and getting him to understand that this is what we're doing, even if it's something he doesn't want to do."

Packed with doctor appointments and eye drops, the beginning weeks of Lloyd's recovery were also draining. "I was using 25 to 26 eye drops a day in the beginning," he said. "There was a point in time where I was seeing Dr. Orlin on Monday, Wednesday, and Friday, and Dr. Sankar on maybe Tuesdays and Thursdays."

Since then, the number of required eye drops has vastly diminished and Lloyd only goes in for appointments every couple of months.

Lloyd was thrilled with the transplant's success. "My eyesight has definitely improved. I believe my vision is around 20/40 or 20/60 now," he remarked. "When I go in for an eye test, I'm doing a lot better than I was in the past."

Amidst her child's ongoing health obstacles, Erin remains optimistic and grateful. "My husband and I have been married almost four years and this is our only child. You would do anything for your kids," she said. "Dr. Orlin has been fantastic. And that's why I do believe we have been able to sustain Ryan's cornea for this long, because we really are in the best possible care."

Are you a patient interested in telling your story in a future issue of *Scheie Vision*? If so, call 215.662.9892 **or email** kristen.mulvihill@uphs.upenn.edu**. We would love to hear from you!**

Vision Research in the Natural World

By Rebecca Salowe

How do we see? How do we focus our eyes? How does our visual system estimate the distance between two objects? We perform these tasks more than 100,000 times each day without much thought. It is the goal of Dr. Johannes Burge, an Assistant Professor of Psychology at the University of Pennsylvania (UPenn), to understand the computational solutions to these tasks.

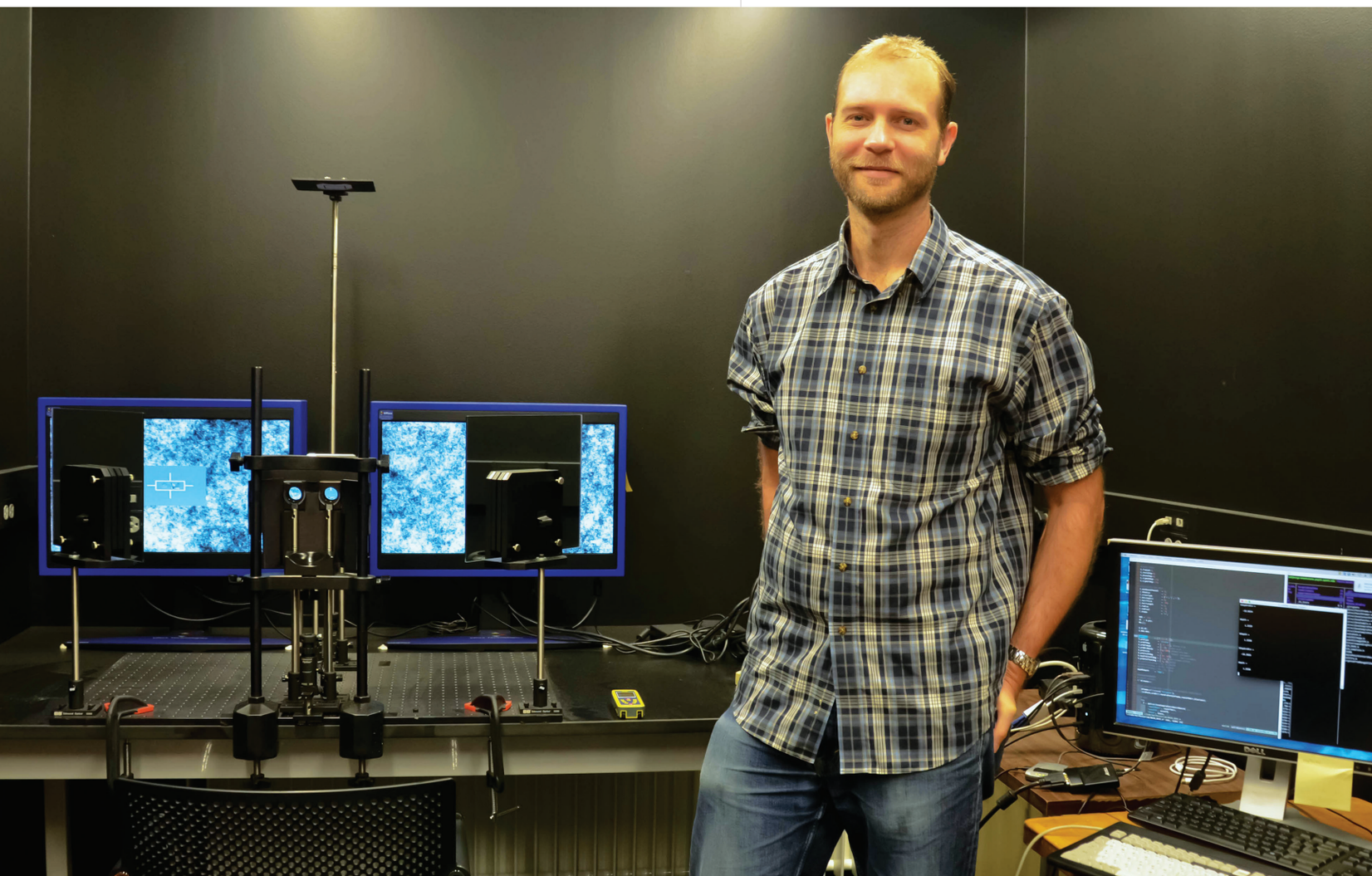
One of over 60 vision scientists at UPenn, Dr. Burge specializes in sensation and perception. His research specifically aims to understand how our visual system completes these processes in the natural world. However, it is difficult to model the "natural world" in a laboratory setting, a challenge that Dr. Burge has spent years developing methods to overcome.

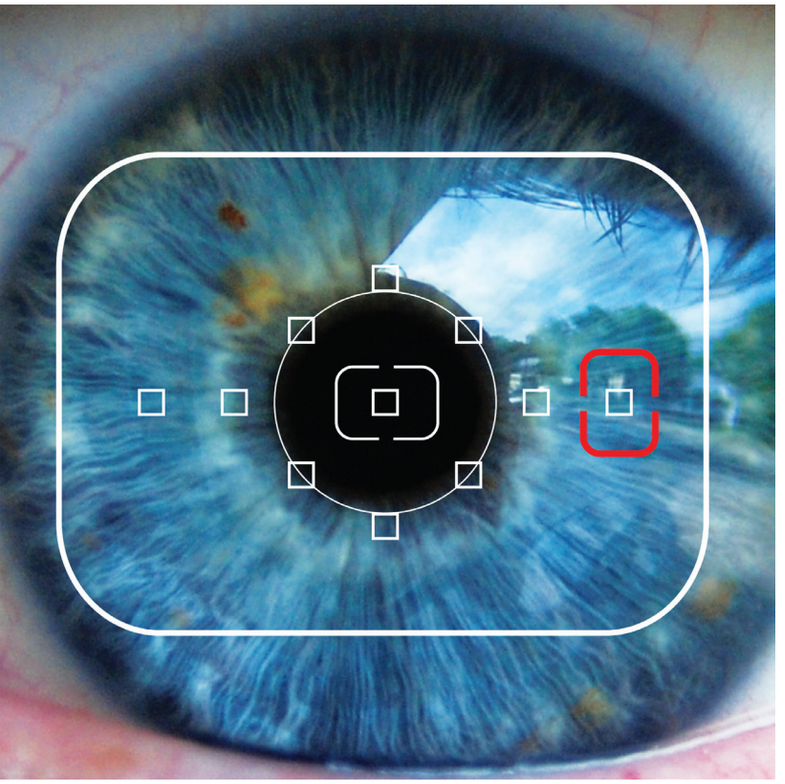
HOW TO MODEL THE WORLD AROUND US

Most laboratory research on eyesight examines and probes vision using artificial stimuli, such as bars or blobs in a particular shape. As a result, the majority of knowledge about the visual system to date comes from research with artificial stimuli. Dr. Burge hopes to change this trend. While bars and blobs are well-defined mathematically, making subsequent analyses easier to control, they are not a realistic portrayal of our world. Our visual world is complex and diverse, full of color and detail.

So why is it rare to use real images – called "natural" stimuli – in vision experiments? "Natural stimuli are more difficult for experiments and analyses, because they are complicated and resist precise mathematical description," Dr. Burge explained. "We cannot control all the variables that may impact the performance of the observer."

Despite these challenges, Dr. Burge's lab continues to investigate methods to better define natural stimuli. Unfortunately, the solution is not as simple as hiring statisticians to create mathematical models of natural images. Due to the sheer complexity of images we see in the natural world, this method has not seen much success.





The auto-focus system in the eye provides unique insights on how to improve camera technology in smartphones.

Thus, Dr. Burge pursued another possible solution, which he likens to "playing the detective." "Let's take the task of estimating the distance of an object from you in a scene," he said. "There are certain features in the images formed on the back of your eye that provide information about how far away that object is. These features are clues about the distance." Examples of "clues" include the size of the object's image or the position of the shadows it casts.

"We then develop statistical tools that automatically identify the useful features that are relevant to estimating distance," he continued. "We determine how to combine those features in the best way possible to estimate the distance. Finally, we conduct an experiment to test if humans in fact use those features."

Dr. Burge has repeatedly found that humans use the available image clues to perform visual tasks nearly as well as the theoretical upper limit. On one hand, these results are expected. There has been great evolutionary pressure to effectively perform basic visual tasks, such as estimating the distance to an object, because doing so will aid the capture of food or avoidance of predators. On the other hand, it is remarkable that a task-based analysis of natural images can tightly predict visual performance.

AUTO-FOCUS.... AND SMARTPHONE CAMERAS

One real-life application of Dr. Burge's research revolves around something unexpected: smartphone photos. Or, more specifically, understanding how the auto-focus system works in the human eye – and how it can better inform this process in cameras.

"The auto-focus system in our eyes works a lot better than the auto-focus system in your camera," said Dr. Burge. "That's because our visual systems use the available information—the clues in the images—in a much more principled way than the engineers at Apple."

Imagine you are taking a photo with your iPhone. You glance at the screen and initially see a blurry image of the scene. The clarity of the image oscillates for a couple seconds before becoming clear and sharp, and then you take the photo.

What is actually happening is that the camera is using a "guess and check" procedure to identify the optimal location of the lens. In a matter of seconds, it moves the lens in one direction and checks if the contrast improves – then continues to make adjustments until the image becomes sharp. Sometimes, the lens moves past the point of best focus, so it returns in the opposite direction (i.e. the image on your phone may be blurry, then clear, then blurry, before becoming stable).

Though this process is fast, usually happening in less than a second, it is significantly slower than the speed of auto-focus in the human eye. "The fact that you can *see* the auto-focusing happen in the camera, and be frustrated by it, means that it is happening much slower than the auto-focusing in your eye," said Dr. Burge. "The human visual system does it differently, and does it better."

This is an incredible feat, when one considers the diversity of images that our eyes see. In an instant, we can turn our heads and see objects at multiple distances with a staggering variety of colors, shapes, sizes, and textures. How do our eyes auto-focus without us even noticing? And can that same process be applied to smartphone cameras in the future? Dr. Burge and colleagues believe so.

"There is one statistical property that is remarkably constant in images, in spite of all the variability," said Dr. Burge. "And that is the amount of contrast at each level of detail in an image. It is what is known as a 1/f ('one-over-f') amplitude spectrum." In this spectrum, the amount of contrast at each level of detail (i.e. frequency) decreases in proportion to the frequency.

However, an out-of-focus image changes the normal shape of this spectrum. A small amount of focus error removes fine detail (i.e. high spatial frequencies) from the image, like the pinstripes on a shirt. A medium amount of focus error removes contrast at intermediate levels of detail. And the trend continues.

The significance of this pattern is that different focus errors are associated with differently shaped spectra. "If you can recover the shape of the spectrum, you can use that shape to estimate focus error," said Dr. Burge. The estimate of that focus error can then be used to shift the lens by a

specific amount – and it happens instantly, without any need for the guess-and-check process. These findings were published in *Proceedings of the Natural Academy of Science* as well as *Information Display*. The findings were also patented.

Though more studies are needed, this auto-focus process has exciting implications for improving smartphone cameras. Dr. Burge and colleagues are also in discussions with a medical device company that is building a digital magnifying glass for individuals with low vision. Patients have given feedback that the auto-focus of this device does not work well, so Dr. Burge is working with the company to see if his method can be incorporated into the device.

BLUR, BINOCULAR DEPTH PERCEPTION, AND PUBLIC HEALTH CONSEQUENCES

Dr. Burge's research converges on another interesting area: monovision prescriptions. In the past decade, more and more patients over age 40 have opted to receive monovision glasses or contacts instead of bifocals. Unlike bifocals, which have one lens with two distinct optical powers, monovision corrections prescribe a completely different lens for each eye. Typically, the dominant eye receives a prescription for far vision and the non-dominant eye for near vision.

"Some people love it because they don't need to look up or down to see far and near, respectively," said Dr. Burge. In addition, monofocal lenses reduce a person's dependency on reading glasses for near-vision tasks, such as reading a book. But these lenses are not without their drawbacks. "With a monovision correction, at least one eye's image will always be blurry, no matter what," Dr. Burge added. "But some people aren't bothered by the superimposed blurry image." In fact, there is some evidence to suggest that the visual system begins to suppress the blurrier of the two images.

