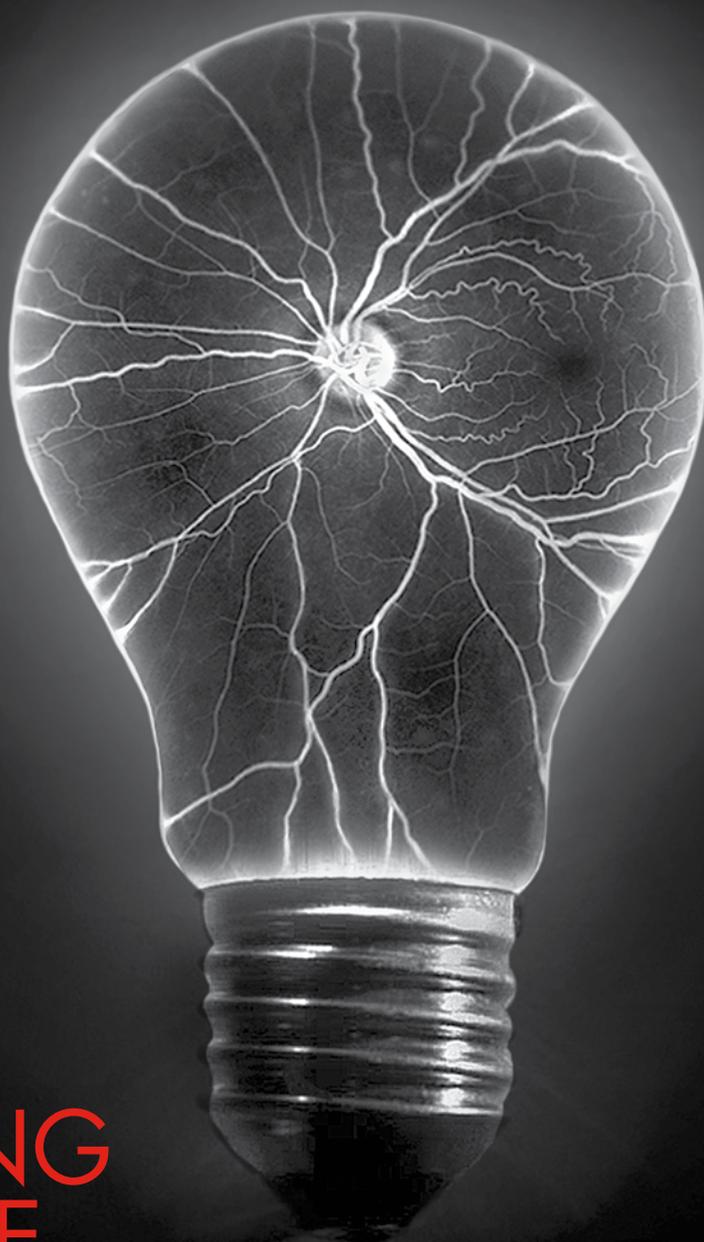


# scheie vision

 Raymond and Ruth Perelman School of Medicine at the University of Pennsylvania



## TURNING ON THE LIGHT:

Scheie researchers  
pioneer therapy for  
genetic blindness.

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# A MESSAGE FROM THE CHAIR

I am very pleased to introduce *Scheie Vision's* first annual edition, featuring the Department of Ophthalmology over the past year. In 2016, the Department has made enormous strides in our tripartite mission of patient care, teaching, and research. It is always with great pride that I reflect upon Scheie's remarkable faculty and staff members, who continue to devote their tremendous talents to preventing and curing vision loss and other ophthalmic conditions.

Through initiatives like Eyes on Site, Scheie's faculty and staff have incorporated revolutionary technology into programs that make eye care more accessible. Under the leadership of Dr. Thomasine Gorry, Eyes on Site has collaborated with numerous departments across the University of Pennsylvania Health System to develop a teleretinal imaging program that could prevent vision loss in thousands of patients in our community alone.

I am thrilled to provide a detailed update on the Center for Advanced Retinal and Ocular Therapeutics (CAROT), which is well on its way to producing the first FDA-approved gene therapy product in the nation. The Primary Open-Angle African American Glaucoma Genetics Study has also hit a huge milestone, becoming the largest-ever glaucoma genetics study on African Americans, with more than 7000 patients enrolled.

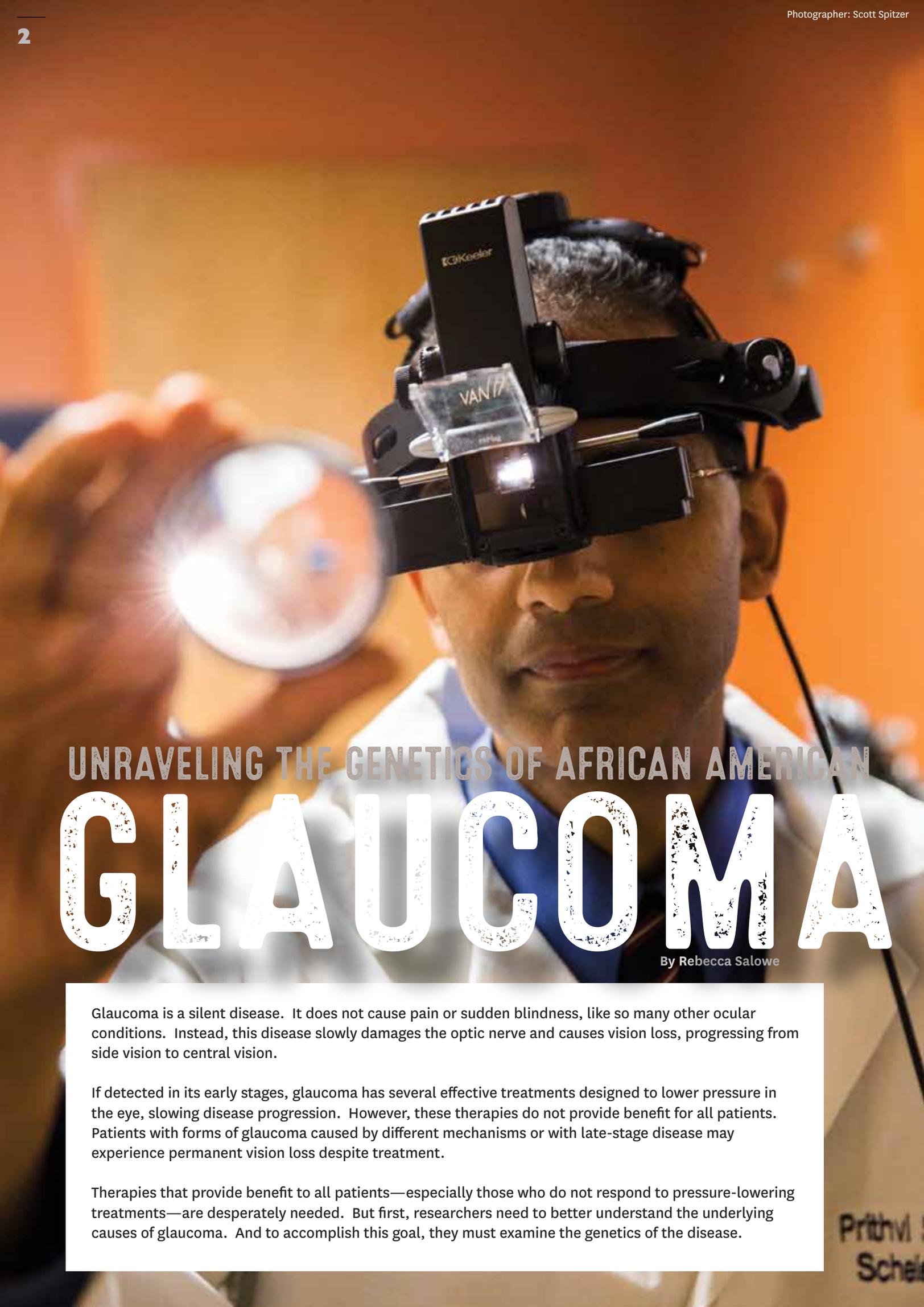
As we reflect on these advancements, we also have our eyes on the future. Teaching allows us to share our passion for eye care with the next generation of scientists. Penn Sight Savers exemplifies the progress made possible by bringing medical students into the world of ophthalmology. Under the guidance of Dr. Prithvi Sankar, this program provides free glaucoma screenings to hundreds of patients who might not otherwise have access to eye care and offers medical students an invaluable learning opportunity. Thank you to Dr. Sankar, and all of the Scheie physicians who demonstrate commitment to the spirit of service and the education of future leaders in medicine.

This year we have the pleasure of welcoming four new faculty members into the Scheie community: Drs. Qi Cui, César Briceño, Jason Mills, and Priyanka Kumar. These outstanding physicians and scientists will greatly contribute to the depth and reach of our Department. As Scheie continues to evolve, I look forward to seeing the opportunities and advancements this coming year will bring.

Happy Holidays!



Joan O'Brien, MD



# UNRAVELING THE GENETICS OF AFRICAN AMERICAN GLAUCOMA

By Rebecca Salowe

Glaucoma is a silent disease. It does not cause pain or sudden blindness, like so many other ocular conditions. Instead, this disease slowly damages the optic nerve and causes vision loss, progressing from side vision to central vision.

If detected in its early stages, glaucoma has several effective treatments designed to lower pressure in the eye, slowing disease progression. However, these therapies do not provide benefit for all patients. Patients with forms of glaucoma caused by different mechanisms or with late-stage disease may experience permanent vision loss despite treatment.

Therapies that provide benefit to all patients—especially those who do not respond to pressure-lowering treatments—are desperately needed. But first, researchers need to better understand the underlying causes of glaucoma. And to accomplish this goal, they must examine the genetics of the disease.

Prithvi  
Schel

## THE BIRTH OF THE POAAGG STUDY

Genes almost certainly play a role in glaucoma. The disease is passed down in families, with children of glaucoma patients at up to an 18-fold higher risk of receiving a diagnosis in their lifetime. Several studies have confirmed the genetic component of glaucoma, identifying a number of genes associated with the disease. However, these studies had one large flaw: they did not include African American patients, and thus their results have unknown relevance to this population.

Researchers at the Scheie Eye Institute believe that different genes may contribute to the more severe form of glaucoma seen in African Americans. This population is diagnosed with glaucoma at five times the rate of Caucasians.

Moreover, African Americans are more likely to progress to blindness from the disease. Recognizing a great unmet need, these researchers began to envision a study that explored glaucoma genetics in a large African American population. This study, if successful, would shed light on their increased burden of disease and pave the path to more targeted and effective treatments.

Dr. Joan O'Brien led efforts to design this study, collaborating with glaucoma specialists to craft a grant proposal to the National Eye Institute. While Dr. O'Brien drew on her extensive background in the genetics of eye cancers, glaucoma specialists contributed their expertise in managing the disease. Together, they proposed the largest-ever study of glaucoma genetics in African Americans.

In 2014, the National Eye Institute awarded \$11.25 million in funding for the Primary Open-Angle African American Glaucoma Genetics (POAAGG) study. Today, the five-year study is led by Dr. O'Brien (Principal Investigator) and Drs. Prithvi Sankar, Eydie Miller-Ellis, Amanda Lehman, and Victoria Addis (Co-Investigators)—and is on the brink of transforming glaucoma care for this most overaffected population.

## THE ENROLLMENT CHALLENGE

To achieve its aims, the POAAGG study must enroll more than 7500 African American patients, collecting clinical information and a DNA sample from each participant. Recruiting such a large number of patients was, and remains, an enormous undertaking.

Initially, the study found great success recruiting patients during regularly scheduled ophthalmology appointments at the University of Pennsylvania (UPenn). Clinical Research Coordinators approached eligible patients before their appointments, explained the study, and collected a DNA sample from interested patients. Many patients were willing to enroll, knowing that their participation could help their community. One patient remarked: "This is a disorder that is silent and can be devastating. I wanted to participate

because, as an African American, this disorder is something that afflicts us many times more than the average person. I feel it's my responsibility to participate if it can help others in the future."

More than 2500 subjects were enrolled using this method in the clinic, until most Scheie glaucoma patients had either enrolled in the study or declined. It became clear that researchers needed new sources of enrollment to meet the goal of 7500 patients.

Fortunately, several ophthalmologists in Philadelphia generously volunteered to open their clinics to the study. Clinical Research Coordinators began to approach patients at the private practice of Dr. Windell Murphy, who was a committed and generous partner in this effort. The ophthalmology clinic at Temple University, led by Dr. Jeffrey Henderer, also participated with enthusiasm and dedication.