Though monofocal lenses are being prescribed more widely, their impact on binocular vision remains unknown.

In preliminary work, Dr. Burge has shown that monovision corrections can have a dramatic impact on binocular depth perception. He cites a perceptual illusion called the Pulfrich Effect as support. In this illusion, a person views a pendulum swinging back and forth in the frontal plane. Then, he or she takes a sunglass lens and places it over one eye. What happens to the percept of the pendulum?

"Instead of the pendulum looking like it is swinging back and forth in the frontal plane, it now looks like it is swinging in an elliptical path, closer when it swings in one direction, farther when it swings in the other," said Dr. Burge. "It's an incredibly dramatic effect."

Why does this happen? It's a relatively simple explanation: the eye with the sunglass lens receives less light, slowing down the eye's response (i.e. the transmission of that signal to the brain). If one eye is sending signals more slowly than the other, a neural disparity is created.

Dr. Burge and colleagues thus reasoned that if one eye were *blurred* more than the other (as in monocular lenses), the same effect would occur. After all, blur reduces contrast, and reduced contrast is also known to decrease the speed of signal transmission. They were surprised to find the exact opposite.

"We found the reverse Pulfrich Effect," he explained. "The perceived elliptical path is in the opposite direction of the elliptical path that we were expecting."

They soon discovered an explanation. Instead of slowing transmission to the eye, like the sunglass lens, the blurred lens actually *quickened* the signal transmission relative to the other eye. The blurring knocked out fine detail, which takes more time to process than coarse detail. A similar effect can occur if the pupil of one eye is dilated and the other is not, as often happens for patients visiting the optometric clinic.

This neural disparity is not just an obscure effect seen in a lab; it may have serious implications for optometric practice and public health.

"Imagine you are pulling up to an intersection in your car," explained Dr. Burge. "And imagine you have a monovision correction that is blurring the right eye for far objects. Now imagine that a bicyclist is coming from the left in the cross traffic. You're going to perceive this bicyclist as being much farther away than he actually is. So maybe you're a bit lax on how you hit the brakes. Collision."

More research is needed to understand if individuals with monovision lenses adapt out of this effect. However, previous research has shown that over time, these Pulfrich effects become more pronounced rather than eliminated.

Driving is just one example of a public health effect of monovision prescriptions. One possible solution is ensuring that in the United States, where we drive on the right side of the road, patients receive the lens focused on far distances in the left eye (rather than whichever eye is dominant). Similarly, drivers in England on the left side of the road should receive the blurred lens in the right eye.

As a whole, Dr. Burge's research into our visual systems has the potential to influence several different realms of life, from day-to-day entertainment to sight-saving technologies.

correcting macular degeneration with gene therapy:

Canine Models and Human Implications

By Nora Laberee

Left to Right: William Beltran, DVM, PhD; Gustavo Aguirre, VMD, PhD; Karina Guziewicz, PhD; Artur Cideciyan, PhD; Samuel Jacobson, MD, PhD. (Photo credit: John Donges, School of Veterinary Medicine)

Researchers at the University of Pennsylvania recently achieved gene therapy success for treating macular degeneration in dogs. Drs. Artur Cideciyan and Samuel Jacobson of the Perelman School of Medicine, and Drs. Karina Guziewicz, William Beltran, and Gustavo Aguirre of the School of Veterinary Medicine, led the Penn team of researchers responsible for this discovery. Their work was published in March 2018 in *Proceedings of the National Academy of Sciences.*

The therapy targets Best disease, an inherited form of vitelliform macular degeneration that causes blindness.

The term macular degeneration refers to eye conditions in which the central part of the retina, called the macula, is slowly damaged. Individuals with macular degeneration lose their central vision, making reading and recognition of faces and objects difficult, and interfering with daily life activities.

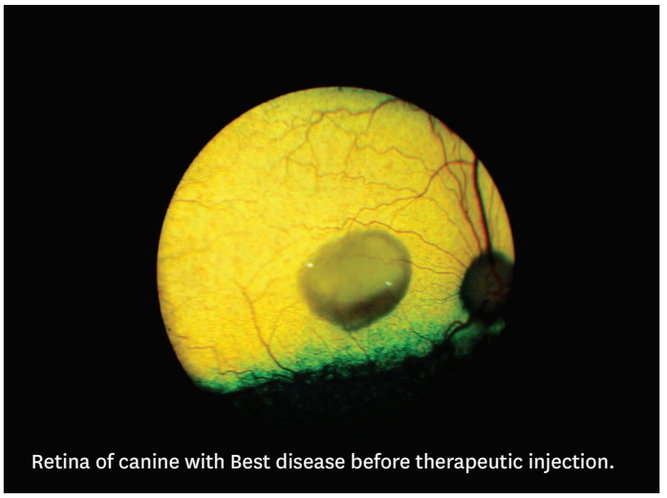
Best disease begins in children and young people and results from a mutation in the *BEST1* gene. The earliest expression of disease causes the foveal retinal cells located at the center of the macula to be separated from their support cells. The fovea is a small but very important

area of tightly packed cone photoreceptors responsible for high resolution vision – a feature thought to be found only in primates. But previous research led by Dr. Beltran, Professor of Ophthalmology and Director of the Division of Experimental Retinal Therapies (ExpeRTs) at Penn's School of Veterinary Medicine, showed that dogs and humans have similar foveas.

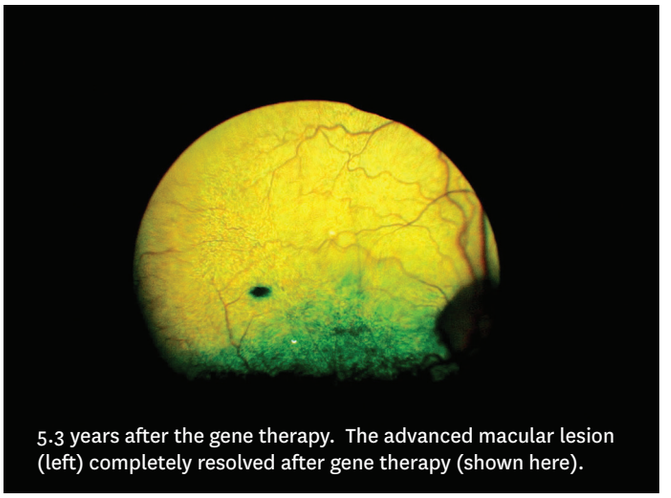
Even more, mutations in the *BEST1* gene also cause macular degeneration in dogs. "Not only is it the same gene mutation causing this disease in both dogs and humans," said Dr. Cideciyan, Research Professor of Ophthalmology at Penn Medicine, "but the foveal similarities between the two are remarkable. This was discovered collaboratively, with Penn Vet School and Penn Medicine working together."

By using non-human models with such similar foveas to humans, the researchers are more confident that their canine results are significant for individuals with Best disease. "Mouse models do not recapitulate the human disease in the same way," said Dr. Guziewicz, Research Assistant Professor of Ophthalmology at Penn Vet School. A crucial difference between mouse and canine models is that dogs cannot be genetically engineered to have the disease; to study canines with Best disease, researchers must find dogs who are already suffering from this form of macular degeneration.

The researchers used a harmless virus to introduce a healthy copy of the *BEST1* gene in the dogs with Best disease, at various stages of the disease. The results have been astounding. The researchers corrected mild and severe lesions, and they were able to observe the gene therapy reconnecting the two retinal cell layers that are separated due to the *BEST1* gene mutation. "On the molecular level, we observed a remarkable restoration of structure between photoreceptors and their support cells, essential for preservation of vision," said Dr. Guziewicz. The treated dogs have remained disease free for as long as six years.



Retina of canine with Best disease before therapeutic injection.



5.3 years after the gene therapy. The advanced macular lesion (left) completely resolved after gene therapy (shown here).

"Here is one more example of how our longstanding collaborative team of Scheie Eye Institute and Penn Vet's vision scientists and ophthalmologists, harnesses the value of canine models to decipher the mechanisms of retinal diseases and validate novel strategies for treating blindness," said Dr. Beltran.

"This is a new and exciting discovery, with a long history involving key discoveries by many investigators trying to understand and treat macular degeneration," said Dr. Jacobson, Professor of Ophthalmology and Director of the Center for Hereditary Retinal Degenerations.

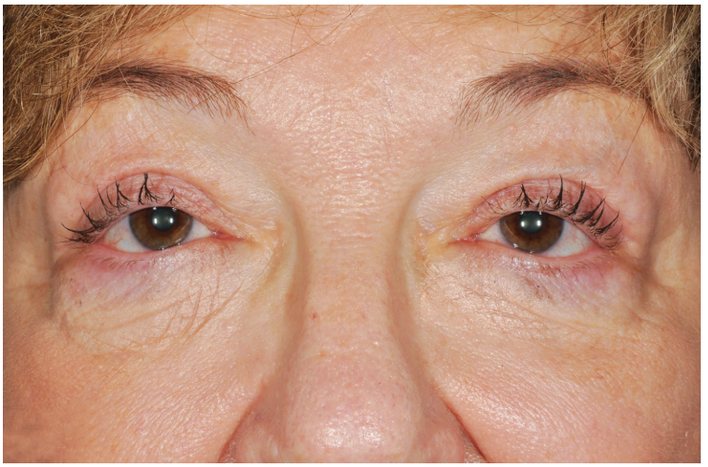
"This project has been taking shape for decades," added Dr. Aguirre, Professor of Medical Genetics and Ophthalmology at Penn Vet. Dr. Aguirre has been studying retinal disease and gene therapy since the 1970's, and Dr. Jacobson since the 1980's. For the past several years, the researchers have focused on the mechanisms of Best disease.

The researchers also involved human patients with the *BEST1* mutation in the current study, to examine the similarities between humans and dogs with Best disease. Using novel retinal imaging and vision-testing strategies, they found microscopic separation of retina from its support cells in human patients, which was associated with slowing of adaptation of vision to dark conditions. This suggests that the mechanism of disease through the separation of cell layers is similar in canines and humans, and further supports the evidence that humans could benefit from this new treatment.

The gene therapy developed for Best disease is the result of years of research, and has tremendously exciting implications for the future. While there is work still to be done before the therapy moves to human trials, the collaborative efforts of these Penn Medicine and Veterinary Medicine researchers have garnered sight-saving results so far, and they are hopeful this will translate to humans, too.

Additional authors on this paper include Penn Vet's András M. Komáromy, Valérie L. Dufour, Simone Iwabe, Gordon Ruthel, and Brian T. Kendrick; Penn Medicine's Malgorzata Swider and Alexander Sumaroka; University of Florida's Vince A. Chiodo and William W. Hauswirth; and University of Toronto's Elise Héon.

Patient 1, **Pre-Blepharoplasty**



Patient 1, **Post-Blepharoplasty**

Elective at Scheie Eye Institute

By Marquis Vaughn

A Q&A with Dr. Sonul Mehta

The Oculoplastic and Reconstructive Surgery Service at the Scheie Eye Institute serves a staggering variety of patients, ranging from those experiencing trauma from a gunshot wound to those diagnosed with thyroid eye disease. The primary goal of this specialty is to provide plastic and reconstructive surgery to the area of the face surrounding the eye and orbit. What many patients do not realize, however, is that this mission covers a variety of elective procedures. Dr. Sonul Mehta, who directs this specialty alongside colleague César Briceño, delves into these details.

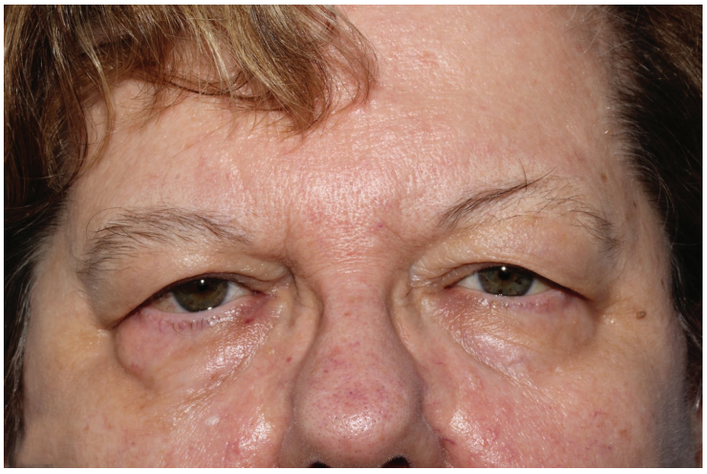
WHAT ELECTIVE SERVICES DO YOU PROVIDE AT THE SCHEIE EYE INSTITUTE?

We offer a range of services that are both surgical and nonsurgical to rejuvenate the mid-face and face. These services include injectable products such as fillers or botox, lasers such as intense pulsed light (IPL), and microdermabrasion, and surgeries including upper and lower lid blepharoplasty, brow lift, ptosis repair, and midface lift.

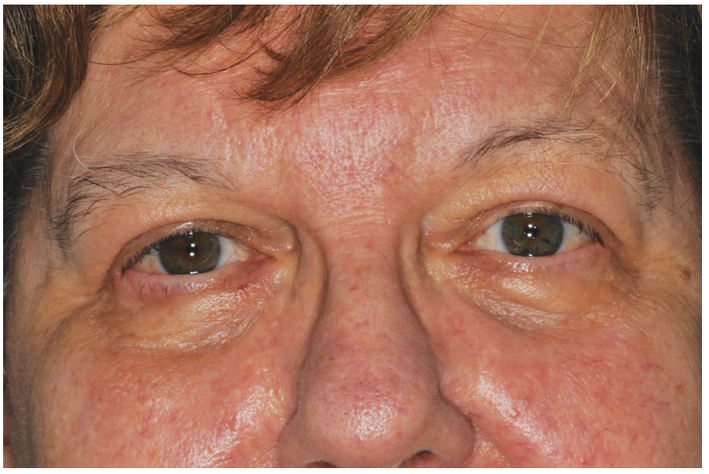
WHICH SERVICES ARE THE MOST POPULAR WITH PATIENTS?

Upper and lower lid blepharoplasty are most popular (see photos above). When patients have upper eyelids that sag or droop, or lower lids that appear puffy or have pouches or bags, they may look sad or tired. Surgery to remove the excess skin and fat can help to rejuvenate the appearance of the eyelids and face.

Botox and other injectables are also popular with patients, as there is no downtime (recovery time).



Patient 2, **Pre-Blepharoplasty**



Patient 2, **Post-Blepharoplasty**

Services

WHAT SERVICES WOULD YOU LIKE TO HIGHLIGHT THAT PATIENTS MAY NOT BE AWARE OF?

There are a few services I would like to highlight:

- Photofacial: In this 30-minute treatment, the physician treats a broad range of skin conditions caused by aging and sun exposure, using the appropriate wavelength or filter. Light energy wavelengths delivered by IPL lightly heat the top layers of the skin. The skin absorbs the heat, which helps to reduce the appearance of broken blood vessels, aging spots, and other facial discolorations. This process helps to restore the skin to its normal state. In addition, the photo-thermal energy eliminates small vessels that cause redness, as well as melanin, which causes unwanted pigmentation.

- Microdermabrasion: This system is used to revitalize and renew all skin types. Small micro-crystals exfoliate the skin, while minimal suction occurs, to help remove dead skin cells from the outer layer of the face. The result is fresher and smoother skin. This treatment also minimizes the appearance of facial blemishes such as age spots, wrinkles, fine lines, and acne scarring. There is no irritation involved, as well as no downtime for recovery. A microdermabrasion treatment also provides an excellent complement to a careful skin care regimen, by helping skin to drink in and fully benefit from the application of high-quality skin care products.

- Brow Lift Surgery: This surgical treatment is designed for patients who have excess skin on the upper lids, wrinkles and fine lines that run across the forehead horizontally, droopy eyebrows, or vertical frown lines that appear in between the eyebrows. The treatment itself gives patients a more youthful and rested appearance, all while eliminating heavy wrinkles and fine lines.

WHAT IS THE MOST COMMON QUESTION YOU RECEIVE?

The most common question I receive is: "What is the downtime after eyelid surgery?" Most patients from eyelid surgery usually have bruising and swelling for about 1-2 weeks.

WHY SHOULD PATIENTS COME TO SEE YOU, VERSUS A PLASTIC SURGEON?

As an oculo-facial plastic surgeon, I specialize in surgeries around the eyes and mid-face. The training of oculoplastic surgeons begins after medical school with a residency in ophthalmology or eye surgery. This training involves understanding the intimate details of the eye, eyelids, bones, tear duct, and facial region around the eye. A key portion of ophthalmology training is very delicate surgery that not only requires an exquisitely delicate touch, but also close attention to detail and precision. After residency, I completed a two-year fellowship dedicated to surgeries and procedures around the eye and face.

For more information about the services described in this article, or to inquire about your eligibility for these treatments and procedures, please call 215.662.8100**.**

A NEW HOME for the macula vision research foundation

By Nora Laberee

The Macula Vision Research Foundation (MVRF) recently found a new home at the Scheie Eye Institute of the University of Pennsylvania.

MVRF was established in 1997 by Karen and Herbert Lotman, after a close family member was diagnosed with macular degeneration, an eye condition that causes retinal deterioration and vision loss. Macular degeneration is a leading cause of vision impairment in the United States for those of age 65 years or older. Mrs. Lotman and the late Mr. Lotman were inspired to start the foundation to help find a cure for macular degeneration, while supporting and helping people with the condition.

MVRF has had close ties with Scheie from the start, so it was a clear choice to team up with Scheie to find a cure for macular degeneration. In June 2018, MVRF established the Karen and Herbert Lotman Fund of the Macula Vision Research Foundation of the University of Pennsylvania Scheie Eye Institute. The establishment of this fund allocates the information and resources associated with MVRF and its donors, as well as its remaining $2.3 million, to Scheie.

Through this new fund, all charitable donations to MVRF will fund vital vision research projects being conducted by scientists at Scheie. Funds from MVRF will be directed to a variety of research efforts, including the study of macular degeneration, and another major area of developing research, gene therapy.

MVRF has generously supported research that led to the development of the sight-saving gene therapy LUXTURNA. This therapy treats Leber's congenital amaurosis (LCA), a retinal degenerative disease that leads to blindness. This represents the first gene therapy for an inherited disease to be approved by the Food and Drug Administration.

"The Lotmans have been instrumental in helping us make major breakthroughs in vision research," said Joan O'Brien, Chairman of the Ophthalmology Department at the University of Pennsylvania. This fund will support crucial vision research and discovery, with implications here at Scheie and far beyond.

Sheri Drossner (left) and Ranjoo Prasad, OD (right) lead the Vision Loss Support Group

scheie's vision loss support group

Creating a Lasting Impact

By Nora Laberee and Kristen Mulvihill

With its first meeting held in January 2017, the Penn Center for Low Vision Rehabilitation's Vision Loss Support Group continues to expand in size and impact.

Led by Ranjoo Prasad, OD, the center provides support to individuals with visual impairments that can no longer be improved through medical or surgical means. The support group embodies this mission, serving as a platform for members to share their experiences and learn from various guest speakers.

"I feel that the support group is going very well, beyond our expectations," said Dr. Prasad. "There is an amazing connection that the members have found among each other."

Meeting each month in the Ralston House, the Vision Loss Support Group is led by Sheri Grand Drossner, a Clinical Research Coordinator at the Scheie Eye Institute with a Master's Degree in Social Work. Each meeting consists of individuals with a range of diagnoses and visual abilities, all of whom share a desire for emotional support and encouragement.

"I'm seeing the connections, which is great, and I'm hearing the participants voice that they truly value coming and they look forward to coming," said Sheri. "The group gives them hope and inspiration to accomplish things they've been struggling with."

The group hosts occasional guest speakers who share knowledge on various topics, including the assistive devices and technologies available for patients with vision loss. In addition to guest speakers, the participants hold valuable open discussions during meetings.

"The group discussion just takes a life of its own," said Sheri. "People do talk about their fears and anxieties, and then people are there to encourage and support. People have questions about services, or maybe something we've discussed in the past."

Several participants expressed how the support group has introduced them to information and resources to which they would not have otherwise been exposed. As more technologies are developed to assist individuals struggling with vision loss, learning how to properly use and find adequate funding for these technologies becomes difficult.

One member, Marlene, emphasized how she learns from both the speakers and the other members. "We get good information and a great speaker who lets us know that there is stuff out there that can help us," Marlene said. She has been a member for a while. "I haven't missed a month that I can think of."

Another member of the group, Yvonne, acts as an advocate for other individuals struggling with their vision loss. "My whole goal is to educate and empower people," she said. "Some people say they don't think they can make it, they say, 'Oh losing your sight, that's it.' But I've learned, that's not it. There's so many resources." Newer members of the group look to experienced members like Yvonne to help them through the unfamiliar and difficult parts of vision loss or impairment.

In the last year, the group has steadily grown. If the group continues to expand, Sheri and Dr. Prasad plan to incorporate caregivers into the sessions, or if opportune, create an entirely separate group for caregivers.

Both Sheri and Dr. Prasad also intend to implement outcome measures to determine the group's impact on patients with low vision or blindness, and how the group enhances their quality of life.

The Vision Loss Support Group meets on the last Tuesday of each month at the Ralston House from 3-4PM. For more information, please contact Sheri Drossner at 215.662.8177.

Leaders of an ROP workshop visiting a NICU in Moscow, Russia.

By Nora Laberee

global connections and global impact

Retinopathy of Prematurity (ROP) is an eye disorder that can affect premature babies, especially those born before 31 weeks of pregnancy and weighing less than 2.5 pounds. Characterized by abnormal blood vessel growth that may lead to retinal detachment, the disorder is potentially blinding and is one of the leading causes of vision loss and blindness in children born prematurely. As the health systems in countries around the world continue to develop, premature babies are surviving at higher rates. This positive development, however, comes with an increased risk of ROP in the surviving premature babies.

Graham Quinn, MD, MSCE, has been studying ROP since his fellowship at the Children's Hospital of Philadelphia in the late 1970s. Interested over decades in the burden of ROP in other countries, Dr. Quinn, along with colleagues Professor Clare Gilbert of the London School of Hygiene & Tropical Medicine and Professor Brian Darlow, a neonatologist from Otago University in Christchurch, New Zealand, created the ROP workshop program. With impact spanning the globe, the program is aimed at teaching and collaborating with doctors and nurses to develop programs for each region to detect and treat ROP.

Dr. Quinn has traveled to dozens of countries spanning six continents, helping to run workshops, talks, and meetings to assist local doctors in their efforts to detect and treat severe forms of ROP. Dr. Quinn's work focuses on giving local healthcare providers the tools and knowledge they need to fight ROP in their own populations. "It's such a privilege to help people take care of their own kids," said Dr. Quinn. "This has been so rewarding." He emphasizes that the whole approach is not to go in and fix the problem, but to help doctors worldwide to step in and take care of their own kids in a given region, city, or country.

Workshop in Hanoi, Vietnam, bringing ophthalmologists, neonatologists and nurses together for a 3 day intensive exchange.

The doctors and caregivers working in these countries are a source of inspiration. “You meet heroes when you undertake an effort like this,” Dr. Quinn said. He cites his close friend Luz Gordillo, MD of Lima, Peru as one of these heroes. Dr. Gordillo did her fellowship in the US, and when she returned to Peru, she was struck by the severity of ROP blindness in her home country. She decided to take action, and singlehandedly implemented treatment and prevention efforts that eventually extended country-wide. “Twenty years later, she will still hop on a plane to treat a child whenever she is called,” Dr. Quinn said.

Since 2006, Dr. Quinn has helped to host a series of ROP World Congresses in Lithuania, India, China, and Mexico in order to bring together ophthalmologists, nurses, and neonatologists to network, learn, and support each other. Another world congress is on the horizon in the next couple of years. Most recently, Dr. Quinn and other researchers at CHOP have published papers on the use of telemedicine in ROP screening and how growth of a premature infant may help determine which babies are at risk for ROP.

As ROP becomes a more common disorder worldwide, more prevention efforts are necessary, and Dr. Quinn points to the next generation for continued efforts on this front. Dr. Quinn is looking forward to his upcoming trips to Rome and Budapest, where he is working with colleagues on longstanding projects. Of his decades of global work on ROP prevention and treatment, Dr. Quinn said, “Enabling physicians and nurses to take care of their kids makes it all worth it.”

Dr. Bunya and Dr. Massaro examine a patient

Fish Oil Supplements

Not Effective for Treating Dry Eye

By Nora Laberee

In 2014, the Dry Eye Assessment and Management (DREAM) study began to screen and recruit patients for a clinical trial testing the efficacy and safety of omega-3 fatty acids as a treatment for dry eye disease. The results, recently published in the *New England Journal of Medicine*, show no evidence of benefit or reduced symptoms from the use of omega-3 fatty acids.

Dry eye disease (DED) affects an estimated 3.2 million women and 1.68 million men over the age of 50 in the United States, according to the American Academy of Ophthalmology. This chronic condition causes ocular discomfort and visual disturbances that can significantly reduce quality of life. Doctors often advise the use of fish oil supplements, or omega-3 fatty acids, to relieve these symptoms, and it is common practice for patients to take these supplements as part of their treatment.

The results of the DREAM study suggest this practice may not be as effective as originally believed. An $8 million grant from the National Eye Institute (NEI) allowed a team made up of 25 different centers across the US to participate in this double-blind clinical trial. Over a 12-month period, participants took daily oral supplements of 3000 mg of n-3 fatty acids (omega-3 fatty acids), or an olive oil placebo. The results show that the change in dry eye symptoms between the active group and the placebo group was not significantly different.

Giacomina Massaro-Giordano, MD, Vatinee Bunya, MD, and Maureen Maguire, PhD, the leads for this study at Scheie, all agreed that they did not expect the results that came out of the study. “As clinicians, we were surprised,” said Dr. Massaro. Omega-3 fatty acids are not usually the primary treatment for dry

eye, but are often recommended in addition to a more central line of treatment like eye drops or prescription medications. Now, the team's data suggesting that omega-3's do not alleviate symptoms may impact the recommendation practices of many ophthalmologists, whether involved in the study or not.

"I always tell patients about the results of the study, whether or not they ask about them. Although, a lot of patients have heard about the results," said Dr. Bunya, the Principal Investigator for the DREAM clinical center at Scheie.

"This should make people think much more seriously about whether or not they're going to advise their patients to take fish oil (omega-3's)," Dr. Maguire added. "There are a large variety of other treatments available."

Dr. Bunya also pointed out how the cost of omega-3 supplements is high enough to be a significant factor in some patient practices. "Some patients have stopped taking the supplement because they found out the results of the study and it was too expensive for them to keep using it, while others have chosen to keep using it because they really feel like it helps them. But I think cost does play a role." This study may change how clinicians discuss these supplements with their patients. Patients who are comfortable with the cost and feel they receive a benefit from the supplements may continue to use them.