The study also began working with the Penn Medicine Biobank (PMBB) to increase enrollment numbers. PMBB has collected DNA samples from more than 40,000 UPenn patients—all who have consented to have their DNA used in research studies across the University. PMBB subjects that were African American and met eligibility criteria were enrolled in the POAAGG study, netting more than 2000 additional patients.

"The research collaboration with the Penn Medicine Biobank has been enormously beneficial," said Dave Collins, Lab Director of the POAAGG study. "The inclusion of PMBB subjects will increase the study's power and ability to identify genetic risk factors for glaucoma."

## RESEARCHERS AT THE SCHEIE EYE INSTITUTE BELIEVE THAT DIFFERENT GENES MAY CONTRIBUTE TO THE MORE SEVERE FORM OF GLAUCOMA SEEN IN AFRICAN AMERICANS.

## BEYOND ENROLLMENT: OUTREACH AND IN-REACH

Though enrollment numbers were steadily rising, researchers recognized that they were not reaching a portion of the local community who might not have access to treatment. Thus, in the summer of 2014, the POAAGG team began conducting free glaucoma screenings throughout Philadelphia. The team brought a van fully-equipped with glaucoma screening equipment to community centers, federally qualified health centers, retirement communities, and churches to evaluate these populations for glaucoma and enroll eligible subjects in the POAAGG study. This van was generously funded by a grant from the UPenn Hospital Board of Women Visitors.

"Screening people for glaucoma has allowed us to potentially save the sight of several people who did not realize that they were at the beginning stages of glaucoma," said Laura O'Keefe, Clinical Project Manager of the POAAGG study. "We were able to help people obtain free eye care, while at the same time learning about the harsh reality faced by those who cannot afford health insurance."

The team also set up a new clinic at the Scheie Eye Institute for free glaucoma screenings. The clinic was publicized to members of the Philadelphia community through a series of



Members of POAAGG team with glaucoma screening van funded by UPenn Hospital Board of Women Visitors.

advertisements in the local subway (SEPTA), announcements on African American talk radio and newspapers, and outreach through African American pastors and government leaders. Many members of the Philadelphia community called to schedule their screenings after seeing these advertisements. If eligible, they were given the opportunity to enroll in the POAAGG study.

### GENETIC ANALYSIS

In 2016, researchers initiated a genome-wide association study (GWAS) on the first 5500 enrolled patients, representing the Discovery Cohort. The purpose of a GWAS is to identify genetic variations that occur more frequently in a disease population than would be expected from chance. Microarrays with probes are used to determine the frequency of approximately 1.8 million of these DNA variants, called single nucleotide polymorphisms (SNPs), in each case and control subject.

The GWAS will identify any variants with a significant association with open-angle glaucoma (the focus of this study). In addition, the GWAS will help researchers to associate variants with specific glaucoma traits, such as intraocular pressure or retinal nerve fiber layer thickness. “Our hypothesis is that genetic variants influence the risk of glaucoma and the traits related to that risk,” said Dr. O’Brien. “It is likely that open-angle glaucoma represents a wide-spectrum of distinct genetic diseases.”

The microarrays used for this study were unique, having been custom-designed in collaboration with Illumina. Researchers included SNPs associated with glaucoma by prior studies and from mitochondrial and Y-chromosomes, as well as potentially pathogenic variants identified in the O’Brien lab. Results from the GWAS are currently being analyzed.

In addition to the GWAS, researchers conducted whole-genome sequencing at the New York Genome Center on patients with severe glaucoma. Whole-genome sequencing determines the complete DNA sequence of the entire genome. This analysis may reveal genetic variants that

predispose patients to the most severe form of glaucoma (diagnosed at a young age with quick progression despite compliance). Admixture analysis and mapping, as well as functional analysis of variants, will also be conducted in future stages of the study.

### LOOKING BACK 200,000 YEARS

POAAGG researchers are not only investigating DNA found in the nucleus; they are also studying variants in mitochondrial DNA (mtDNA). Mitochondria have their own independent genome, which is inherited solely from the mother. Recently, several studies have implicated mitochondrial dysfunction in glaucoma pathogenesis, leading POAAGG researchers to further investigate this area.

Investigators must look back approximately 200,000 years to fully understand how variants in mtDNA can affect glaucoma risk. All living humans descend in an unbroken line on their mother’s side from a common ancestor, designated as Mitochondrial Eve. Descendants of Mitochondrial Eve have slowly migrated out of Africa, giving rise to ‘haplogroups’ that describe their specific mitochondrial ancestries. Each haplogroup represents a particular lineage with a defining set of mutations that have accumulated in mtDNA over time.

Researchers found that POAAGG subjects are genetically very diverse, representing multiple African ancestries and the deepest roots of the mitochondrial family tree. They also identified several haplogroups that appear to confer an elevated risk of developing glaucoma. These groups likely harbor mutations that elevate glaucoma risk and severity. For example, lineages with missense variants in one mitochondrial gene (*MT-CO1*) had more severe glaucoma and worse vision loss, despite having lower eye pressures. It is possible that this variant denotes the very first “subtype” of open-angle glaucoma.

Eventually, this information can be used to identify groups of patients at high risk of glaucoma and target treatments to their “subtype” of disease. In addition, better understanding of the role of mitochondrial dysfunction in glaucoma can

pave the way to bioenergetics therapies that support mitochondrial function.

### HOT OFF THE PRESS...

Though genotyping results have not yet been publicly shared, researchers have published results from a number of smaller-scale studies. The POAAGG database contains richly detailed information on thousands of subjects, which has allowed researchers to investigate a number of interesting questions. For example, a recent manuscript examined why certain patients go blind from glaucoma while others maintain their vision. Difficulties with access to care, low visual acuity, and poor control of intraocular pressure were identified as major risk factors for blindness.

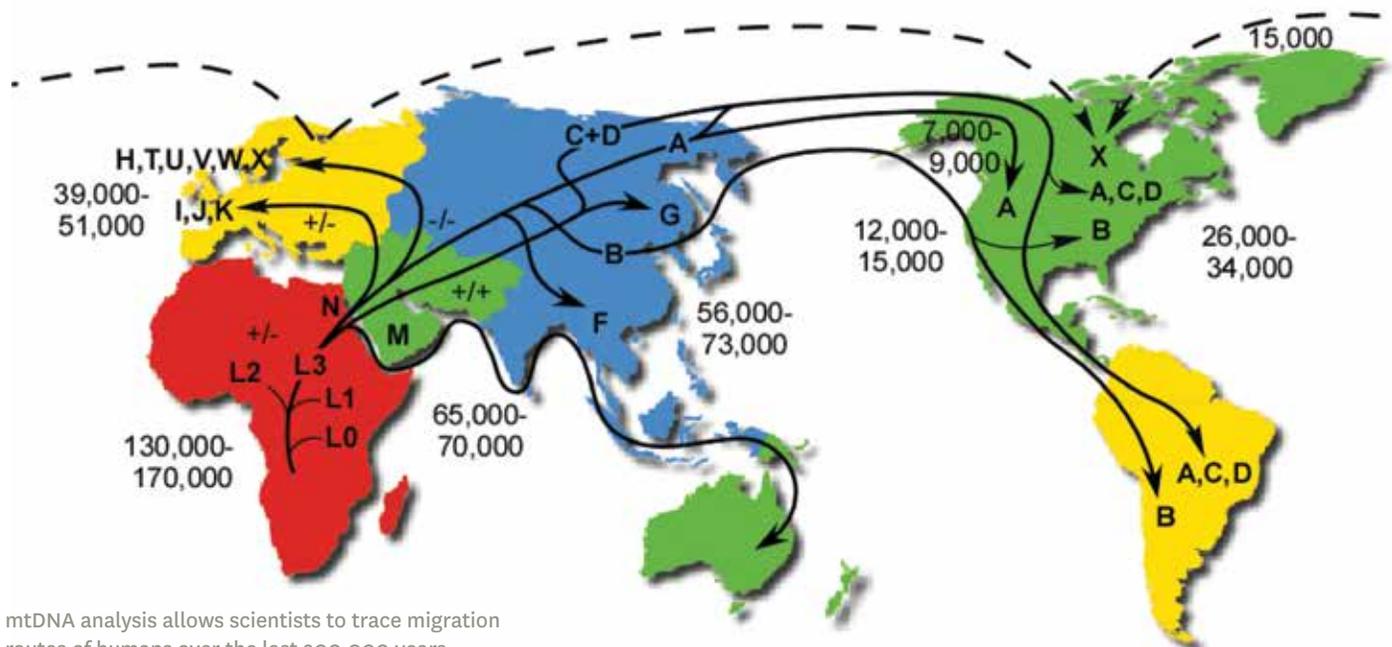
Many other clinical studies are in progress, including examinations of disease progression and family history among POAAGG subjects. The glaucoma specialists, in conjunction with departmental biostatisticians

(Maureen Maguire, Gui-shuang Ying, Max Pistilli) and the Ophthalmology Reading Center (Ebenezer Daniel), have also developed new systems to grade the visual fields and optic nerves of patients. “We have created quantitative systems for previously qualitative data,” said Dr. O’Brien. “This will allow deep endophenotyping to be correlated with genetic variants. We can then identify subgroups of open-angle glaucoma and find variants that regulate or dysregulate targetable genetic pathways.”

Researchers in the laboratory have also been busy publishing results in peer-reviewed journals. Two years ago, the study replaced blood collection with saliva collection, which is a cheaper, simpler, and less invasive method of obtaining DNA. While the quality of saliva samples for large genetic studies has been questioned in the scientific community, POAAGG researchers disproved these doubts, finding a 99.996% concordance between genotyping from blood and saliva DNAs collected from the same individuals.

## Human mtDNA Migrations

From <http://www.mitomap.org>



mtDNA analysis allows scientists to trace migration routes of humans over the last 200,000 years.

“These results led us to use saliva collection as our primary method for obtaining DNA for analysis,” said Harini Gudiseva, Lab Manager for the POAAGG study. “Collection of saliva DNA has tremendously boosted enrollment, while also decreasing the personnel effort and training required to obtain DNA samples of adequate quality.”

### GLAUCOMA IS “MANY DISEASES”

More than two years remain in the POAAGG study. In this time, researchers will enroll a second cohort of patients, called the Validation Cohort. This group will permit replication of findings from the initial GWAS within an independent dataset.

Ultimately, researchers hypothesize that glaucoma is not “one” disease with one clear treatment option, but rather multiple diseases with different genetic underpinnings and phenotypes. For example, some individuals may have a mutation in a gene associated with trabecular meshwork outflow, leading to high eye pressure. Others may have lower pressure yet more severe disease, pointing to a mutation associated with mitochondrial dysfunction or optic neuropathy.

Dissecting glaucoma into subtypes will allow researchers to develop targeted treatments for each form of disease. These interventions may one day transform the screening and treatment of glaucoma, saving the sight of many patients.



# Scheie Advances Teleretinal Imaging Program

Diabetic retinopathy is a condition caused by damage to blood vessels in the retina. If left untreated, it can progress to macular edema, retinal swelling that impairs vision. Diabetic retinopathy develops in approximately 40 to 45 percent of patients with diabetes and is the leading cause of vision loss for working-aged adults in the developing world. While annual eye examinations are necessary for early diagnosis and treatment of diabetic retinopathy, the majority of diabetes patients in the United States receive fewer ophthalmic exams than is recommended (less than one a year). As a result, about half of patients with diabetic retinopathy remain unaware until they begin to notice symptoms. In order to prevent the disease from progressing, proper monitoring of diabetic patients is essential. This year Scheie has made strides in developing a teleretinal imaging initiative to increase accessibility of eye screenings and catch diabetic retinopathy before it causes vision loss.

The Ophthalmology Department's teleretinal imaging service "Eyes on Site," led by Dr. Thomasine Gorry, is pioneering a program that offers an alternative to "in person" diabetic eye exams. The key to the initiative is a "non-mydratic" (without pupillary dilation) digital retinal imaging camera, manufactured by Eidon. This device, which underwent a several month trial period beginning in December 2015 with the support of the Penn Center for Health Care Innovation Accelerator Program, is designed to increase opportunities to detect early signs of diabetic retinopathy. Because it does not require pupil-dilating eye drops, the non-mydratic camera is more comfortable and convenient for patients than other high-quality imagers. Screenings only take 5-10 minutes and can be offered in accessible locations with simultaneous diabetic and eye care services (such as in primary care physician and optometrist offices). Thus, patients who miss formal eye exams at ophthalmology centers could still receive screenings at centralized locations and have their images sent to ophthalmologists to be assessed.