The results show that the change in dry eye symptoms between the active group and the placebo group was not significantly different.

The investigators involved in the DREAM study are already thinking about how to further study the disease. As a biostatistician at Penn Medicine, and the Principal Investigator of the coordinating center for DREAM, Dr. Maguire looks forward to further studying the data and researching the causes and treatments of dry eye. Dr. Massaro emphasizes the need for the various forms of dry eye to be better categorized, so they can each be studied individually. "There is a broad spectrum of patients with dry eye disease," Dr. Maguire said. While the doctors agree that further categorization is necessary, Dr. Maguire pointed out that no subgroups from the initial study were found to benefit from the supplements any more than others.

Omega-3 supplement pills

Preclinical Study Highlights Novel Therapy for Optic Nerve

By Rebecca Salowe

Dr. Kenneth Shindler, an Associate Professor of Ophthalmology and Neurology at the University of Pennsylvania, has spent his career studying methods to prevent damage to the optic nerve. A recent collaboration with Noveome Biotherapeutics has turned his research in a new and surprising direction. Together, these researchers showed that a biologic (i.e. naturally derived drug) called ST266 can prevent damage to the optic nerve and lessen vision loss, when intranasally delivered in mice.

Optic nerve disorders such as optic neuritis (inflammation) and traumatic optic neuropathy (acute injury following blunt head trauma) are notoriously difficult to treat. These disorders are not rare: approximately 50% of patients with multiple sclerosis have an episode of optic neuritis, and more than half of these patients experience permanent visual dysfunction, even after acute inflammation resolves. Traumatic optic neuropathy occurs in up to 5% of blunt head injuries, and is one of the leading ocular injuries sustained in military combat.

Dr. Shindler addresses the challenge of treating these patients: "Numerous therapies have been tried, and none have worked," he said. "People have advocated for high-dose steroids for traumatic optic neuropathy, but there is little evidence that they help patients. Optic nerve trauma results in permanent vision loss so there's a great need to prevent this loss of vision."

Over the past decade, as Dr. Shindler continued to study the mechanisms of optic nerve disorders, Noveome began to investigate a unique biologic called ST266. ST266 is a solution containing secreted proteins produced by culturing a novel population of human amnion epithelial cells under proprietary conditions. This solution includes growth factors and cytokines that have anti-inflammatory and neuroprotective effects in human cells.

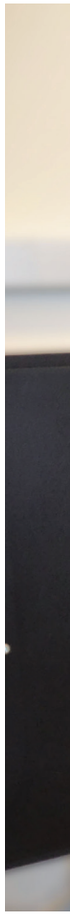
"Their initial reasoning for studying this biologic was wound healing," explained Dr. Shindler. "It was based on the observation that when surgeries are conducted in utero in human babies, the babies are born without a scar. The theory was that there was something about the amniotic fluid that the baby is bathed in that may promote wound healing."

Researchers at Noveome indeed found that ST266 was effective in topically treating wounds. They then experimented with administration of the biologic through the nose, hoping to surpass the blood-brain barrier and achieve delivery directly to the brain. "They found that the highest concentration of the proteins went to the eye and the optic nerve," said Dr. Shindler. Noveome contacted Dr. Shindler to inquire about testing ST266 in his animal model of optic nerve disease. "They said, 'We have this solution that reduces inflammation, prevents nerve cell damage, and goes to the eye and optic nerve. Can you test it in your models?'"

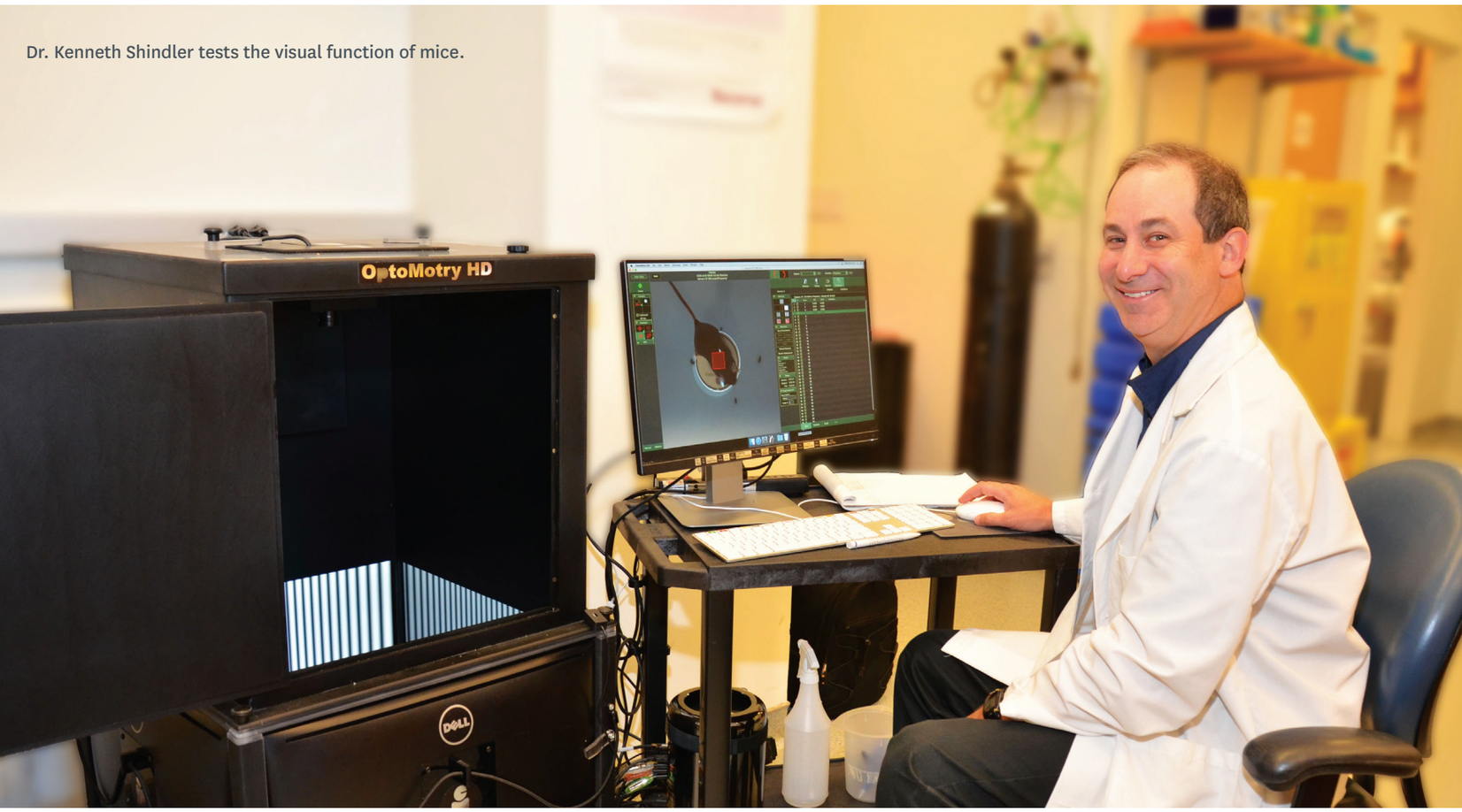
ST266 reduced inflammation, prevented loss of retinal ganglion cells, and attenuated visual dysfunction in the mice

Still tentative, Dr. Shindler and colleagues agreed to proceed with a preclinical study in a mouse model with multiple sclerosis (simulating optic neuritis). "It was so unique that I thought it was worth trying," he recalled. As hoped, the biologic accumulated in rodent eyes and the optic nerve. More surprising, however, was its efficacy. ST266 reduced inflammation, prevented loss of retinal ganglion cells, and attenuated visual dysfunction in the mice. "We were surprised that it worked better than anything we've ever tested in these animals," Dr. Shindler said. These results, published in *Scientific Reports* in 2017, received substantial media attention.

Researchers remained unsure, however, if ST266 was effective in protecting the optic nerve simply because it reduced inflammation. Thus, in 2018, Dr. Shindler's laboratory published results of a second preclinical study on mice with optic crush injury, which simulates conditions in humans caused by head injury. Again, the biologic was administered non-invasively through nasal passages by Dr. Shindler. These mice also showed reduction of optic nerve inflammation, increased



Disorders



Dr. Kenneth Shindler tests the visual function of mice.

survival of retinal ganglion cells, and a trend towards improved visual function. These results, published in *Investigative Ophthalmology & Visual Sciences*, not only confirmed the previous study, but also showed that the biologic has neuroprotective properties beyond just reducing inflammation.

The success of the preclinical studies naturally leads to the question: is it possible that this biologic could be effective in humans? Dr. Shindler and colleagues are working with Noveome to begin a Phase I clinical trial to determine the safety of ST266 delivery via targeted intranasal delivery. The trial, which will take place at Penn, will be conducted in patients with ocular hypertension (who have normal retinas, but are being screened for glaucoma risk).

These results also suggest that intranasal administration could become an alternative option to deliver existing drugs to the retina. Currently, intravitreal injections are the primary method of drug delivery to the retina; though effective, this route of delivery is invasive and carries a small risk of adverse events. Additional studies are needed in humans, but it is possible that intranasal delivery may offer a safer, easier, and less invasive method to deliver therapies to the retina.

Ultimately, ST266 may hold promise for treating not only optic neuritis and traumatic optic neuropathy, but other diseases that affect the optic nerve, such as glaucoma. The biologic also could have benefits in targeting neurodegenerative conditions of the brain, such as Alzheimer's or Parkinson's Disease. Though no conclusions can be made in humans until the completion of clinical trials, researchers remain hopeful about the potential that this biologic may hold.

Recipients of the Champalimaud Vision Award, from left to right: Michael Redmond, PhD; James Bainbridge, MD, PhD; Albert Maguire, MD; Jean Bennett, MD, PhD; Robin Ali, PhD; Samuel Jacobson, MD, PhD. Photo credit: Rui Ochoa.

three penn ophthalmologists win prestigious vision research award

By Rebecca Salowe

In September 2018, three Penn Medicine ophthalmologists were awarded the António Champalimaud Vision Award for their groundbreaking work leading to the first gene therapy for an inherited disease. These researchers included Jean Bennett, MD, PhD, the F.M. Kirby Professor of Ophthalmology; Samuel Jacobson, MD, PhD, Professor of Ophthalmology; and Albert M. Maguire, MD, Professor of Ophthalmology.

They shared this year's 1 million Euro prize with four other researchers, who worked synergistically to develop a gene therapy for retinal degenerations caused by the *RPE65* gene mutation. This therapy restored vision in children and adults with the mutation and received historic FDA approval in December 2017.

The other recipients of the award included Robin Ali, PhD and James Bainbridge, MD, PhD of the University College of London; Michael Redmond, PhD of the National Institutes of Health; and William W. Hauswirth, PhD of the University of Florida College of Medicine. All recipients plan to use the award to advance their research programs.

Based in Lisbon, Portugal, the Champalimaud Foundation was established in 2004. This award is given to the scientists with the greatest contribution to vision research worldwide.

The ceremony in Lisbon, Portugal was held on September 4, 2018. Photo credit: Rui Ochoa.

Neuro-ophthalmic and strabismus specialist Madhura Tamhankar, MD

Oculoplastics and orbital specialist César A. Briceño, MD

Scheie Launches Thyroid Eye Disease Program

By Kristen Mulvihill

In November 2018, the Scheie Eye Institute launched a Thyroid Eye Disease Program.

Thyroid Eye Disease (TED) is the most common orbital disorder in adults and is predominantly seen in patients with hyperthyroidism. The condition can affect anyone, although it is more common in women and smokers.

"TED causes irreversible facial disfigurement. In addition to the impact that it has on vision, it can severely affect a patient's emotional well-being," said Dr. César A. Briceño, Assistant Professor of Ophthalmology at the University of Pennsylvania.

Patients affected with TED can have their visual function severely limited by disfiguring proptosis (protrusion of the eye), dry eyes, and double vision. They often require long-term care, which may involve medical and surgical interventions to improve their visual function and eye appearance. The care of these patients is often multidisciplinary, requiring expert management of proptosis, double vision, and dry eyes.

"Reconstructive surgery for TED can dramatically improve not only the vision and ocular comfort, but it can also help to reverse many of the disfiguring facial changes that are brought on by this disease," said Dr. Briceño.

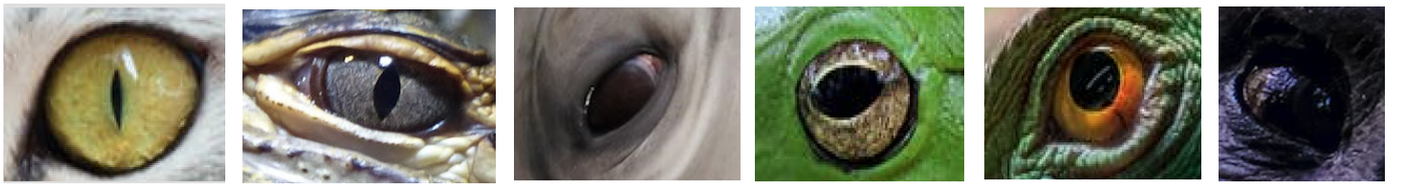
The Thyroid Eye Disease Program offers advanced, comprehensive care for patients with TED. In this clinic, patients will jointly see two physicians with unique areas of expertise: oculoplastics and orbital specialist Dr. César A. Briceño and neuro-ophthalmic and strabismus specialist Dr. Madhura Tamhankar. Together, these physicians will evaluate each patient and devise an appropriate treatment plan. Patients will be offered rehabilitative therapies onsite with these physicians, such as decompression surgery, eye muscle surgery, and eyelid surgery.