Currently, Eyes on Site is collaborating with a number of departments across the University of Pennsylvania Health System (UPHS) to optimize the process by which physicians diagnose images taken remotely. For example, tools are being developed to increase the compatibility between the Eidon camera and Scheie's imaging and documenting software. Scheie has also taken steps to expand the use of retinal imaging across UPHS. Eyes on Site recently partnered with the University of Pennsylvania Family Practice, Internal Medicine, Endocrine, Pathology, and Lab Medicine Departments to develop a Diabetic Service Center, which will use non-mydratic camera imaging to assist with diabetic retinopathy diagnosis and management.

This plan could significantly increase the prevention of vision loss caused by diabetic retinopathy and macular edema. According to statistics from the National Eye Institute, diabetic retinopathy is present in about 5% of the

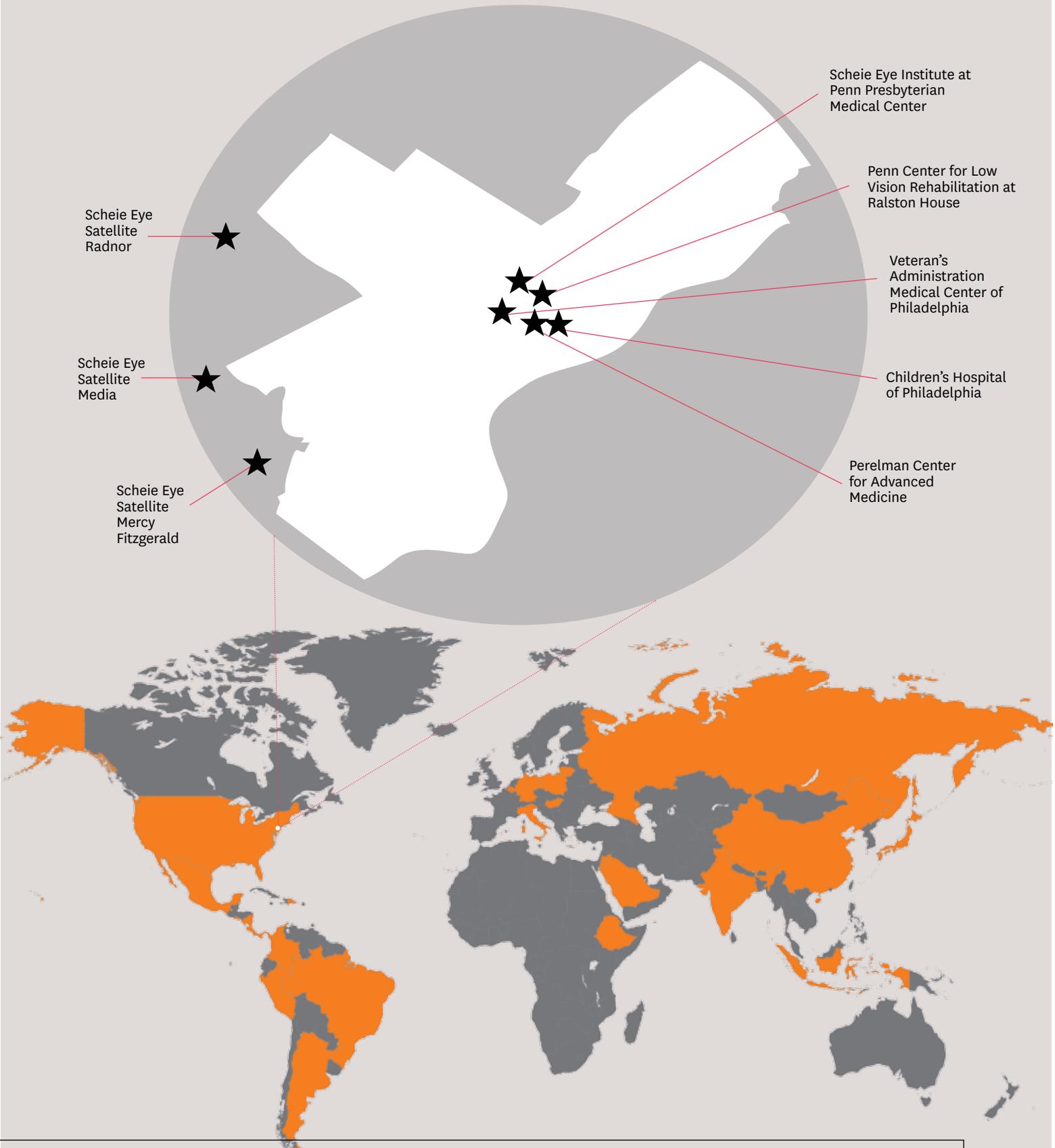
total adult population. In the UPHS alone, 320,000 patients miss yearly eye screenings. Of these patients, approximately 16,000 could have diabetic retinopathy that is not being managed by a health care provider. Teleretinal imaging will increase the likelihood of early diagnosis and prevention of potential vision loss. The advancements that Eyes on Site has made in the past year serve as a reminder of the world-changing opportunities made possible by innovation and collaboration.

The full Eyes on Site team includes: Sheara Hollin, COO; Thomasine Gorry, MD, MGA, Associate Professor of Ophthalmology, Co-Chair of CPUP Clinical Operations: Quality Domain; Joan O'Brien, MD, Chairman of Ophthalmology; Tomas Aleman, MD, Retina Service; Eydie Miller-Ellis, MD, Director of Glaucoma Service; Gideon Whitehead, BM; Rebecca Bigos, Process Quality Analyst; Davis Herrman, Design Specialist; Diane Dao, Medical Student.

**About half of patients with diabetic retinopathy remain unaware until they begin to notice symptoms.**

# Scheie on the Map

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



## International Clinical Care

**Scheie faculty and residents provide eye care to underserved populations around the world.**

# Scheie by the Numbers FY16\*



#1 IN NATIONAL EYE  
INSTITUTE FUNDING  
**\$7,951,795**

**58**

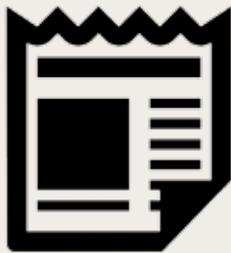
**CLINICAL AND  
RESEARCH FACULTY**



**17** OPHTHALMIC  
SPECIALITIES

**7** NEW SERVICES ADDED  
IN THE PAST 5 YEARS

**RESEARCH IMPACT  
H-INDEX**



**96**



**117,865** PATIENT  
VISITS



**INCREASE IN  
PATIENT VISITS  
IN THE PAST 5  
YEARS**



**118**  
**CLINICAL TRIALS**

**250+**

RESEARCH STUDIES  
AND CLINICAL  
TRIALS IN 5 YEARS

**2,431**

**SURGERIES  
PERFORMED  
BY FACULTY**

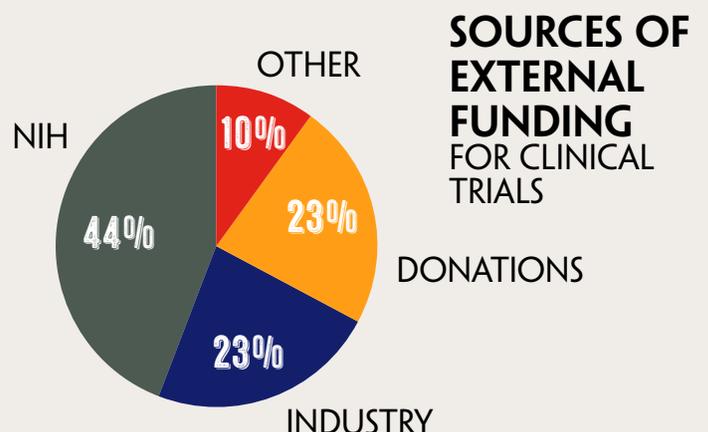


**15**

**OPHTHALMOLOGY  
RESIDENTS**

**100%**

GRADUATING IN THE  
PAST 5 YEARS PURSUED  
FELLOWSHIPS IN TOP  
NATIONAL PROGRAMS





# COLORFUL LANGUAGE

By Ava Kikut

UPenn investigates the relationship between color naming and color perception across cultures.

Hadza informant tracing shape to test for color blindness.

It turns out the expression “orange is the new black” may have some chronological truth. University of Pennsylvania psychologists Drs. David Brainard and Coren Apicella recently conducted a cross-cultural study on color naming with psychologists from Ohio State University. Their research supports a theory that human languages used words for black, white, and red for many thousands of years before they used words for orange and other colors.

This cross-cultural study involved data collected from the Hadza, a nomadic tribe in rural Tanzania. The Hadza live almost entirely on food they hunt and gather, relying on a lifestyle similar to that of humans living ten thousand years ago, before the advent of agriculture. “Humans have been living as hunter-gatherers for the majority of their existence on the planet,” Dr. Apicella explained. “[The Hadza’s] environment resembles the environment that our ancestors lived in more than the environment that we find ourselves in today.” Dr. Apicella and other cultural psychologists believe that studying the Hadza can lend insight into the origins of human behavior.

Research on the Hadza also allows psychologists to differentiate between cultural and universal characteristics. The Hadza’s self-sustaining lifestyle has allowed them to remain linguistically, geographically, and culturally isolated from other civilizations (although tourism and other factors have begun to change this in the past few years). This isolation has kept the Hadza out of range from Western media and other forces that would influence their behavior and language. “When you are looking for tests of universality, they provide some of the strongest evidence,” said Dr. Apicella.

Dr. Brainard, who serves as the Director of the Penn Vision Research Center and focuses primarily on the psychology of vision, contacted Dr. Apicella last year with the idea of collecting information from the Hadza to investigate the universality of color perception and naming. “I knew there was a lot of interest in how people name colors and thought the Hadza would be an interesting group to study. Dr. Apicella has a lot of experience doing fieldwork with the Hadza, which is a pretty involved skill,” Dr. Brainard explained. He also reached out to Drs. Delwin Lindsey and Angela Brown, at Ohio State University, who both have backgrounds in coordinating cross-cultural research. “They were very excited,” said Dr. Brainard. From there, the four researchers collaborated to design the study.

The planning process required strategically choosing color samples that study participants would be asked to name. Among the samples selected, some are more easily named in English, such as red and blue, and some tend to be named with less consensus, such as mustard. These selections were informed by the World Color Survey (WCS), a dataset of terms for 330 colors provided by 2,616 speakers of 110 non-industrial languages (Lindsey, Brown, Brainard, & Apicella, 2015). The final survey included a narrowed down list of 23 color samples.

After passing a test for color blindness, each participant would be individually asked to name each of the 23 samples. One point of departure from the WCS and other previous color surveys was the inclusion of “I don’t know” (DK) as an acceptable answer choice. “Drs. Lindsey and Brown were interested in what would happen if we didn’t insist on names,” said Dr. Brainard. That way, participants would not feel pressure to make up words when they did not have an answer.

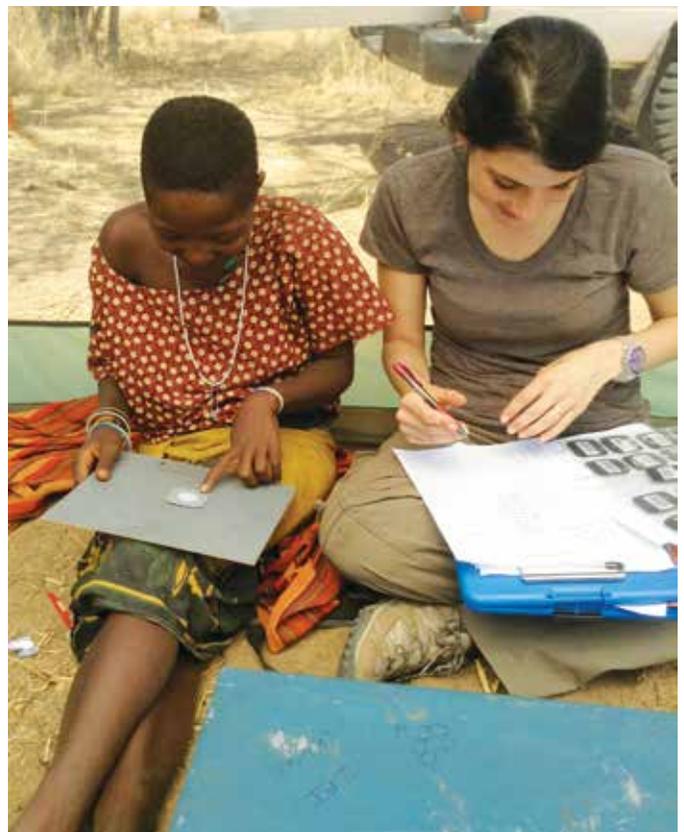
Drs. Lindsey and Brown interviewed 43 U.S. informants, whose first language was English, and 48 monolingual Somali immigrants living in Columbus, Ohio. This was compared to data collected by Dr. Apicella from 55 Hadza (Hadzane speaking) informants.

The data revealed that English speakers had the highest consensus for color terms, followed by Somali speakers, and then Hadzane

speakers. All of the English speaking informants used the same 11 terms for 11 of the 23 samples (See Figure 1.C). Over 80% of Somali informants used the same term for each of five color samples (See Figure 1.B). In contrast, black, white, and red were the only three colors for which all Hadzane speaking informants used the same terms. There was very low consensus on the rest of the samples, to which the most common response was DK (See Figure 1.A) (Lindsey, Brown, Brainard, & Apicella, 2015).

One important observation is the Hadza collectively had a complete lexicon of color terms. This means that at least one term was given by at least one participant for each of the 23 colors. Additionally, the Hadzane color terms followed a categorization pattern that aligns with universal color categories. A Hadza informant might use the same term for a green sample as for a blue sample, but would not use the same term for a red sample. They seemed to have made these distinctions without having learned them. This finding suggests that color categorization occurs at a neurobiological level that is not culturally influenced.

“We think that our data are consistent with a view that there is something universal about the ways that color names evolve,” said Dr. Brainard, “even in cultures as isolated as the Hadza.”



Dr. Apicella presenting color samples to a Hadza informant.

Hadzane is not the only language to have consensus terms solely for black, white, and red. These three colors seem to be more commonly referred to in pre-industrialized languages than other colors. “There is a theory about the order in which color names appear across cultures,” Dr. Brainard explained. According to this hypothesis, there is a scripted order in which colors are named in languages, which starts with black, white, and red (followed by green, yellow and blue, pink, etc.).

Dr. Brainard predicts that the greatest influence on the development of color lexicons is cultural necessity. “As societies become more industrialized...we have a lot of cultural need to use color to refer to things,” said Dr. Brainard. “There are more things that are made in color and the color becomes more important for distinguishing.”

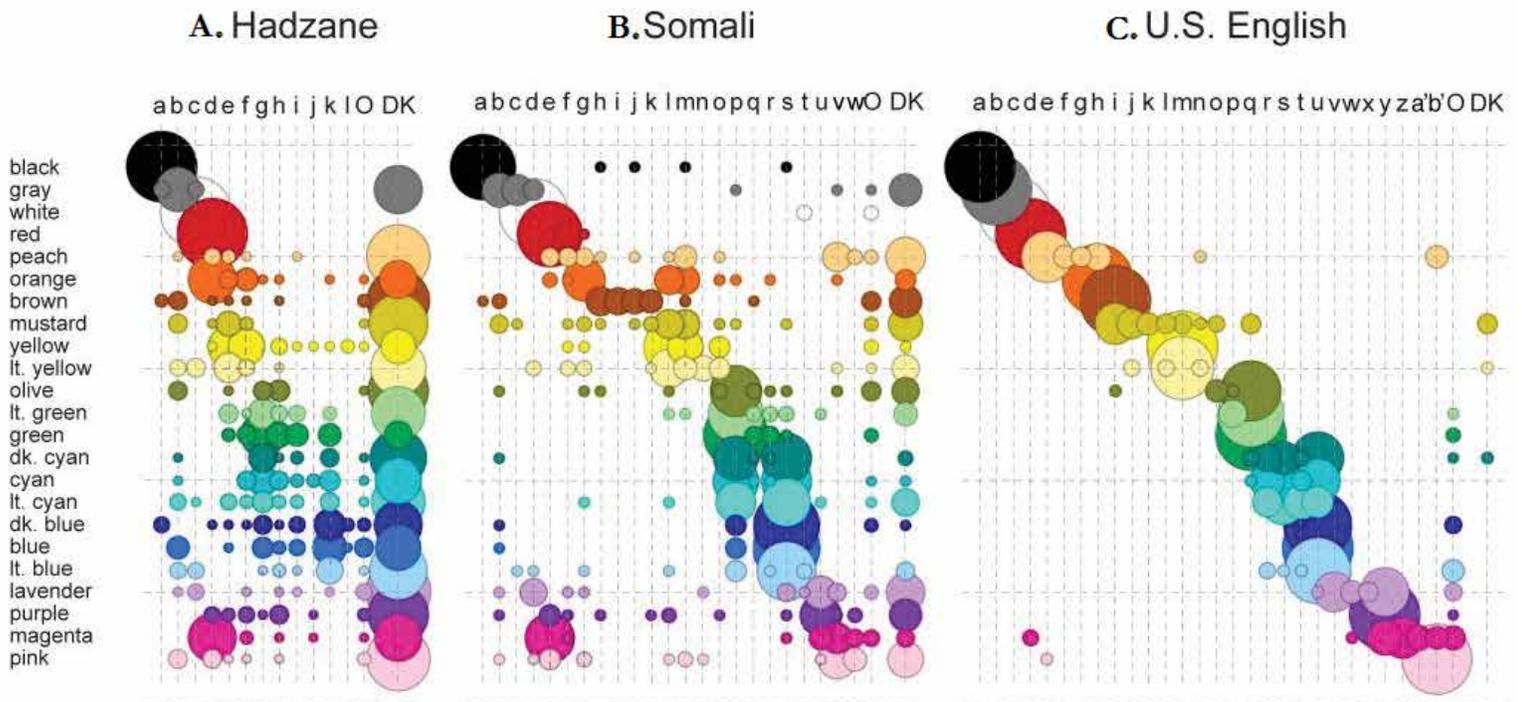


Figure 1

**GROUP COLOR NAMING DATA**

Each letter represents a color term in the given language. “O” means other terms used by less than two informants. “DK” means don’t know. The size of each disk indicates the fraction of informants who provided the same term for each color. For example, in Figure 1.A, the Hadzane data chart, seven small brown dots show Hadzane speakers gave seven different terms for brown. The big brown disk under “DK” shows that most Hadzane participants did not provide a term for brown. In contrast, Figure 1.C indicates that all English speakers used the same term (“i”) for brown.

The Hadzane data chart shows large disks under “DK” for every non-BWR sample, indicating that most Hadzane participants did not know a term for most colors.

(Reprinted from *Current Biology*, 25, Lindsey, D.T., Brown, A.M., Brainard, D.H., & Apicella, C.L., “Hunter Gatherer Color Naming Provides New Insight into the Evolution of Color Terms,” 2442, 2015, with permission from Elsevier.)



Hadza informant identifying an orange color sample.

This might explain why Somali, which has been exposed to industrialization relatively recently, would have a greater color lexicon than Hadzane but a lower one than English. Unlike Somali immigrants, Hadzane speakers have not yet needed to develop a broad color lexicon. However, it is quite likely that this is beginning to change as an increased presence of Westerners has begun to affect Hadzaland in the past couple of years.

This study has crucial implications for our understanding of the relationship between culture, language, and perception. It suggests that while language is influenced by cultural need, there is a universal biological process by which humans categorize what they see. There are, of course, a few questions still left unanswered: Why are black, white, and red consistently the first colors to be named? Are these colors more important to human communication than other colors? And if some colors are more valuable than others, can orange ever truly replace black?

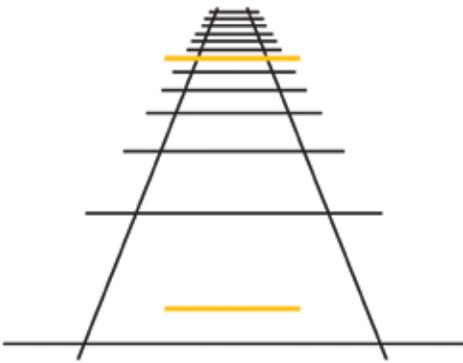
**For more about this study:**

Lindsey, D.T., Brown, A.M., Brainard, D.H., & Apicella, C.L. (2015). Hunter Gatherer Color Naming Provides New Insight into the Evolution of Color Terms. *Current Biology*, 25, 2441-2446.

# OPTICAL ILLUSIONS

By Rebecca Salowe

## Which yellow line is longer?



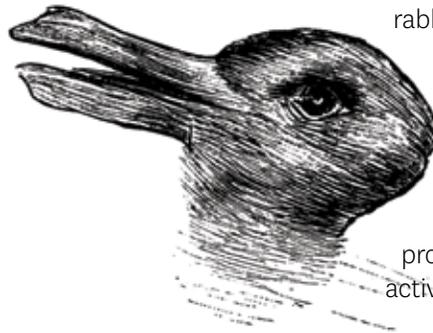
**Answer:** Most people perceive the upper yellow line to be longer, but both lines are actually identical in length.

**Explanation:** The Ponzo illusion is a *geometrical-optical illusion*. The human mind interprets this image as lines (or railroad tracks) receding in the distance, meaning the upper yellow line must be farther away. A farther object must be larger than a closer object in order to create retinal images of the same size – so we interpret the upper yellow line as longer.

Source: Ponzo M. *Intorno ad alcune illusioni nel campo delle sensazioni tattili sull'illusione di Aristotele e fenomeni analoghi*. *Archives Italiennes de Biologie*. 1911.

## Which do you see: a rabbit or duck?

**Answer:** The brain can switch between seeing a duck (facing left) or a rabbit (facing right).



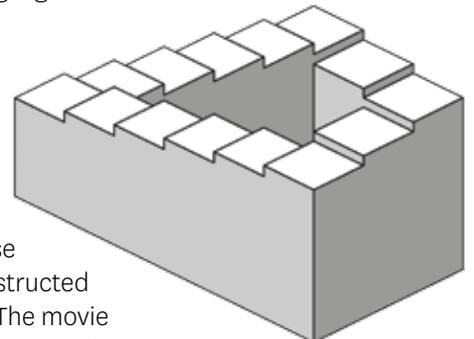
**Explanation:** The rabbit-duck illusion is an *ambiguous image*. This illusion exploits graphical similarities to provide multiple, stable perceptions of a single image. The figure shows that perception is not only a product of the stimulus, but also of our mental activity.

Source: McManus IC, Freegard M, Moore J, Rawles R. *Science in the Making: Right Hand, Left Hand. II: The duck-rabbit figure*. *Laterality* 2010;15;167.

## What's wrong with this staircase?

**Answer:** The steps descend in a clockwise direction, yet form a continuous loop – meaning a person could climb forever without getting higher or lower.

**Explanation:** The Penrose stairs are a *paradox illusion*. Each region makes sense on its own, but together forms an impossible staircase that could not be constructed in three dimensions. The movie *Inception* features Penrose stairs as an example of impossible architecture in one of its dream states.



Source: Deutsch D. *The Paradox of Pitch Circularity*. *Acoustics Today* 2010;6;8-14.



# SCHEIE EXPANDS ELECTIVE SERVICES

By Marquis Vaughn

The Scheie Eye Institute is committed to providing individualized care to patients across 17 subspecialties. Scheie provides outstanding care in traditional ophthalmic subspecialties such as glaucoma, retina, and neuro-ophthalmology. The Department is also exceptionally strong in its elective services offerings, which provide a variety of options for non-urgent surgical care. These elective services span across subspecialties, including the Cornea and Refractive Surgery Department, Dry Eye and Ocular Surface Center, and Oculoplastics and Orbital Surgery Department.

## **CORNEA AND REFRACTIVE SURGERY DEPARTMENT**

Drs. Stephen Orlin and Michael Sulewski are the co-directors of the Cornea and Refractive Surgery Department at Scheie. Both are highly recognized and respected for their research and clinical contributions to ophthalmology. Scheie offers a variety of elective services in this area, such as LASIK, LASEK, and PRK. These surgical procedures are used (instead of glasses or contact lenses) to resolve common eye-related issues such as myopia (nearsightedness), hyperopia

(farsightedness), and astigmatism (curvature of cornea or lens). In LASIK surgery, drops are added to the eye to numb the cornea, and then a flap is precisely created by the physician to expose the underlying cornea. An excimer laser is then used to reshape the cornea and improve visual acuity. Scheie offers other corrective surgeries to patients who do not qualify for these types of refractive surgeries, such as intraocular lens implantation (to restore focusing power after loss of natural lens), refractive lensectomy (to correct nearsightedness and farsightedness), INTACS (to reduce astigmatism and short sightedness), and Conductive Keratoplasty (to noninvasively correct presbyopia and low hyperopia).