"We strongly believe that having a TED program that combines two sub-specialties will enable our patients to have a better understanding of their condition," said Dr. Tamhankar. "Our patients will be offered a comprehensive treatment plan. By aiming to create a center of excellence in managing TED, our goal is to offer our patients novel therapies when they become available in the future."

To schedule a visit or refer a patient to the Thyroid Eye Disease Program at the Scheie Eye Institute, please call 215.662.8100**.**

WHOSE EYE IS IT ANYWAY?

By Kristen Mulvihill and Nora Laberee

1 

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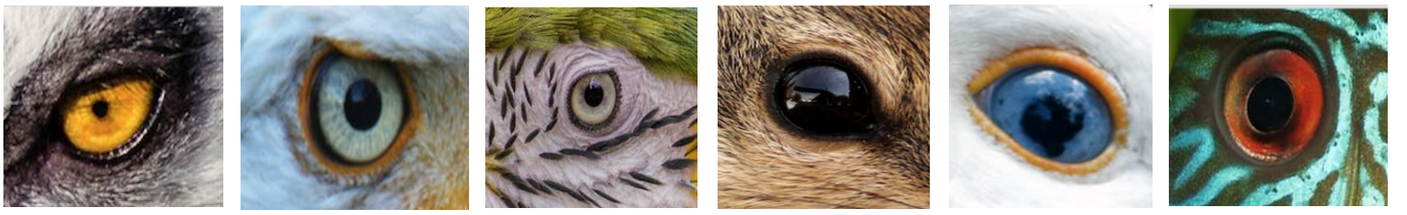
5 

Above, you will find 26 photos of eyes, each from a different animal. Color, pupil size, eye size, and orientation all differ in these animals. Each of these animals has adapted to a specific environment, creating unique specializations for seeing in a wide variety of contexts and physical habitats. From the bee's ability to see ultraviolet rays that are invisible to humans, to the transparent scales that cover a gecko's eyes instead of eyelids, the complex makeup of an animal's eyes can reveal much more than what we see on the surface. See how many eyes you can guess correctly!

ANSWERS:

(1) cat, crocodile, dolphin, frog, gecko, gorilla
(2) mosquito, chameleon, human, elephant
(3) python, iguana, leopard, rooster, zebra
(4) lion, owl, turtle, bee, dog
(5) lemur, bald eagle, macaw bird, squirrel, goose, fish

SCHEIE BY THE NUMBERS

FY2018*

CREATED BY KRISTEN MULVIHILL

59 CLINICAL & RESEARCH FACULTY

FACULTY HAVE TRAVELED TO

30+ COUNTRIES

FOR CLINICAL SERVICE

17 OPHTHALMIC SPECIALTIES

MORE THAN **125,000** PATIENT VISITS

3,002 SURGERIES PERFORMED BY FACULTY

149 FACULTY PUBLICATIONS

A LEADER IN RESEARCH IMPACT

106 H-INDEX

117 CLINICAL TRIALS IN PROGRESS

100% OF GRADUATING RESIDENTS PURSUE TOP FELLOWSHIP PROGRAMS

RESIDENCY PROGRAM RANKED

#3

IN THE NATION FOR RESEARCH OUTPUT PER ALUMNUS

*July 1, 2017 - July 1, 2018

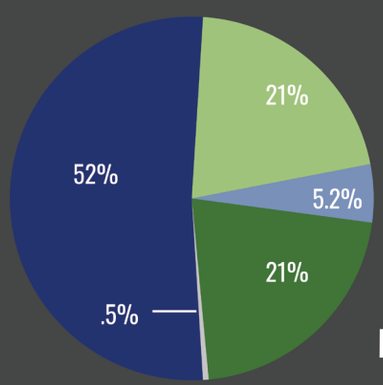
RANKED #3

IN THE NATION FOR NATIONAL EYE INSTITUTE FUNDING

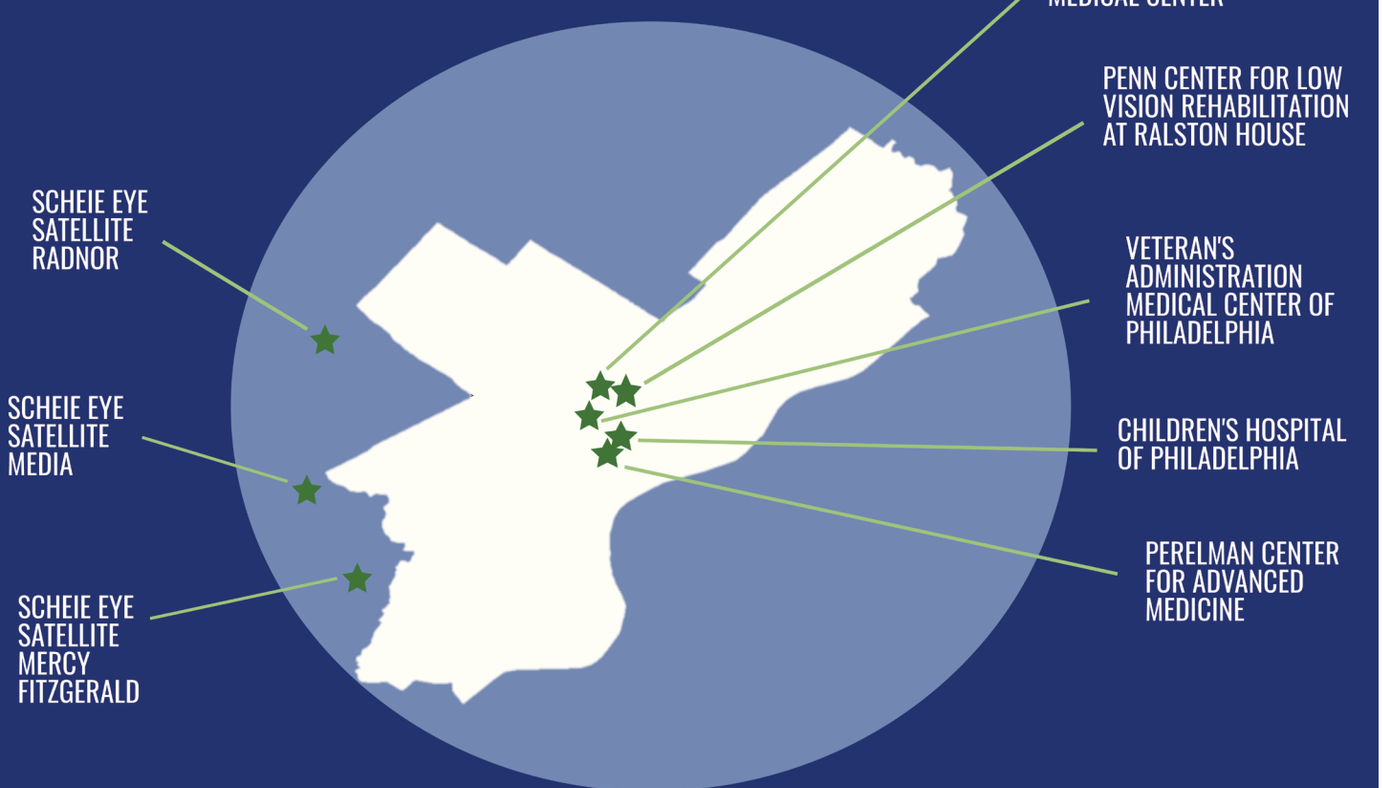
of active projects

$15,548,575

SOURCES OF EXTERNAL FUNDING FOR CLINICAL STUDIES



SCHEIE OFFERS EYE CARE IN EIGHT CLINICAL FACILITIES ACROSS PHILADELPHIA AND DELAWARE COUNTY



scheie WELCOMES

By Kristen Mulvihill

Katayoon Baradaran Ebrahimi

The Scheie Eye Institute is delighted to welcome Dr. Katayoon (Katy) Baradaran Ebrahimi, who recently joined the faculty as an Assistant Professor of Ophthalmology, with a specialty in medical retina and ocular oncology.

After finishing her residency, Dr. Ebrahimi was awarded a competitive fellowship from the International Council of Ophthalmology, and pursued a fellowship in ocular pathology, followed by fellowships in ocular oncology and medical retina. She has studied at leading academic institutes worldwide, including the Moorfields Eye Institute at University College London, the Johns Hopkins Wilmer Eye Institute, University of California San Francisco, and Duke University.

Dr. Ebrahimi was determined to join a program that effectively balanced academics, research, and clinical practice. “I found UPenn and the Scheie Eye Institute offered me this nice balance of clinical and research opportunities,” she said. “I aspire to become a member of a diligent and enthusiastic team that stresses collaboration, while encouraging a pursuit towards excellence.”

Over the past six years, Dr. Ebrahimi has developed a research project focusing on age-related macular degeneration (AMD). Her research explores the molecular mechanisms of the development of AMD and provides evidence for a potential new treatment target for AMD. Her translational research is focused on multimodal imaging in AMD. “The ultimate goal is to identify early clinical biomarkers of AMD that will permit a better understanding of the underlying disease mechanisms, as well as to help define long sought-out sensitive and specific discriminators between early AMD and normal aging,” said Dr. Ebrahimi.

Anne Jensen

The Scheie Eye Institute is thrilled to welcome Dr. Anne Jensen, who joined the faculty in September 2018 as an Assistant Professor of Clinical Ophthalmology, with a specialty in pediatric ophthalmology and strabismus.

After receiving her medical degree from the Perelman School of Medicine, Dr. Jensen went on to do her residency at Scheie. She then completed a year of specialized fellowship training in pediatric ophthalmology and strabismus at the Children's Hospital of Philadelphia (CHOP).

Dr. Jensen is eager to continue her journey in Philadelphia. "CHOP and Scheie have long traditions of excellence, both academically and clinically, and I consider myself very fortunate to have the chance to continue to be a part of that," said Dr. Jensen. "But above all else, I think the people who make up these departments are what make CHOP and Scheie such special places to practice medicine."

Outside of her clinical responsibilities, Dr. Jensen is interested in pursuing research focused on retinopathy of prematurity and other projects relating to pediatric ophthalmology. As a Penn medical student, a Scheie resident, and a CHOP fellow, Dr. Jensen is excited to experience the program from a different perspective as a faculty member.

"I owe a tremendous debt to my mentors, and would love nothing more than to pay forward the generous help that was shown to me," said Dr. Jensen.

In her free time, Dr. Jensen enjoys spending time with her husband Mark and her two children, three-year-old Jane and nine-month-old Ben.

Christina Moon

The Scheie Eye Institute is excited to welcome Dr. Christina Moon, who joined the faculty in October 2018 as an Assistant Professor of Clinical Ophthalmology.

Dr. Moon attended the Dartmouth-Brown Medical School Joint MD program and received her MD from the Warren Alpert Medical School of Brown University. After completing a transitional internship at Einstein Medical Center in Philadelphia, she went on to complete her ophthalmology residency at the Wilmer Eye Institute of Johns Hopkins Hospital, and her cornea and refractive surgery fellowship at the Bascom Palmer Eye Institute at the University of Miami.

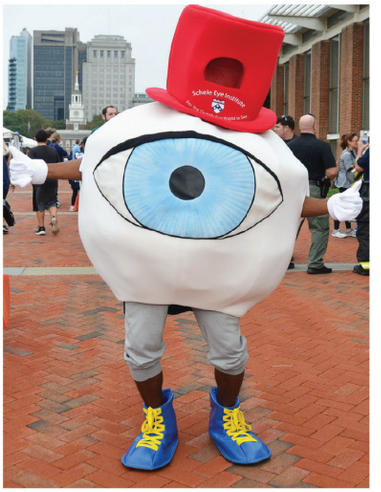
Prior to coming to Scheie, Dr. Moon spent several years as the Director of Cornea and Refractive Surgery at Beth Israel Deaconess Medical Center in Boston. In this role, she taught Harvard Medical School students and PGY3 Massachusetts Eye and Ear residents in the clinic and operating room.

A native of Wilmington, Delaware, Dr. Moon lives in Villanova with her husband and one-year-old son.

SNAPSHOTS of scheie | 2018


EXIT


EAGLES



dear friends

Scott M. Goldstein, MD
Pediatrics & Adult
Oculo-Facial Plastic Surgeon
Tri-County Eye & Wills Eye Institute

The opportunity to be a physician, I believe, leads to one of the most rewarding careers. Being an ophthalmologist can be even more unique and fulfilling. We create special bonds with our patients over a long period of time, while caring for their vital sense of vision. Our patients share details of their lives with us and vice versa. We help them to maintain vision and function yet, at times, we may need to convey news of a sight- or life-threatening diagnosis. Patients rely on us to do right by them. And hopefully, we do not let them down.

Our Scheie training almost assuredly and reliably ensures that we will not fail here. I can recall one instance as a resident being called out by Dr. Alexander Brucker for rushing through an exam and missing a small finding – a lesson I carry with me to this day. Although I admit, I don't always have the brightness of my indirect ophthalmoscope at the brightest setting, as Dr. Brucker also suggested. But I am grateful for the push to always be the best I can be. It was a pleasure to see him appointed as the first endowed Founder's Professor in Retinal and Vitreous Diseases in October, for being a "physician's physician" who leads and inspires by example.