## **DRY EYE AND OCULAR SURFACE CENTER**

Drs. Mina Massaro-Giordano and Vatinnee Bunya are the co-directors of the Penn Dry Eye and Ocular Surface Center. As the first and only center of its kind in the Philadelphia region, the Dry Eye and Ocular Surface Center is unique in that it incorporates revolutionary therapies and procedures as well

as innovative research, all while providing the best quality patient care. “Through our center, we can offer many unique, state-of-the-art modalities for both diagnosis and treatment (intense pulsed light, lipiflow, meibomian gland probing, specialized contact lenses, and more) that are not offered at other places,” said Dr. Massaro. “For example, we have a confocal microscope that allows us to see corneal nerves in great detail.” Dr. Bunya added, “Patients are also able to participate in various clinical trials and research studies.” Current research studies include investigations of novel therapies such as nerve growth factor drops for the treatment of ocular surface disease, dietary supplements, and new methods for better diagnosis of dry eye disease.

### **OCULOPLASTICS AND ORBITAL SURGERY DEPARTMENT**

Dr. Sonul Mehta is the Director of the Oculoplastic and Reconstructive Surgery Division at Scheie. Oculoplastic surgery is a surgical subspecialty of ophthalmology that includes a large range of surgeries and other medical treatments that focus on the management of orbital diseases, trauma, eyelid irregularities, tumors in and around the eye, pathology of the tear duct, and thyroid eye disease.

Oculoplastic surgeons offer aesthetic procedures that are more subtle and precise than other types of plastic surgery. “As oculoplastic surgeons, we specialize and offer plastic and reconstructive surgery around the eye involving the eyelid, tear duct, bony orbit, and the adjacent face,” said Dr. Mehta. “The elective services we provide cover a broad range of aesthetic and reconstructive procedures including upper eyelid blepharoplasty, lower eyelid blepharoplasty, eyelid ptosis repair, reconstructive eyelid surgery, eyebrow lifts, skin treatment, Botox injections for wrinkles, facial fillers, microdermabrasion, photo-facials, management of eyelid and facial skin cancers, and scar revision.”

The Oculoplastics Department also collaborates with many other departments such as Dermatology, Otolaryngology, Plastic Surgery, Neurosurgery, Endocrinology, Oncology, and Radiation Oncology in order to provide the most favorable outcomes for our patients. “At the Scheie Eye Institute and Penn Medicine, we incorporate cutting edge therapies and procedures, and pride ourselves in providing the best quality care and aesthetic treatments to our patients,” said Dr. Mehta. This past summer, Scheie expanded this subspecialty by hiring Dr. César Briceño to join the faculty.

### **FUTURE DIRECTIONS**

Jasmine Nunez, the new Elective Services Coordinator, is working on plans to update web marketing tools and informational brochures to familiarize people with elective services at Scheie. She will also take on a guest relations role with patients, giving them a special and customized visit according to their needs. “I believe the Elective Services Department sheds light on our versatility in providing all around services for patients. We offer more than glasses and routine eye examinations, and I plan on spreading the word so we are able to reach a variety of people,” said Jasmine.

To find out more information about elective services at Scheie, or to see if you qualify for any of these procedures, please visit our website at <https://www.pennmedicine.org/for-patients-and-visitors/find-a-program-or-service/ophthalmology> or contact Jasmine Nunez (215-662-8128).



**Before Ptosis Surgery**



**After Ptosis Surgery**



# Turning on the Light:

## Two Years at the Center for Advanced Retinal and Ocular Therapeutics

By Rebecca Salowe

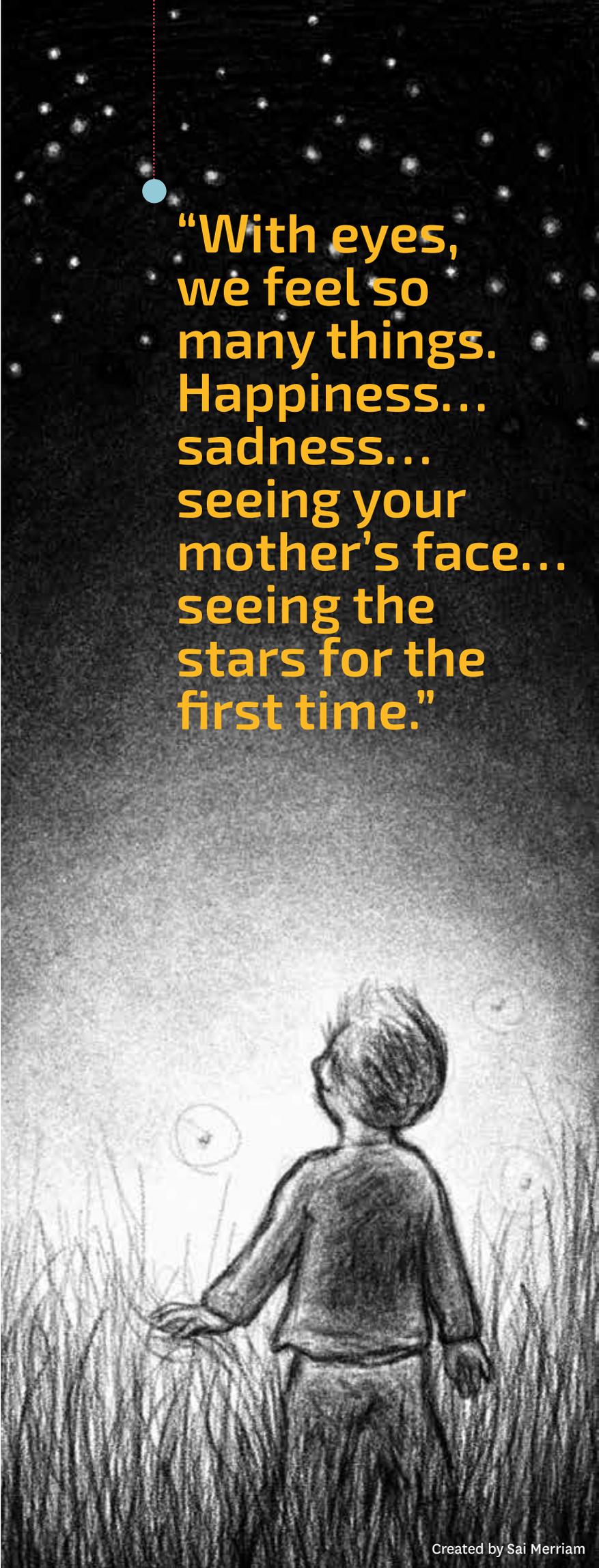
Corey Haas was eight years old when he saw sunlight for the first time. Born with a retinal disease called Leber's Congenital Amaurosis (LCA), Corey grew up in a world of darkness. He wore thick glasses, navigated with a cane, and had no pupil response when staring at a light bulb. He was well on his way to becoming completely blind.

That all changed on a sunny day in 2008 during a visit to the Philadelphia zoo. Corey walked through the entrance of the zoo and gazed upward. Shielding his eyes, he suddenly cried out. "The light! It hurts!" His parents were stunned. Four days earlier, Corey had received an experimental gene therapy treatment at the Children's Hospital of Philadelphia. Their legally blind son could now see sunshine for the very first time. They fumbled to find their phones and call Dr. Jean Bennett, hardly daring to believe.

*Could it be?*

### A BREAKTHROUGH IN GENE THERAPY

Like Corey, more than 285 million people worldwide experience vision loss or blindness. Despite the staggering impact of vision loss on patients and families, relatively little funding has been invested in research on genetic eye disorders, such as LCA. Drs. Jean Bennett and Albert Maguire, recognizing this need, began to investigate genetic approaches to reversing blindness.



"With eyes, we feel so many things. Happiness... sadness... seeing your mother's face... seeing the stars for the first time."



Their research began more than two decades ago, when gene therapy was a field with enormous promise but few positive results. In 1999, all gene therapy trials were halted following the death of 18-year-old Jesse

Gelsinger in a gene therapy trial at UPenn. The safety bar for human gene therapy was raised so high that researchers needed approval from 13 UPenn committees before submitting a protocol to the Food and Drug Administration.

Despite the seemingly insurmountable barriers in this field, Drs. Bennett and Maguire persevered, convinced that their approaches for treating retinal disease could be safe and effective. They were soon ready to test a gene therapy procedure in dogs. The research group delivered an adeno-associated virus (AAV) encoding RPE65 (the mutated gene) to blind dogs with LCA – and restored their photoreceptor responses.

The story of blind dogs regaining sight was featured in numerous media outlets, including Good Morning America, and was presented to the U.S. Congress. The next step was clear, but hampered by regulatory hurdles: applying this approach so blind children could see.

After three years of careful preparation – which included generating the clinical vector, building a full set of safety and efficacy data, navigating regulatory requirements, and forging new collaborations – Drs. Bennett and Maguire began the first clinical trial for gene therapy for LCA caused by RPE65 mutations. The results were astounding. Efficacy was reported in all twelve original patients, including five children. Corey Haas was among the first to regain his vision.

“I remember the day that we got the results back from the first patient enrolled in the first phase of the trial,” said Dr. Jeannette L. Bennicelli. “It was obvious after a very short period of time – it was only days – that this patient had some restoration of vision and could see light. I was at my lab bench, and Jean came and told me. We were so excited that we were jumping up and down and screaming.”

In the following years, Dr. Bennett, Dr. Maguire, and colleagues continued follow-up studies on LCA patients, as well as exploring gene therapy options for other degenerative eye diseases. Over time, the idea for a center where these scientists could continue researching and treating blinding

conditions was born. The Center for Advanced Retinal and Ocular Therapeutics (CAROT) was established in July 2014, with Drs. Bennett and Maguire as Co-Directors.

## **BASIC SCIENCE DISCOVERY**

The mission of CAROT is to develop novel therapies for retinal and ocular disorders and to restore sight in visually impaired or blind individuals. Two years after its inception, CAROT has become one of the premier centers for personalized diagnosis and treatment in the United States.

CAROT is unique in that it focuses on all stages of therapy development. This process begins with basic science exploration, considered the “discovery engine of the center.”

In the field of ocular gene therapy, a major part of basic science discovery is the design of a clinical vector to package a therapeutic gene and deliver it to the eye. The two major classes of vectors used for gene therapy are viruses and DNA complexes. Due to their great clinical promise, the Research Vector Core of CAROT (directed by Dr. Shangzhen Zhou) focuses on the production of viral vectors.

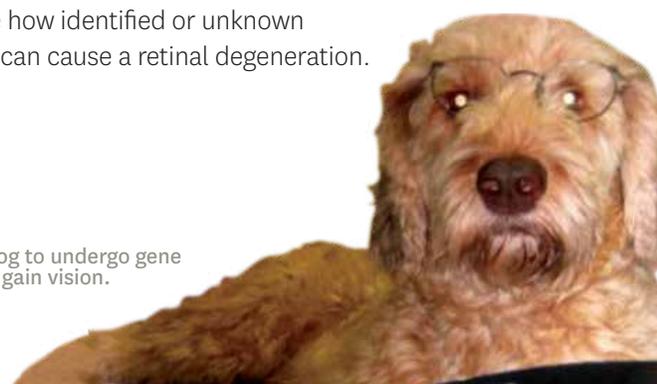
“There are several considerations for selecting a specific viral vector for a clinical trial,” said Dr. Latha Vasireddy, an investigator at CAROT. “The basic features include the capability of the vector to attach to and enter the target cell and successfully transfer recombinant DNA to the nucleus; the ability of the genome to be expressed in the nucleus for a period of time; and a lack of toxicity.”

AAV vectors fulfill the majority of these criteria and are most commonly used at CAROT. In addition to having an excellent safety record in human studies, AAV vectors efficiently deliver DNA to retinal cells and have a number of serotypes with differences in cell specificity. These vectors are not only used for clinical trials at CAROT, but also for gene therapy programs targeting extra-ocular diseases across UPenn.

CAROT also has an Induced Pluripotent Stem Cell (iPSC) Core, which focuses on the generation of retinal cells from iPSCs. iPSCs are a relatively new type of pluripotent stem cell that can be generated directly from somatic cells through the use of defined transcription factors. Due to the scarcity of adult stem cells, and the ethical issues and non-autologous nature of embryonic stem cells, iPSCs currently hold much promise in the field of regenerative medicine.

CAROT uses iPSCs to generate retinal cells, including the retinal pigment epithelium, retinal progenitor cells, and photoreceptors. These cells are then used to investigate how identified or unknown mutations can cause a retinal degeneration.

First blind dog to undergo gene therapy and gain vision.





“An advantage to using human iPSCs is that we can evaluate novel or complex mutations where animal models are not available or representative of human clinical disease phenotype,” said Dr. Jay Mills, the Director of the iPSC Core at CAROT.

Dr. Mills also hopes to couple non-human models (rodent, primate, canine) with human retinal developmental models to recapitulate disease phenotypes, which can then be rescued using chemical or gene augmentation strategies.

“We hope that our facility will help to bridge the gap between the benchtop to bedside, and be a readily available resource to academic and corporate researchers,” said Dr. Mills.

## CLINICAL TRIALS

Translating basic science research into a fully-designed clinical trial is a difficult bridge to cross, but one that CAROT has successfully navigated on several occasions.

“While bench research requires creativity and free thinking, translational research requires a level of rigidity and a formulated pattern of development,” explained Junwei Sun, Chief Administrator of CAROT. “Our challenge is to use the knowledge of free thinking and put it into a pattern of development.”

CAROT recently concluded a Phase III clinical trial evaluating the efficacy of gene therapy for patients with LCA2 with mutations in RPE65, the treatment that restored Corey’s vision several years prior. This trial is the very first gene therapy re-administration study for a genetic disease. If successful, this trial will allow the therapy to be officially labeled as a drug and prescribed to patients. Enrollment and data analysis have

been completed and submitted to regulatory agencies, but results cannot be disclosed at this time.

CAROT also recently wrapped up a second clinical trial exploring a new disease target, choroideremia, an inherited disorder that gives rise to retinal disease and eventual blindness. The Phase 1/2 clinical trial delivered the gene therapy product SPK-CHM to 10 enrolled patients.

Outcomes from clinical trials are evaluated through traditional retinal and visual function tests, a functional test, and a mobility test. Many of the trial subjects have also been examined by CNS (central nervous system) Imaging and advanced retinal imaging.

Dr. Manzar Ashtari, Director of CNS Imaging, studies the functional and structural brain changes in patients undergoing gene transfer therapy. “So far, our studies have shown that despite long term visual deprivation, the brain’s visual pathways remain intact,” said Dr. Ashtari. “After retinal gene therapy, these pathways undergo a great deal of brain plasticity in order to enable the processing of newly established visual signals.” Dr. Ashtari and colleagues are also investigating biomarkers that can be used as outcome measures to evaluate the short and long term efficacy of retinal gene therapy.

Dr. Jessica Morgan, Director of Advanced Retinal Imaging, complements CNS imaging with high-resolution adaptive optics imaging to assess the structure and function of retinal cells before and after experimental treatment. “High resolution imaging allows us to study the effectiveness of treatment at the level of individual cellular structure and function,” she said.

## JOURNEY TO THE MARKETPLACE

Currently, there are no FDA-approved gene therapies in the United States – though this may be changing very soon with the conclusion of several Phase III clinical trials at CAROT. If these trials prove that a gene therapy treatment is safe and effective, the product can then be submitted for FDA approval.

Industry sponsors will help to guide these final steps and facilitate the delivery of any approved products to patients. Spark Therapeutics, for example, has sponsored previous trials at CAROT. A recent multi-billion dollar alliance agreement with Biogen, a top biotech company, will also help to bring ocular gene therapy programs to the clinic. This collaboration supports the research of Dr. Bennett and Dr. James Wilson (Director of UPenn's Gene Therapy Program) and seeks to develop manufacturing approaches to commercialize gene therapy products.

CAROT researchers greatly enjoy collaborating on the final stages of a therapy's development, which is a relatively rare opportunity for an academic institution. "Few scientists are able to see a study move from the bench to the clinic," said Dr. Bennett. "This is a process that requires a tremendous amount of complementary expertise as well as the ability to work well together."

CAROT has also collaborated with Novartis to develop a hands-on surgical training program, which will teach

surgeons how to perform a subretinal injection. This procedure, used to deliver gene products to the retina, can result in adverse events such as retinal detachment if performed incorrectly.

**CURRENTLY,  
THERE ARE NO  
FDA-APPROVED  
GENE THERAPIES  
IN THE UNITED  
STATES - THOUGH  
THIS MAY BE  
CHANGING VERY  
SOON.**

"The surgical procedure is thought to be something within reach of any board-certified vitreo-retinal surgeon, yet like any procedure, there is a learning curve," said Dr. Bennett. "It is thus important to develop a training plan so that the drug can be administered by certified surgeons."

## AN EXHILARATING FUTURE

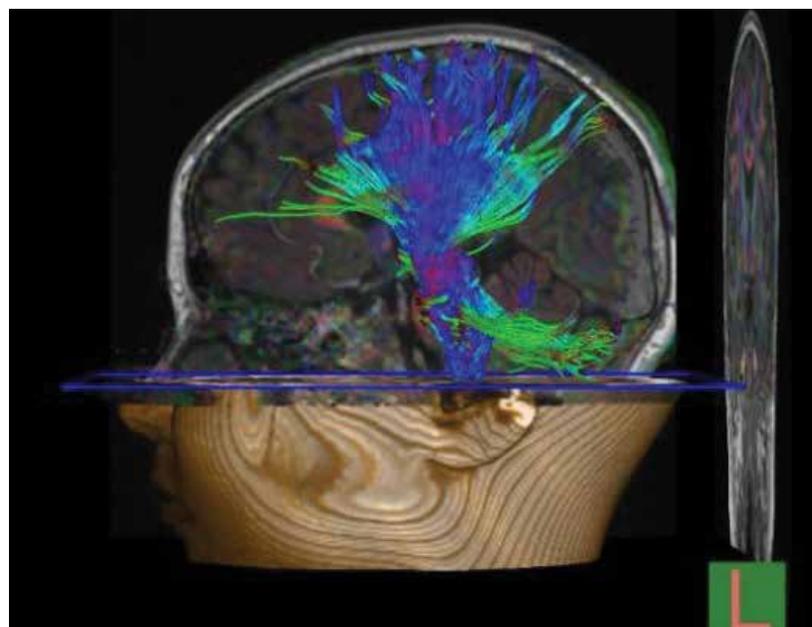
In upcoming years, CAROT will continue to explore new disease targets, conduct clinical trials, and hopefully obtain FDA approval for products for patients. In addition, the center seeks to make their technologies available to other scientists by providing guidance on vector therapy construction, clinical trial design, patient identification, and regulatory oversight.

Watching the transformation of children like Corey, it is difficult to not believe in the enormous potential of this institute.

"After all, eyes are such an important organ of our body," said Dr. Ashtari. "With eyes, we feel so many things. Happiness... sadness...seeing your mother's face...seeing the stars for the first time. It's just so much that anyone could give."



Drs. Jean Bennett and Albert Maguire receive the Penn Presbyterian Hospital Heroes Award for their research.



Functional MRI shows individual neurons in child with LCA.

# what are our patients saying?

Coordinated by Marquis Vaughn

**"I  
first  
met**

**Dr. Joan  
O'Brien** in

the summer of 2014, when I was having vision problems shortly after completing chemotherapy for CNS lymphoma. I had been advised by my oncologist that the eye was a frequent site of CNS lymphoma recurrence since chemotherapy did not get into the eye, but was in a state of disbelief when I arrived at Scheie for my first appointment with the Chairman of the University of Pennsylvania's Ophthalmology Department and the Director of the Scheie Institute. I did not expect such a big job to be done by such a tiny, gentle woman! But I was immediately impressed by Dr. O'Brien's level of expertise and ability to relate to me as a patient. I remember the myriad of tests expertly conducted by the staff at Scheie - tests I had never had before like taking pictures of the inside of your eye! And I remember meeting with Dr. O'Brien after those tests, when she confirmed that there was, in fact, lymphoma in my eye. She then carefully described treatment options, answered questions that I had, and together we reached the conclusion that radiation was my best option—and it was an option that would work. Not "might work," but "would work." She inspired such confidence right from the start.

I had planned a vacation with a friend to Hawaii in September, and radiation treatment would definitely put those plans into jeopardy. I remember the compassion Dr. O'Brien showed when she said, "The human side of me so much wants to tell you to 'Go to Hawaii,' but the doctor in me says it is important for you to start this treatment as soon as possible."

And so, I delayed that dream trip until November, when radiation treatment would be behind me. I am now two years post-treatment, and I see Dr. O'Brien every six months. There is always a group of interns, fellows, and residents on hand. I am impressed with how patient Dr. O'Brien is with them, as she carefully questions them about their observations and points out things they might have missed. And she ALWAYS personally examines me, not just leaving it to the new generation of experts. Also, despite how busy she is, Dr. O'Brien always takes as much time as I need, translates the "medical speak" into comprehensible lay terms without patronizing or talking down to me, and has retained the compassion that she demonstrated in my very first visit."

— Carolyn Maranca



**"Dr. Joan O'Brien has been my physician for nearly 23 years** and counting! Despite moving around to different cities during these 23 years, I continue to go back to Dr. O'Brien for care because of how well she takes care of her patients and the trust I have in her. Dr. O'Brien was the one that diagnosed me with retinoblastoma and performed the enucleation. Although I have vision in one eye, I don't feel like there's a loss. She has done a great job of making me feel comfortable and been encouraging of everything throughout all these years. I go back to her every year, because she, along with her staff, has upheld the highest standards when it comes to care. I definitely feel at ease knowing that I can reach out to her for any concerns not only with my health. Dr. O'Brien has been and continues to be such a great physician, and I know those who interact with her can say the same."

— Kathy Ngyuen

**“I wanted to express my sincerest thanks** for all that Dr. Stephen Orlin and his staff have done for me. I know that I am one of many patients that he has helped but the corneal transplant that I received is life changing. I am a single dad of three beautiful children and have a successful career. Having poor vision was frustrating at best and often scary as I tried to be a good parent to my kids.

God has given him a gift to heal others and I’m truly thankful for it. I appreciate all the years he has dedicated to studying medicine and using that knowledge to help others. Dr. Orlin and his staff were personable, professional, and I am grateful for all that they have done for me.”

— Adam Confino



**“I can’t say enough** about the treatment that I have received from Dr. Benjamin Kim. I first met him when he performed emergency surgery on my left eye to repair a torn retina. Since then, he has performed two vitrectomies on me to repair macular holes. Every operation has been successful and he has provided me with every option. If I have an issue, he always fits me into his schedule. His staff is incredible. I always get an immediate response. When I was having a particular problem, he saw me five times in a nine day period. As an attorney, I know to ask questions, and possibly seek other opinions, especially about something as necessary as my eyesight. I have never sought another opinion. I totally trust his judgment.”

— Peter Scuderi, Esq.

**“Dr. Massaro-Giordano seemed to know much more about dry eye** than anyone else we had encountered. Seeing her presentation convinced us not only to support Scheie before we even arranged an appointment, but also to get to Scheie as quickly as we could.”

— Andrew Douglas

# SCHEIE BY THE SEASONS | 2016

## WINTER 2016

FEBRUARY: ANNUAL AFRICAN AMERICAN CELEBRATION EVENT



## SPRING 2016

APRIL: ANNUAL ALUMNI MEETING  
CELEBRATING SCHEIE'S 142ND ANNIVERSARY



## SUMMER 2016

JULY: SCHEIE FACULTY AND STAFF  
ATTEND PHILLIES GAME



## FALL 2016

OCTOBER: SCHEIE ATTENDS PHILADELPHIA VISION WALK FOR FOUNDATION FIGHTING  
BLINDNESS. A SPECIAL SHOUTOUT TO DOMINIQUE CAGGIANO, CLINICAL RESEARCH  
COORDINATOR AT SCHEIE, WHO ORGANIZED TEAM MEMBERSHIP AND FUNDRAISING!



# PENN MEDICAL STUDENTS FIGHT GLAUCOMA IN PHILADELPHIA COMMUNITY



## WHAT IS PENN SIGHT SAVERS?

Penn Sight Savers is a student-run program that offers free glaucoma screenings across Philadelphia to hundreds of patients a year. The group has three major missions: (1) to make eye care more accessible, (2) to educate people in the Philadelphia community on the necessity of regular vision checks, (3) to provide first and second year medical students with hands-on clinical experience.

Each spring semester, four first-year medical students work with Scheie glaucoma specialists to host screening stations at local health fairs and community events, usually in West Philadelphia. During the fall semester of their second year, members select and mentor four new students to take over in the spring.

Makayla McCoskey, the Chairperson of Perelman School of Medicine's Ophthalmology Student Interest Group, a Research Assistant at Scheie, and one of the second-year medical student leaders of Penn Sight Savers, described how the program operates and makes an impact.