As we each move from training to practice, we bring with us many of the small but important lessons our distinguished professors shared with us. Our patients depend on us to remain at the forefront of care. I believe experience is the best teacher, and the width and breadth of the Scheie residency (and fellowships) is unparalleled, helping our graduates to become tomorrow's leaders.

The business and politics of medicine are ever evolving, too. Big business and private equity are bringing offers to some practices. Others are banding together to form large private group practices. Many work in academia, pushing the frontiers of science, research, and clinical care. No matter where any of us find ourselves, our Scheie training clearly has given us the skills to be successful. I encourage everyone to give back to Scheie, return to Scheie for an alumni weekend, and stay connected with old classmates and colleagues. It is this multifaceted continued support of our beloved home that helped you to hone the skills to be who you are today – and keeps our institutional future bright!

Scott M. Goldstein, MD Res '00, Fel '02
President, Scheie Alumni Society

SAVE the DATE

2019 Scheie Eye Institute Alumni Association CME Accredited Conference

Friday, April 12, 2019
7:30am-4:30pm
Scheie Eye Institute, Breakfast and Lunch served
Honored Alumni Lecture: Jennifer Thorne, MD, PhD
David M. Kozart Lecture: George (Jack) Cioffi, MD

7:00pm-10:30pm
Dinner and Dancing at The Rittenhouse Hotel

Saturday, April 13, 2019
7:30am-12:30pm
Scheie Eye Institute, Breakfast served

Meet Our Team

Comprehensive Ophthalmology
Charles Nichols, MD
Deborah Herrmann, MD
Dwight Stambolian, MD, PhD
Jane Portnoy, MD
Paul Tapino, MD
Thomasine Gorry, MD, MGA

Cornea
Christina Moon, MD
Michael Sulewski, MD
Stephen Orlin, MD

Dry Eye
Giacomina Massaro-Giordano, MD
Vatinee Bunya, MD

Glaucoma
Amanda Lehman, MD, MSc
Eve Higginbotham, SM, MD
Eydie Miller-Ellis, MD
Prathima Neerukonda Atluri, MD
Prithvi Sankar, MD
Qi Cui, MD, PhD
Victoria Addis, MD

Low Vision
Ranjoo Prasad, OD

Neuro-Ophthalmology
Ahmara Ross, MD, PhD
Grant Liu, MD
Kenneth Shindler, MD, PhD
Madhura Tamhankar, MD

Ocular Oncology
Joan O'Brien, MD
Katayoon Baradaran Ebrahimi, MD

Ocular Pathology
Vivian Lee, MD

Oculoplastics
César Briceño, MD
Sonul Mehta, MD

Optometry
Alisha Fleming, OD
Kelly McCann, OD
Regina Altemus, OD
Sara Bierwerth, OD
Stacey Cesarano, OD

Pediatric Ophthalmology (CHOP)
Anne Jensen, MD
Brian Forbes, MD, PhD
Gil Binenbaum, MD
Graham Quinn, MD
James Katowitz, MD
Karen Revere, MD
Monte Mills, MD
Priyanka Kumar, MD
Robert Avery, DO, MSCE
Stefanie Davidson, MD
William Anninger, MD
William Katowitz, MD

Retina & Vitreous
Albert Maguire, MD
Alexander Brucker, MD
Benjamin Kim, MD
Brian VanderBeek, MD, MPH
Joshua Dunaief, MD, PhD
Juan Grunwald, MD
Samuel Jacobson, MD, PhD
Tomas Aleman, MD

Uveitis
Nirali Bhatt, MD

Research Faculty
Alan M. Laties, MD
Artur Cideciyan, PhD
Ebenezer Daniel, MBBS, MS, MPH, PhD
Gui-shuang Ying, MD, PhD
Jason Mills, PhD (CAROT)
Jean Bennett, MD, PhD (CAROT)
Jessica Morgan, PhD (CAROT)
Manzar Ashtari, PhD, DABR (CAROT)
Maureen Maguire, PhD
Richard Stone, MD
Venkata Ramana Murthy Chavali, PhD

2018-2019 Fellows

Christiana Munroe, MD
(CHOP Oculoplastics)
Iga Gray, MD, PhD (Glaucoma)
Joyce Khandji, MD (CHOP Pediatrics)
Katherine Uyhazi, MD, PhD
(Retinal Degeneration & Medical Retina)
Peter Bracha, MD (Retina)
Robert Carroll, MD (Retina)
Ryan McGuire, MD (CHOP Pediatrics)

2018-2019 Residents

First Year Residents
Delu Song, MD
Enny Oyeniran, MD
Lana Verkuil, MD
Meera Ramakrishnan, MD
Yafeng Li, MD, PhD

Second Year Residents
Brian Shafer, MD
Drew Scoles, MD, PhD
Erin O'Neil, MD
James Clay Bavinger, MD
Kurt Scavelli, MD

Third Year Residents
Jaclyn Gurwin, MD
Lindsay Dawson, MD
Michael Ammar, MD
Michael Sulewski, Jr., MD
Rebecca Bausell, MD

Recruiting Clinical Studies

COMPREHENSIVE OPHTHALMOLOGY

Prathima Neerukonda Atluri, MD
Ophthalmic Education for Emergency Medicine Residents
Joan DuPont
(215) 662-8038

Dwight Stambolian, MD, PhD
Amish Eye Study
Debbie Dana
(215) 573-9771

Dwight Stambolian, MD, PhD
Screening for Genetic Eye Diseases
Debbie Dana
(215) 573-9771

CORNEA

Stephen Orlin, MD
Zoster Eye Disease Study (ZEDS): A Study of Valacyclovir in Immunocompetent Subjects with a History of Dendriform Epithelial Keratitis, Stromal Keratitis, Endothelial Keratitis, and/or Iritis due to Herpes Zoster Ophthalmicus (HZO)
Adrienne Saludades
(215) 662-8091

DRY EYE

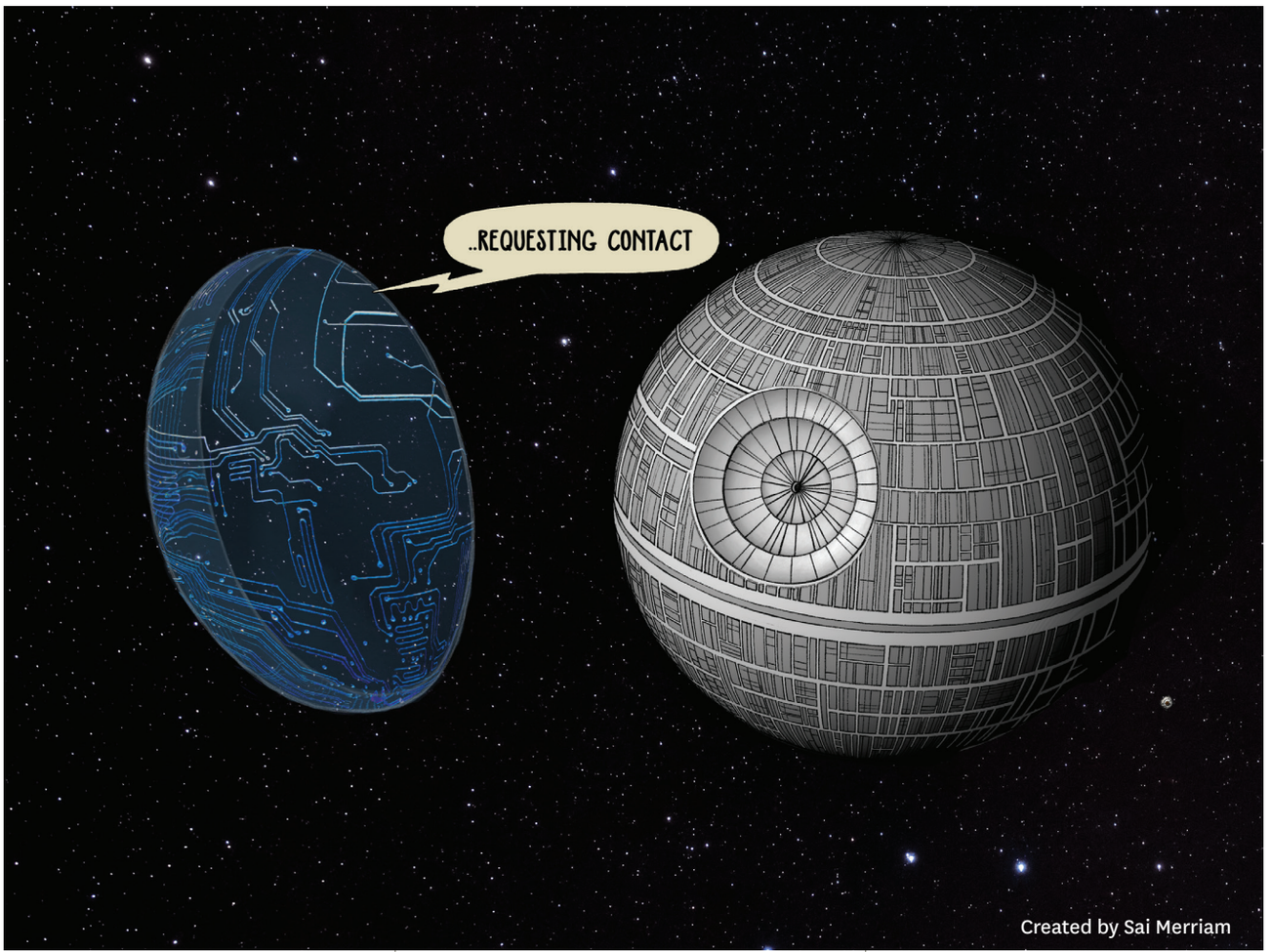
Vatinee Bunya, MD
Anterior Segment Imaging Study
Matthew Henderson
(215) 662-9393

Vatinee Bunya, MD
Novel Sjogren Syndrome Antibodies Dry Eye Study
Matthew Henderson
(215) 662-9393

Vatinee Bunya, MD
Sicca BioBank Study
Matthew Henderson
(215) 662-9393
Joan DuPont
(215) 662-8038

Vatinee Bunya, MD
Novel Sjogren's Biomarker BioBank Study
Matthew Henderson
(215) 662-9393
Joan DuPont
(215) 662-8038

Vatinee Bunya, MD
Ocular Surface Health in Sjogren's Syndrome and Graft Versus Host Disease Before and After Self-Retained Cryopreserved Amniotic Membrane Placement
Matthew Henderson
(215) 662-9393



Vatinee Bunya, MD
Penn SICCA Follow-Up Study
Matthew Henderson
(215) 662-9393

Vatinee Bunya, MD
Identification of Patients with Early Sjogren's Syndrome
Matthew Henderson
(215) 662-9393

Vatinee Bunya, MD
Sjogren's Screening Dry Eye Study
Matthew Henderson
(215) 662-9393

Giacomina Massaro-Giordano, MD
An 8-Week Study to Evaluate Safety and Efficacy of Recombinant Human Nerve Growth Factor Eye Drops Solution Versus Vehicle in Patients with Dry Eye
Joan DuPont
(215) 662-8038

Giacomina Massaro-Giordano, MD
Tear Neurostimulation
Joan DuPont
(215) 662-8038

GLAUCOMA

Qi Cui, MD, PhD
Focus Groups to Elicit Perceptions of Health-Related Quality of Life of Patients with Glaucoma
Joan DuPont
(215) 662-8038

Eydie Miller-Ellis, MD
Ocular Hypertension Treatment Study 20-Year Follow-Up
Sheri Grand Drossner
(215) 662-8177

Joan O'Brien, MD
The Primary Open-Angle African American Glaucoma Genetics Study
Sai Merriam
(215) 662-8673

NEURO-OPHTHALMOLOGY

Kenneth Shindler, MD, PhD
Neuro-Ophthalmology Research Disease Investigator Consortium
Meghan Karlik
(215) 662-8094

Kenneth Shindler, MD, PhD
A Phase IV Trial of Neuroprotection with ACTH in Acute Optic Neuritis
Meghan Karlik
(215) 662-8094

Madhura Tamhankar, MD
A Phase 2/3, Randomized, Double-Masked, Sham-Controlled Trial of QPI-1007 Delivered by Single or Multi-Dose Intravitreal Injection(s) to Subjects with Acute Nonarteritic Anterior Ischemic Optic Neuropathy
Devica Bhutani
(215) 662-8691

Madhura Tamhankar, MD
Visual Restoration for Hemianopia
Devica Bhutani
(215) 662-8691

OCULOPLASTICS

César Briceño, MD
Collaborative Multi-Center American Society of Ophthalmic Plastic and Reconstructive Surgery
Joan DuPont
(215) 662-8038

César Briceño, MD
Adaptation to the NEI VFQ-9
Joan DuPont
(215) 662-8038

César Briceño, MD
Meibography of Common Eyelid Margin Lesions
Joan DuPont
(215) 662-8038

PEDIATRIC OPHTHALMOLOGY

Tomas Aleman, MD
A Post-Authorization, Multicenter, Multinational, Longitudinal, Observational Safety Registry Study for Patients Treated

with Voretigene Neparvovec
Agnieshka Baumritter
baumritter@email.chop.edu

William Anninger, MD
Clinical Study of the Artisan Aphakia Lens for the Correction of Aphakia in Children
Agnieshka Baumritter
(215) 590-4596
baumritter@email.chop.edu