## HOW DO THE SCREENINGS WORK?

The students of Sight Savers run screenings under the supervision of Scheie glaucoma specialist Dr. Prithvi Sankar, the group's primary mentor, as well as Drs. Eydie Miller-Ellis and Victoria Addis.

The students transport equipment from Scheie to the site of the event. After setting up a table, they begin testing patients.

"A physician and a medical student will look at the back of the patient's eye. We will also do a visual field test, which is a quick and easy test to look for signs of glaucoma," said Makayla.

During the visual field tests, patients look at a screen and

push a button each time they see a dot. "If a dot comes up on the upper corner and you don't click, the computer thinks you didn't see it," Makayla explained. "And then it will come up again. If you click it this time you probably can see it. But if it comes up several times and you never see anything in this sliver of your vision, then that part of your vision may be gone."

The students discuss the results with Dr. Sankar, who uses the visual field test, a visual acuity test, and the photo of the back of the eye from an ophthalmoscope to assess the patient's vision.

## WHAT CAN PATIENTS LEARN FROM THESE SCREENINGS?

Sight Savers' assessments inform patients when they should seek more advanced screenings and/or treatment. "We are going to let them know if we see something suspicious and if they need to get further care right away," Makayla said. "If Dr. Sankar sees something worrisome, he will specifically reach out to those patients and tell them to come in and make an appointment at Scheie."

Makayla added that regardless of the results of the screening, she and the other students talk with each patient about the importance of receiving yearly eye exams.

"I think a lot of people overlook how important vision care really is...if you are not experiencing vision loss, you probably won't realize it might be something to worry about," Makayla stated. "We are not only giving people a physical screening; we are also focusing on education."

## SO, WHY IS IT IMPORTANT TO GET A YEARLY EYE EXAM?

If detected early enough, glaucoma can be prevented from causing vision loss. However, without regular checkups, people can begin going blind before they realize they have glaucoma, and this damage is irreversible.

“Glaucoma is such a sneaky disease because it can go on for a long time and cause vision loss, but it’s in the periphery so you don’t notice you’re losing vision until the disease is pretty advanced,” explained Makayla. “You do need to get your eyes checked because something bad might be going on even if you haven’t noticed it yet.”

While Sight Savers screens for glaucoma, it is important for patients to attend annual appointments in ophthalmologist offices, which are fully-equipped for more comprehensive exams. Comprehensive eye exams not only reveal early signs of vision loss, they allow for diagnoses of a variety of systemic diseases. Chronic kidney disease, for example, has ocular manifestations that ophthalmologists can identify in images of the eye.

### HOW HAS PENN SIGHT SAVERS MADE AN IMPACT?

Last semester, Sight Savers attended five health fairs in West Philadelphia, screening about 80 to 90 patients per fair. Many of these patients are considered part of a high-risk population for glaucoma.

“Being in West Philadelphia, many patients are African American. Glaucoma is five times more common and 15 times more likely to lead to blindness in the African American population,” Makayla pointed out.

Additionally, she explained that many of the people attending health fairs are uninsured, and rely on the services offered as

their primary source of care. “We see them for such a short period of time, it’s such a short vision check, but it’s valuable and it is something that people need and they want, even if they are not going in for full check-ups because they are not covered.”

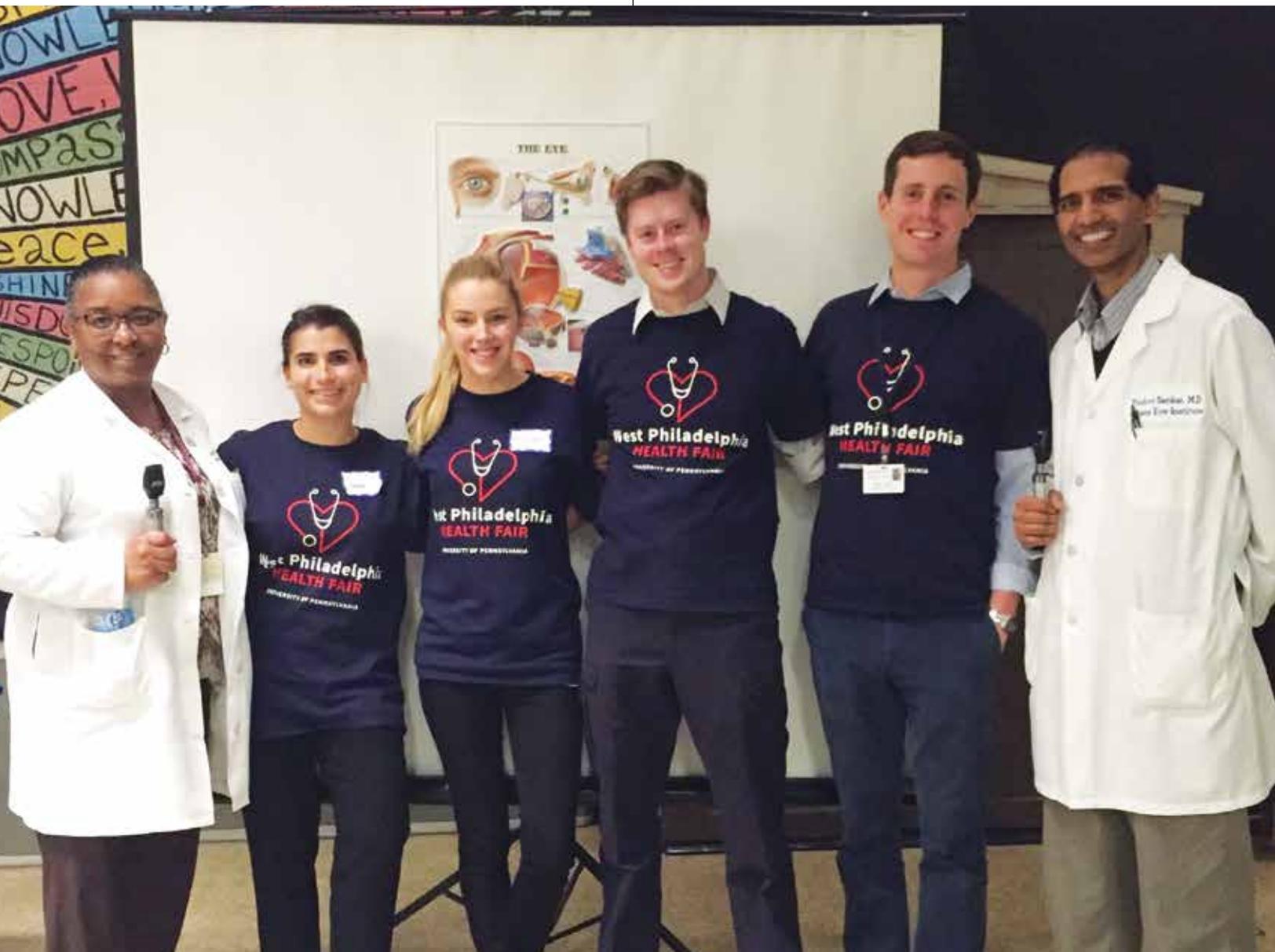
### HOW CAN STUDENTS GET INVOLVED?

In addition to its primary goal of making eye care and information accessible to the Philadelphia community, Penn Sight Savers provides a unique opportunity for first-year medical school students.

“It is such a great learning opportunity,” Makayla remarked. “From the medical student perspective it really allows us to gain clinical skills that we otherwise don’t get a chance to practice in the pre-clinical years when we are mostly sitting in a classroom and going to lecture.”

Penn Sight Savers is currently recruiting first year medical students, who will assume leadership roles when the current members (second years) go into clinics in January. “We have an application process. It’s really simple, just asking applicants to write a short paragraph saying why they want to be fully involved in Sight Savers,” said Makayla.

If you are interested in joining Penn Sight Savers or coordinating with Penn Sight Savers on an upcoming event, contact Makayla McCoskey at [Makayla.McCoskey@uphs.upenn.edu](mailto:Makayla.McCoskey@uphs.upenn.edu).



# Scheie Welcomes

DR. CÉSAR BRICEÑO

DR. JASON MILLS

DR. PRIYANKA KUMAR

DR. QI CUI

## Dr. César Briceño

By Marquis Vaughn



The Scheie Eye Institute is pleased to announce the arrival of Dr. César Briceño, who joined Scheie in September as an Assistant Professor of Ophthalmology. Dr. Briceño specializes in ophthalmic plastic and reconstructive surgery, particularly thyroid disease, orbital trauma, and facial reconstruction.

Dr. Briceño was born in Santo Domingo, capital of the Dominican Republic. After earning his undergraduate degree in biology at Harvard University, he worked as a management consultant in the pharmaceutical industry in Boston. He attended Johns Hopkins University for medical school, the University of Southern California for his ophthalmology residency, and the University of Michigan Kellogg Eye Center for his oculoplastics fellowship, where

he joined the faculty. At Kellogg, in addition to his clinical work and research, Dr. Briceño provided surgical instruction to medical students, residents, and fellows.

Dr. Briceño has been deeply involved in outreach work in Latin America through the University of Michigan Medical School's (UMMS) Global REACH Program. As the liaison to Latin America for Kellogg, Dr. Briceño participated in a collaborative project to study the effectiveness of telemedicine for the diagnosis of cutaneous eyelid lesions, developed a resident exchange program between Kellogg and Brazilian residents, and formed and expanded educational and research collaborations between the University of Michigan and Brazilian institutions. He has also cultivated relationships in Chile, Colombia, and Peru.

Dr. Briceño is excited to join the Scheie family and work closely with Dr. Sonul Mehta in the Oculoplastics Department. He also plans to study surgical and quality of life outcomes in oculoplastic and orbital surgery. Dr. Briceño is particularly enthusiastic about potential cross-departmental collaborative opportunities, which he expects will "facilitate the multi-disciplinary care of thyroid eye disease patients."

Outside of work, Dr. Briceño teaches competitive ballroom dancing. He enjoys painting and spending time with his husband, Dr. José Bauermeister, and Beatrice, their adorable black mouth cur. Welcome, Dr. Briceño!

## Dr. Jason Mills

By Rebecca Salowe



The Scheie Eye Institute is thrilled to welcome Dr. Jason Mills, who will serve as the Director of the Induced Pluripotent Stem Cell (iPSC) Core at the Center for Advanced Retinal and Ocular Therapeutics (CAROT).

Dr. Mills began his education at the University of Delaware, where he studied pre-veterinary medicine. He subsequently completed his Master's degree in Animal Science at the University of Nebraska, before returning to the University of Delaware to pursue a PhD in Stem Cell and Molecular Biology.

After completing his PhD, Dr. Mills took a position as the Technical Director of the Embryonic Stem Cell / iPSC Core Facility at The Children's Hospital of Philadelphia. A few years later, Dr. Bennett reached out to Dr. Mills about the possibility of joining CAROT.

In his new role as the Director of the iPSC Core Facility at CAROT, Dr. Mills works with colleagues to use induced pluripotent stem cells to generate retinal cells. These cells can then be used to study rare ocular disorders, revealing how mutations cause retinal degeneration. They can also be used to create human retinal development models, which allow chemical or gene augmentation strategies to be tested.

Dr. Mills finds his work at CAROT very fulfilling so far. "I've found people at CAROT to be very collaborative, forward thinking, and self-sacrificing, which is hard to come by sometimes in science," he said.

Dr. Mills live in the Philadelphia suburbs with his wife, daughter (first grade), and son (preschool). In his free time, he enjoys training for triathlons.

## Dr. Priyanka Kumar

By Rebecca Salowe



The Scheie Eye Institute is delighted to welcome Dr. Priyanka Kumar, who recently joined the faculty as an Assistant Professor of Ophthalmology, with a specialty in pediatric ophthalmology and adult strabismus.

Dr. Kumar received her undergraduate and medical degrees from the University of Chicago. Soon after beginning her clinical rotations in medical school, she found herself fascinated by ophthalmology. “I decided to pursue ophthalmology not only because of the beauty and complexity of the human eye,” she said, “but also because of the field’s clinical independence, surgical breadth, technological innovation, and constant investigation of the unknown.”

The leap from ophthalmology to pediatric ophthalmology was easy to make. “Children have the unique challenge of managing complex vision problems in the context of a developing visual system,” she explained. “I am perpetually inspired by the optimism and resilience of pediatric patients and their families.” Dr. Kumar also enjoys working with adult strabismus patients, which she regards as a natural extension of her field.