Robert Avery, DO, MSCE
Retinal Imaging in Children with Tumors of the Visual Pathway and/or Neurofibromatosis Type 1
Arielle Pinto
PINTOA1@email.chop.edu

Robert Avery, DO, MSCE
Volumetric Analysis of Optic Pathway Gliomas in Children with NF1
Arielle Pinto
PINTOA1@email.chop.edu

Robert Avery, DO, MSCE
Resource Utilization and Financial Burden of Outpatient Care for Subjects with Neurofibromatosis Type 1
Arielle Pinto
PINTOA1@email.chop.edu

Brian Forbes, MD, PhD
Luminopia One Treatment Study (C-AM-2)
Agnieshka Baumritter
baumritter@email.chop.edu

James Katowitz, MD
The Importance of Appearance to Severely Visually Impaired Individuals
Lauren Tomlinson
TOMLINSONL@email.chop.edu

James Katowitz, MD
Causes for Failure in Frontalis Suspension Surgery Using Autogenous Fascia Lata for Congenital Ptosis
Lauren Tomlinson
TOMLINSONL@email.chop.edu

James Katowitz, MD
Hydrogel Implants: A Children's Hospital of Philadelphia Experience
Lauren Tomlinson
TOMLINSONL@email.chop.edu

James Katowitz, MD
No More Droop: A Review of the Various Methods of Ptosis Repair at Children's Hospital of Philadelphia
Lauren Tomlinson
TOMLINSONL@email.chop.edu

William Katowitz, MD
The Use of the Microdebrider in Endoscopic Dacryocystorhinostomy (eDCR) in Children
Lauren Tomlinson
TOMLINSONL@email.chop.edu

Bart LeRoy, MD
Case Series of Patient with Usher Syndrome Identified Prior to Onset of Retinitis Pigmentosa via Hearing Loss Gene Panels
Lauren Tomlinson
TOMLINSONL@email.chop.edu

Grant Liu, MD
Follow-Up of Benign Pediatric Neuro-Ophthalmic Conditions
Geraldine Liu
liug@email.chop.edu

Karen Revere, MD
Height of the Tarsal Plates in Children
Lauren Tomlinson
TOMLINSONL@email.chop.edu

RETINA

Tomas Aleman, MD
A Post-Authorization, Multicenter, Multinational, Longitudinal, Observational Safety Registry for Patients Treated with Voretigene Neparvovec
Joan DuPont
(215) 662-8038

Tomas Aleman, MD
Lamination Patterns in Macular Retinoschisis

Manzar Ashtari, PhD, DABR
Longitudinal Functional and Structural Neuroimaging of Leber's Congenital Amaurosis

Manzar Ashtari, PhD, DABR
Longitudinal Functional and Structural Neuroimaging of Leber's Congenital Amaurosis of Phase 3 Patients

Manzar Ashtari, PhD, DABR
Study of the Functional Neuroplasticity and Connectivity in Patients with Choroideremia who Undergo Unilateral Retinal Gene Therapy

Jean Bennett, MD, PhD
Molecular Genetics of Inherited Retinal Degeneration
Jean Bennett
(215) 898-0915

Jean Bennett, MD, PhD
Outcome Measure Study for Inherited Retinal Degeneration
Jean Bennett
(215) 898-0915

Alexander Brucker, MD
A Natural History Observation and Registry Study of Macular Telangiectasia Type 2: The MacTel Study
Sheri Grand Drossner
(215) 662-8177

Alexander Brucker, MD
Genes in Diabetic Retinopathy Project
Sheri Grand Drossner
(215) 662-8177

Alexander Brucker, MD
Evaluation of OCT-Angiography in Retinal and Optic Neuropathy Patients
Joan DuPont
(215) 662-8038

Alexander Brucker, MD
PVD-OCT Study
Joan DuPont
(215) 662-8038

Alexander Brucker, MD
A Study that Tests BI 1467335 in Patients with Diabetic Retinopathy
Sheri Grand Drossner
(215) 662-8177

Alexander Brucker, MD
A Phase 2, Placebo-Controlled, Double-Masked Study to Assess Safety and Efficacy of ISIS 696844, an Antisense Inhibitor of Complement Factor B, in Patients with Geographic Atrophy Secondary to Age-Related Macular Degeneration (AMD)
Joan DuPont
(215) 662-8038

Joshua Dunaief, MD, PhD
Retinal Photography to Determine the Prevalence of Age-Related Macular Degeneration (AMD) in Patients with Elevated Serum Iron Levels
Meghan Karlik
(215) 662-8094

Katayoon Baradaran Ebrahimi, MD
Retinal Imaging in Patients with Age-Related Macular Degeneration (AMD), Strong Family History of AMD, Unilateral AMD, Small Drusen, Old Normal and Young Normal Adults
Katayoon Baradaran Ebrahimi
(215) 615-1554

Samuel Jacobson, MD, PhD
A Study of Retinal Degenerations Through Blood Analysis

Samuel Jacobson, MD, PhD
U10-NIH Collaborative Research on Therapy for Visual Disorders (Gene Therapy for Leber Congenital Amaurosis)

Samuel Jacobson, MD, PhD
Retinal Imaging by Optical Coherence Tomography Clinical Trials of Gene Therapy for Leber Congenital Amaurosis

Samuel Jacobson, MD, PhD
Collaborative Research on Cancer Vaccines of Gene Therapy or Blindness and Visual Impairment

Samuel Jacobson, MD, PhD
Determining the Natural History of Models of Human X-Linked RP to Establish the Timing of Proof-of-Concept Research

Samuel Jacobson, MD, PhD
Studies Towards Treatment of CNGA3-Achromatopsia

Samuel Jacobson, MD, PhD
Function and Structure in Retinal Degenerations

Samuel Jacobson, MD, PhD
Gene Therapy for LCA1

Samuel Jacobson, MD, PhD
Early-Onset Retinal Degenerations (Eye drops and cataracts)

Samuel Jacobson, MD, PhD
Phase I Trial of Ocular Subretinal Injection of a Recombinant Adeno-Associated Virus (rAAV2-CB(SB)-hRPE65) Gene Vector to Patients with Retinal Disease due to RPE65 Mutations (Clinical Trials of Gene Therapy for Leber Congenital Amaurosis)

Samuel Jacobson, MD, PhD
National Ophthalmic Genotyping and Phenotyping Network, Stage 1 - Creation of DNA Repository for Inherited Ophthalmic Diseases

Samuel Jacobson, MD, PhD
Retinitis Pigmentosa Natural History Study of Patients with the P23H Mutation of the Rhodopsin Gene (Rhodopsin Natural History Study)

Benjamin Kim, MD
Optical Coherence Tomography Imaging of the Retina of Frontotemporal Lobar Degeneration Patients
Adrienne Saludades
(215) 662-8091

Albert Maguire, MD
Study to Evaluate a Reading Speed Test in Patients with and without Visual Impairment
Jean Bennett
(215) 898-0915

Albert Maguire, MD
The X-Linked Retinitis Pigmentosa (XLRP) Gene Therapy Study
Denise Pearson
(215) 662-6396

Albert Maguire, MD
A Phase I, Open-Label, Multiple-Cohort, Dose-Escalation Study to Evaluate the Safety and Tolerability of Gene Therapy with RGX-314 in Subjects with Neovascular AMD
Denise Pearson
(215) 662-6396

Jessica Morgan, PhD
High Resolution Retinal Imaging
Jessica Morgan
(215) 614-4196

Jessica Morgan, PhD
A Multiple-Site, Phase 1/2, Safety and Efficacy Trial of AGTC 402, a Recombinant Adeno-Associated Virus Vector Expressing CNGA3, in Patients with Congenital Achromatopsia Caused by Mutations in the CNGA3 Gene
Jessica Morgan
(215) 614-4196

UVEITIS

Nirali Bhatt, MD
Macular Edema Ranibizumab v. Intravitreal anti-inflammatory Therapy (MERIT) Trial
Meghan Karlik
(215) 662-8094

Nirali Bhatt, MD
ADalimumab Vs. conventional ImmunoSupprEssion for corticosteroid-sparing (ADVISE) Trial
Meghan Karlik
(215) 662-8094

Faculty Awards

(July 1, 2017 – July 1, 2018)

Victoria Addis, MD
- Elected to Penn Faculty Pathways Program

Jean Bennett, MD, PhD
- 2017 Clinical Innovator Award, National Medical Association
- 2018 American Ingenuity Award for Life Sciences, Smithsonian Magazine
- 2018 António Champalimaud Vision Award
- 2018 August M. Watanabe Prize in Translational Research, Indiana University School of Medicine
- 2018 Keynote Speaker, American Society for Gene and Cell Therapy
- 2018 Marion Spencer Fay Award, Drexel University College of Medicine
- 2018 Philadelphia Business Journal's Extraordinary Doctors
- 2018 Retina International Keynote Speaker and Special Recognition Award
- 2018 Roy Steinberg Memorial Lecturer, University of California, San Francisco

Alexander Brucker, MD
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor
- Arnall Patz Medal, Macula Society Meeting
- Honorable Gabriel Coscas Awardee and Lecturer, DMLA en Pratique
- Paul Sternberg, Senior Lecturer, Vanderbilt University Eye Institute

Artur Cideciyan, PhD
- 2018 Proctor Award, Association for Research in Vision and Ophthalmology (ARVO)

Qi Cui, MD, PhD
- American Glaucoma Society (AGS) Young Clinician Scientist Award
- NIH/NEI Loan Repayment Award

Stefanie Davidson, MD
- 2018 SJ Magazine Top Docs for Kids

Joshua Dunaief, MD, PhD
- Keynote Speaker, Case Western Reserve Vision Research Symposium

Katayoon Baradaran Ebrahimi, MD
- 5th Biennial International Symposium on AMD Travel Award, Harvard Medical School

Deborah Herrmann, MD
- 2017 Castle Connolly Exceptional Women in Medicine
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor

Samuel Jacobson, MD, PhD
- 2018 António Champalimaud Vision Award
- 2018 Proctor Award, Association for Research in Vision and Ophthalmology (ARVO)

Albert Maguire, MD
- 2018 American Ingenuity Award for Life Sciences, Smithsonian Magazine
- 2018 António Champalimaud Vision Award

Eydie Miller-Ellis, MD
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor

Monte Mills, MD
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor

Joan O'Brien, MD
- 2017 PPMC Patient Advocacy Award
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor
- Inducted into American Ophthalmological Society
- Keynote Speaker, Association for Vision and Ophthalmology (ARVO) Women's Leadership Forum

Stephen Orlin, MD
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor

Graham Quinn, MD
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor

Prithvi Sankar, MD
- Elected to Academy of Master Clinicians, Perelman School of Medicine
- Leonard Tow Humanism in Medicine Award, Gold Foundation
- Penn Pearl Teaching Award, Perelman School of Medicine
- Senior Achievement Award, American Academy of Ophthalmology

Madhura Tamhankar, MD
- 2018 Castle Connolly Top Doctor
- 2018 Philadelphia Magazine Top Doctor
- Best Presentation at Walsh Society Meeting, Hawaii

Faculty Publications

(July 1, 2017 – July 1, 2018)

Aleman, T. S., Ventura, C. V., Cavalcanti, M. M., et al. (2017). **Quantitative assessment of microstructural changes of the retina in infants with congenital zika syndrome**. *JAMA Ophthalmology, 135*(10), 1069-1076.

Ammar, M. J., Kolomeyer, A. M., Bhatt, N. (2018). **Recurrent branch retinal artery occlusion from susac syndrome: Case report and review of literature**. *Retinal Cases & Brief Reports*.

Asbell, P. A., Maguire, M. G., Peskin, E., et al. (2018). **Dry eye assessment and management (DREAM(c)) study: Study design and baseline characteristics**. *Contemporary Clinical Trials, 71*, 70-79.

Baumann, B., Sterling, J., Song, Y., et al. (2017). **Conditional muller cell ablation leads to retinal iron accumulation**. *Investigative Ophthalmology & Visual Science, 58*(10), 4223-4234.

Beltran, W. A., Cideciyan, A. V., Boye, S. E., et al. (2017). **Optimization of retinal gene therapy for X-linked retinitis pigmentosa due to RPGR mutations**. *Molecular Therapy, 25*(8), 1866-1880.

Binenbaum, G., Bell, E. F., Donohue, P., et al. (2018). **Development of modified screening criteria for retinopathy of prematurity: Primary results from the postnatal growth and retinopathy of prematurity study**. *JAMA Ophthalmology, 136*(9), 1034-1040.

Binenbaum, G., & Ying, G. S. (2018). **Role of maternal race on algorithms predicting retinopathy of prematurity-reply**. *JAMA Ophthalmology, 136*(2), 221-222.

Binenbaum, G., Ying, G. S., Tomlinson, L. A. (2017). **Validation of the children's hospital of Philadelphia retinopathy of prematurity (CHOP ROP) model**. *JAMA Ophthalmology, 135*(8), 871-877.

Borchert, M., Liu, G. T., Pineles, S., et al. (2017). **Pediatric optic neuritis: What is new**. *Journal of Neuro-Ophthalmology, 37 Suppl 1*, S14-S22.

Bressler, N. M., Beaulieu, W. T., Maguire, M. G., et al. (2018). **Early response to anti-vascular endothelial growth factor and two-year outcomes among eyes with diabetic macular edema in protocol T**. *American Journal of Ophthalmology, 195*, 93-100.

Brucker, A. J. (2018). **Editorial**. *Retina, 38 Suppl 1*, S1-S2.

Bryant, L., Lozynska, O., Han, G., et al. (2018). **On variants and disease-causing mutations: Case studies of a SEMA4A variant identified in inherited blindness**. *Ophthalmic Genetics, 39*(1), 144-146.

Bryant, L., Lozynska, O., Maguire, A. M. (2017). **Prescreening whole exome sequencing results from patients with retinal degeneration for variants in genes associated with retinal degeneration**. *Clinical Ophthalmology, 12*, 49-63.

Bryant, L., Lozynska, O., Marsh, A., et al. (2018). **Identification of a novel pathogenic missense mutation in PRPF31 using whole exome sequencing: A case report**. *The British Journal of Ophthalmology*.

Bundy, J. D., Chen, J., Yang, W., et al. (2018). **Risk factors for progression of coronary artery calcification in patients with chronic kidney disease: The CRIC study**. *Atherosclerosis, 271*, 53-60.

Bunya, V. Y., Chen, M., Zheng, Y., et al. (2017). **Development and evaluation of semiautomated quantification of lissamine green staining of the bulbar conjunctiva from digital images**. *JAMA Ophthalmology, 135*(10), 1078-1085.

Bunya, V. Y., Fernandez, K. B., Ying, G. S., et al. (2018). **Survey of ophthalmologists regarding practice patterns for dry eye and sjogren syndrome**. *Eye & Contact Lens*.

Bunya, V. Y., Iwabe, S., Macchi, I., et al. (2017). **Tolerability of topical tocilizumab eyedrops in dogs: A pilot study**. *Journal of Ocular Pharmacology and Therapeutics, 33*(7), 519-524.

Calzetti, G., Levy, R. A., Cideciyan, A. V., et al. (2018). **Efficacy outcome measures for clinical trials of USH2A caused by the common c.2299delG mutation**. *American Journal of Ophthalmology, 193*, 114-129.

Carvalho, L. S., Turunen, H. T., Wassmer, S. J., et al. (2017). **Evaluating efficiencies of dual AAV approaches for retinal targeting**. *Frontiers in Neuroscience, 11*, 503.

Chakraborty, R., Ostrin, L. A., Nickla, D. L., et al. (2018). **Circadian rhythms, refractive development, and myopia**. *Ophthalmic & Physiological Optics, 38*(3), 217-245.

Chan-Ling, T., Gole, G. A., Quinn, G. E., et al. (2018). **Pathophysiology, screening and treatment of ROP: A multi-disciplinary perspective**. *Progress in Retinal and Eye Research, 62*, 77-119.

Charng, J., Jacobson, S. G., Heon, E., et al. (2017). **Pupillary light reflexes in severe photoreceptor blindness isolate the melanopic component of intrinsically photosensitive retinal ganglion cells**. *Investigative Ophthalmology & Visual Science, 58*(7), 3215-3224.

Charng, J., Tan, R., Luu, C. D., et al. (2017). **Imaging lenticular autofluorescence in older subjects**. *Investigative Ophthalmology & Visual Science, 58*(12), 4940-4947.

Cheng, Q. E., Gao, J., Kim, B. J., Ying, G. S. (2018). **Design characteristics of geographic atrophy treatment trials: Systematic review of registered trials in clinicaltrials.gov**. *Ophthalmology Retina*, 2(6):518-525.

Chua, M. R., Tomlinson, L. A., Binenbaum, G. (2018). **Pediatric thyroid eye disease: Clinical characteristics and orbital decompression outcomes**. *Ophthalmic Plastic and Reconstructive Surgery, 34*(4S Suppl 1), S52-S55.

Chung, D. C., McCague, S., Yu, Z. F., et al. (2018). **Novel mobility test to assess functional vision in patients with inherited retinal dystrophies**. *Clinical & Experimental Ophthalmology, 46*(3), 247-259.

Collins, D. W., Gudiseva, H. V., Chavali, V. R., et al. (2018). **The MT-CO1 V83I polymorphism is a risk factor for primary open-angle glaucoma in African American men**. *Investigative Ophthalmology & Visual Science, 59*(5), 1751-1759.

Conrad, E. C., Jivraj, I., Kardon, R., et al. (2018). **Unilateral periodic pupillary constriction causing alternating anisocoria**. *Neurology, 90*(2), 86-88.

Cui, Q. N., Fudemberg, S. J., Resende, A. F., et al. (2018). **Validation of the structure-function correlation report from the heidelberg edge perimeter and spectral-domain optical coherence tomography**. *International Ophthalmology*.

Daniel, E. (2018). **Ophthalmoscopy and telemedicine in retinopathy of prematurity**. *JAMA Ophthalmology, 136*(5), 505-506.

Daniel, E., Pan, W., Quinn, G. E., et al. (2018). **Single grading vs double grading with adjudication in the telemedicine approaches to evaluating acute-phase retinopathy of prematurity (e-ROP) study**. *Journal of AAPOS, 22*(1), 32-37.

Daniel, E., Pan, W., Ying, G. S., et al. (2018). **Development and course of scars in the comparison of age-related macular degeneration treatments trials**. *Ophthalmology, 125*(7), 1037-1046.

Daniel, E., Pistilli, M., Kothari, S., et al. (2017). **Risk of ocular hypertension in adults with noninfectious uveitis**. *Ophthalmology, 124*(8), 1196-1208.

Datta, S., Cano, M., Ebrahimi, K., et al. (2017). **The impact of oxidative stress and inflammation on RPE degeneration in non-**

neovascular AMD. *Progress in Retinal and Eye Research, 60*, 201-218.

Darlow, B. A., & Binenbaum, G. (2018). **Oxygen, weight gain, IGF-1 and ROP: Not a straightforward equation**. *Acta Paediatrica, 107*(5), 732-733.

de Blank, P. M. K., Fisher, M. J., Liu, G. T., et al. (2017). **Optic pathway gliomas in neurofibromatosis type 1: An update: Surveillance, treatment indications, and biomarkers of vision**. *Journal of Neuro-Ophthalmology, 37 Suppl 1*, S23-S32.

Dedania, V. S., Zacks, D. N., Pan, W., et al. (2017). **Testosterone supplementation and retinal vascular disease**. *Retina, 38*(11), 2247-2252

Derham, A. M., Chen, E., Bunya, V. Y., et al. (2017). **Bilateral herpetic keratitis after bilateral intravitreal bevacizumab for exudative macular degeneration**. *Cornea, 36*(7), 878-879.

de Oliveira Dias, J. R., Ventura, C. V., de Paula Freitas, B., et al. (2018). **Zika and the eye: Pieces of a puzzle**. *Progress in Retinal and Eye Research, 66*, 85-106.

Dooley, S. J., McDougald, D. S., Fisher, K. J., et al. (2018). **Spliceosome-mediated pre-mRNA trans-splicing can repair CEP290 mRNA**. *Molecular Therapy Nucleic Acids, 12*, 294-308

Doroslovacki, P., Tamhankar, M. A., Liu, G. T., et al. (2018). **Factors associated with occurrence of radiation-induced optic neuropathy at "safe" radiation dosage**. *Seminars in Ophthalmology, 33*(4), 581-588.

Dry Eye Assessment and Management Study Research Group, Asbell, P. A., Maguire, M. G., Pistilli, M., et al. (2018). **n-3 fatty acid supplementation for the treatment of dry eye disease**. *The New England Journal of Medicine, 378*(18), 1681-1690.

Duong, T. T., Vasireddy, V., Ramachandran, P., et al. (2018). **Use of induced pluripotent stem cell models to probe the pathogenesis of choroideremia and to develop a potential treatment**. *Stem Cell Research, 27*, 140-150.

Duong, T. T., Vasireddy, V., Ramachandran, P., et al. (2018). **Use of induced pluripotent stem cell models to probe the pathogenesis of choroideremia and to develop a potential treatment**. *Stem Cell Research, 27*, 140-150.

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Faculty In the News

Below are some recent news stories about our ophthalmology faculty's research and clinical work.

October 13, 2018: Dr. Giacomina Massaro-Giordano – **Dompé at the Medical Conference "The Impact of Environment and Healthy Lifestyles in Human Health."** *Newswise*: "Considering the severity of the disease (neurotrophic keratitis) and the lack of viable alternatives, having an innovative therapeutic option that can act on corneal lesions is of great importance to the community of ophthalmologists and to the patients themselves."

September 5, 2018: Drs. Jean Bennett, Samuel Jacobson, and Albert Maguire – **Gene Therapy for Rare Genetic Blindness Wins Prestigious Champalimaud Vision Award**. *News Medical Life Sciences*: "It is considered to be one of the largest science prizes that surpasses even the Nobel Prize in Physiology or Medicine."

September 4, 2018: Drs. Jean Bennett, Samuel Jacobson, and Albert Maguire – **Gene Therapy Breakthrough Wins World's Largest Vision Award**. *U.S. News & World Report*: "Seven scientists in the United States and Britain who have come up with a revolutionary gene therapy cure for a rare genetic form of childhood blindness won a 1 million euro ($1.15 million) prize."

August 20, 2018: Drs. Artur Cideciyan and Samuel Jacobson – **Researchers Find Potential New Gene Therapy for Blinding Disease**. *NIH*: "Scientists funded by the National Eye Institute (NEI) report a novel gene therapy that halts vision loss in a canine model of a blinding condition called autosomal dominant retinitis pigmentosa (adRP)."

August 20, 2018: Drs. Artur Cideciyan and Samuel Jacobson – **Penn's Experimental Gene Therapy Saves Night Vision in Dogs, Paving the Way for Human Tests**. *Philly.com*: "The success in six dogs paves the way for clinical trials in humans, perhaps in just a few years, and comes as gene therapy raises hopes for turning debilitating hereditary eye diseases into treatable conditions."

July 29, 2018: Dr. Ebenezer Daniel – **Study Reveals Connections Between Scarring and Anti-VEGF Treatments**. *MD Magazine*: "These findings shed light on the long-term outcomes of patients treated with anti-VEGF therapy in a real-world setting beyond clinical trials."

April 25, 2018: Dr. Ahmara Ross – **WURD Radio Reality Check**. *WURD Radio*: "Glaucoma is five to six times more prevalent in the African American population than European counterparts, and the disease itself can take out people that are primarily working class citizens in their 40s and 50s."

April 13, 2018: Dr. Maureen Maguire – **Fish Oil Supplements Fail to Ease Dry Eye, Study Shows**. *HealthDay News*: "Contrary to a long-held belief in the ophthalmic community, omega-3 supplements are not significantly better than a placebo at reducing dry eye symptoms."

March 5, 2018: Drs. Artur Cideciyan and Samuel Jacobson – **New Gene Therapy Corrects a Form of Inherited Macular Degeneration in Canine Model**. *Science Daily*: "Researchers from the University of Pennsylvania have developed a gene therapy that successfully treats a form of macular degeneration in a canine model."

January 16, 2018: Dr. Giacomina Massaro-Giordano – **How Fluctuations in Sex Hormones Impact AMD**. *MD Magazine*: "The pathogenesis of conditions of the eye such as age-related macular degeneration (AMD) could be impacted by gender-based differences in hormone fluctuations."

December 19, 2017: Drs. Jean Bennett and Albert Maguire – **First Gene Therapy for Inherited Disease Gets FDA Approval**. *NPR*: "In tests on patients, the treatment often produced dramatic results, restoring the ability of patients to see things they could never see before, such as the stars, the moon, fireworks and their parents' faces."

September 29, 2017: Dr. Alexander Brucker – **Struggling with Vision Loss, She Finds New Purpose in Philly's Foundation Fighting Blindness**. *Philly.com*: "The foundation opened many doors for me, the most important one being the Scheie Eye Institute at Penn Presbyterian Medical Center. There, I met Alexander Brucker, who used an imaging diagnostic tool called optical coherence tomography angiography to finally diagnose my condition."

September 8, 2017: Dr. Benjamin Kim – **Dementia News: Simple Eye Test Could Quickly Detect Early Signs of Rare Type**. *Express*: "Now scientists at the University of Pennsylvania School of Medicine have found eye changes may signal frontotemporal dementia, also known as frontotemporal lobe degeneration – FTD."

September 8, 2017: Dr. Tomas Aleman – **Zika Associated with Similar Retinal Problems as Cobalamin C Deficiency**. *MPR*: "Retinal maldevelopment associated with congenital Zika syndrome (CZS) is similar to the maldevelopment seen with cobalamin C (cBIC) deficiency, according to a study published online in *JAMA Ophthalmology*."

September 6, 2017: Dr. Gil Binenbaum – **Penn-CHOP Study: Art Courses Could Help Medical Students Become Better Doctors**. *PhillyVoice*: "The study, published in the journal *Ophthalmology*, found that art observation classes could help teach medical students to become better clinical observers."

August 30, 2017: Dr. Ranjoo Prasad – **How Low Vision Services Can Help You**. *BrightFocus Foundation*: "The first step would be to let their doctors know. Then the doctor or eye doctor will probably ask them a few more detailed questions and refer them to somebody who would be able to help with achieving their functional goals again."

Note: This list includes a selection of news items published in 2017 and 2018. For a complete list, visit https://www.pennmedicine.org/departments-and-centers/ophthalmology/about-us/news.

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