After completing her residency at the Cole Eye Institute and her fellowship at the Emory Eye Center, Dr. Kumar was excited to join Penn Ophthalmology. What appealed to her in particular was the opportunity to work closely with a large network of providers, the wealth of resources available to advance research, and the well-developed global health programs. Most of all, however, she was drawn to the people at Penn, who she described as “smart, kind, hard-working, and with wonderful work-life balance.”

Outside of her clinical duties, Dr. Kumar plans to conduct clinical research on retinopathy of prematurity, pediatric ocular trauma, and strabismus. She also hopes to be involved in the training of medical students, residents, and fellows.

Dr. Kumar lives in Philadelphia and looks forward to discovering the city in its entirety. She is especially looking forward to exploring the Schuylkill River Trail; the theaters, museums, and festivals; and the rich history of the city.

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## Dr. Qi Cui

By Ava Kikut



The Scheie Eye Institute is pleased to welcome Dr. Qi Cui, who joined the glaucoma service as an Assistant Professor in September. Dr. Cui is working under the National Eye Institute Mentored Physician Scientist (K12) Award with Drs. Maureen Maguire, Marni Falk, and Joan O’Brien. “As an aspiring clinician-scientist, I cannot imagine a more ideal and supportive environment in which to develop my career as a junior faculty,” said Dr. Cui.

Dr. Cui received her MD and PhD in neuroscience at the University of Rochester, where her doctorate focused on the interactions between eye movements and the spatial perception of sounds and images. This exposure to the study of vision inspired her to pursue a career in ophthalmology.

Dr. Cui became interested in glaucoma as a resident at the University of California, San Francisco. “I observed firsthand the important part a glaucoma specialist plays in the daily life and thereby overall wellbeing of his or her patients,” she said. After finishing her residency, Dr. Cui returned to the East Coast to pursue a glaucoma fellowship at Wills Eye Hospital.

At Scheie, Dr. Cui examines the role that genetic risk factors play in the development of primary open-angle glaucoma (POAG) in the African American population. “POAG tends to occur earlier and progress more quickly in African Americans. Despite this, our current understanding of the etiology underlying POAG is poor,” said Dr. Cui. Through this project, she hopes to contribute to the subtype categorization of POAG, which will allow for the development of targeted treatments.

In addition to her research, Dr. Cui devotes 20% of her efforts to clinical practice. She enjoys interacting with patients and “developing the type of patient-physician bond forged through continuity of care I have long admired in my mentors.”

Dr. Cui’s husband, Evan Katzel, will be starting his fellowship in microsurgery at the University of Pennsylvania and Fox Chase Cancer Center next year. “After several years apart due to the necessities of our separate training paths, we will now finally be relocating to the same city,” said Dr. Cui. While she loves hiking and traveling, and recently returned from a trip to Tibet, Dr. Cui has grown to love Philadelphia. Her passion and enthusiasm will no doubt be an enriching addition to the Scheie community.

# ALUMNI PRESIDENT



Ophthalmology in Philadelphia has a long distinguished history through the many accomplished surgeons who have worked and studied here for more than two centuries, starting with Dr. Philip Physick. Many other doctors, including Drs. Norris, de Schweinitz, Adler, Scheie, Frayer, Kozart, and so many others trained and flourished while working here. They have shared their expertise and knowledge with thousands of patients and hundreds of residents and fellows.

Winston Churchill once noted that, "We make a living by what we get, but we make a life by what we give." As eye physicians and surgeons, we have made a living by utilizing our unique skill sets. We received these skills through the hard work and generosity of the attending physicians, whose shoulders we have peered over and stood upon. We have taken these skills and techniques, often improving them to train the next generation of doctors and care for the many patients that have come through our own offices and operating rooms. By preserving and improving vision, we have given joy, meaning, and function to our patients' lives.

After finishing my residency and fellowship at Scheie, I joined the faculty for one year. During that time I had the distinct pleasure of sharing an office with Dr. Frayer. He was working part-time at this point in his 50+ year career, but was sharp as a tack and full of insightful advice and guidance. In this same light, it was also nice to learn that the 2016 Penn Ophthalmology 50<sup>th</sup> reunion class, including Dr. Dan Albert, met with the graduating Scheie residents this past spring to share advice and wisdom. They provided insight to our newly-minted ophthalmologists, hopefully challenging them to give back as their careers grow.

It has been a pleasure serving as Alumni President over the past six years. I have enjoyed connecting with other Scheie alumni at our spring meeting and fall reception at the AAO. I have also enjoyed meeting more recent residents and fellows and watching new careers begin every time I return to Scheie. It is in the spirit of these new beginnings and old roots that Scheie Alumni are connected. Looking forward, my hope in the coming year is to formally form an engaged alumni group that gives back to the institution and those that follow in our footsteps. Be on the lookout for ways to reconnect and give back, both with gifts and time.

For those of you who don't want to wait, I encourage you to come to the Spring 2017 Alumni Meeting where Sandy Brucker will be giving the David M. Kozart Memorial Lecture in honor of his 40 years at Scheie. In fact, you can also help recognize Dr. Brucker's achievement by contributing to a professorship being created and named in his honor!

In closing, let me acknowledge the great support of those at Scheie every day. Our current faculty, under the leadership of Dr. Joan O'Brien, continue to innovate and amaze, all while supporting the education of students, residents, and fellows. Many fellow alumni such as Drs. Steve Orlin, Jim Katowitz, and Charlie Nichols carry on the traditions they learned here in Philadelphia. "The longer you can look back, the further you can look forward." Together we carry on the traditions of one of the oldest and best ophthalmology departments in the United States and together we can keep it strong!

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

## SAVE the DATE

2017 Scheie Eye Institute Alumni  
Association CME Accredited Conference

**FRIDAY, APRIL 21, 2017**

**7:30am-4:30pm**

Scheie Eye Institute, breakfast and lunch served

**Honored Alumni Lecture** Donald L. Budenz, MD, MPH

**David M. Kozart Memorial Lecture** Alexander J. Brucker, MD

**7:00pm-10:30pm**

Dinner and Dancing at Rittenhouse Hotel

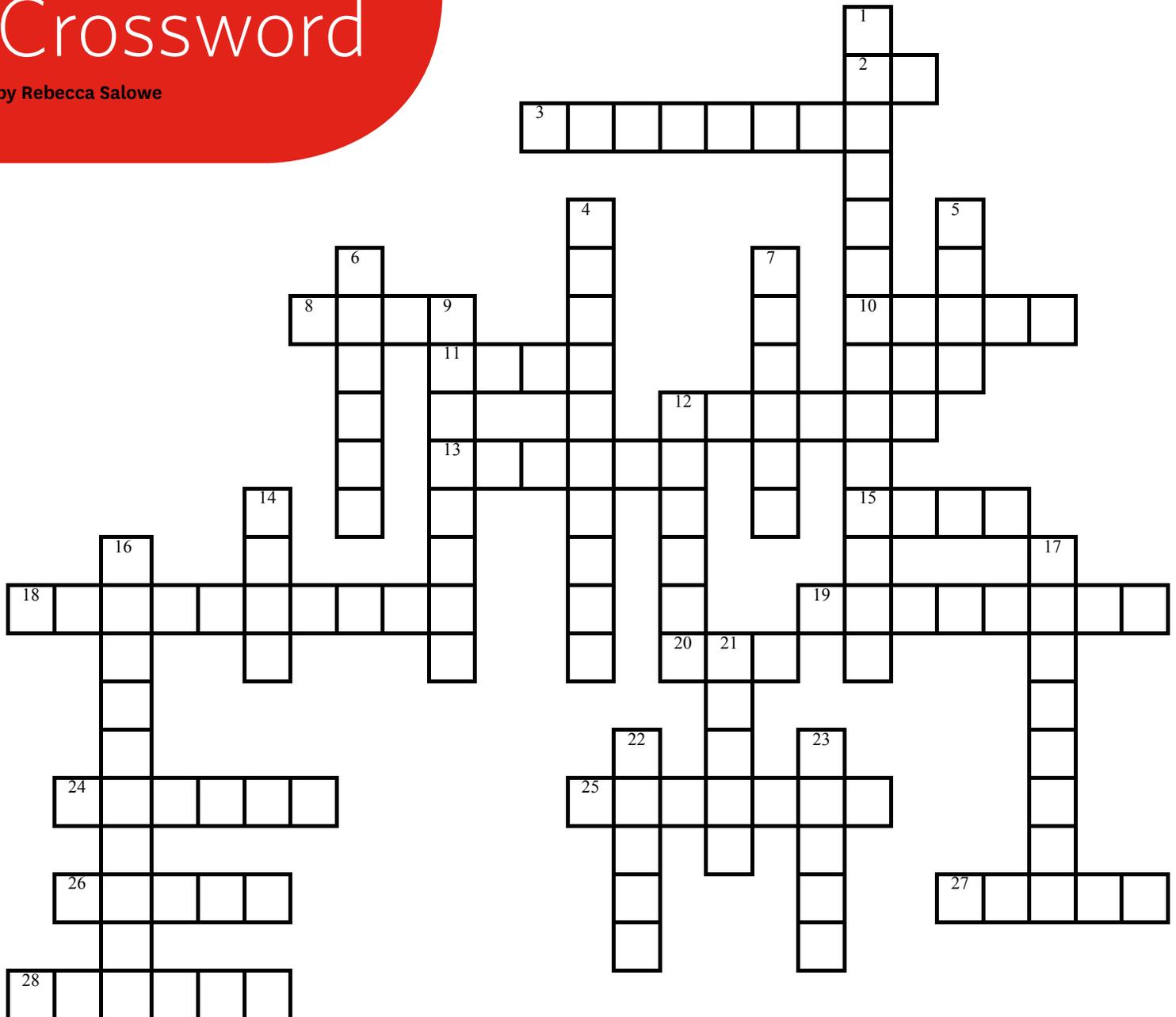
**Saturday, April 22, 2017**

**7:30am-12:30pm**

Scheie Eye Institute, breakfast and lunch served

# Sharp Eyes Crossword

by Rebecca Salowe



## Across:

- 2 Optometrist degree
- 3 Pupil enlargement
- 8 "The eye is the window to the \_\_\_\_\_."
- 10 Photoreceptors responsible for color vision
- 11 Blinded Game of Thrones character
- 12 Near-sightedness
- 13 Light-sensitive structure lining back of eye
- 15 Colored portion of eye
- 18 Condition requiring reading glasses after age 40
- 19 Ben Franklin invention from 1784
- 20 Age-related macular degeneration
- 24 White outer layer of eyeball
- 25 Method of reading for blind
- 26 Eye of the \_\_\_\_\_
- 27 First word that Helen Keller learned
- 28 Said "Eye for an eye makes whole world blind."

## Down:

- 1 Pink eye
- 4 Cross-eyed
- 5 \_\_\_\_\_ therapy
- 6 Famous blind musician (last name)
- 7 First name of Dr. Scheie
- 9 Gland that produces tears
- 12 Responsible for central vision
- 14 Small, painful lump on eyelid
- 16 Test for eyeglass prescription
- 17 Cloudiness of lens
- 21 Blind protagonist from *All the Light We Cannot See*
- 22 \_\_\_\_\_ eyed girl
- 23 "Love is \_\_\_\_\_."

# Scheie Eye Institute Faculty by Specialty

## Comprehensive Ophthalmology

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

## Cornea

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  
Prithvi Sankar, MD  
Qi Cui, MD, PhD  
Victoria Addis, MD

## Neuro-Ophthalmology

Grant Liu, MD  
Kenneth Shindler, MD, PhD  
Madhura Tamhankar, MD  
Robert Avery, DO, MSCE

## Ocular Oncology

Joan O'Brien, MD

## Ocular Pathology

Vivian Lee, MD

## Oculoplastics

César Briceño, MD  
Sonul Mehta, MD

## Optometry

Alisha Fleming, OD  
Kelly McCann, OD  
Ranjoo Prasad, OD  
Stacey Cesarano, OD

## Pediatric Ophthalmology (CHOP)

Brian Forbes, MD, PhD  
Gil Binenbaum, MD  
Graham Quinn, MD  
James Katowitz, 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

John Kempen, MD, MPH, MHS, PhD  
Nirali Bhatt, MD

## Research Faculty

Alan M. Laties, MD  
Artur Cideciyan, PhD  
Ebenezer Daniel, 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

## 2016-2017 Fellows

### 2016-17 Fellows

Ahmara Ross, MD, PhD (Glaucoma)  
Anastasia Traband, MD (Retina)  
Anita Kohli, MD (Neuro-Ophthalmology)  
Anton Kolomeyer, MD, PhD (Retina)  
Imran Jivraj, MD (Neuro-Ophthalmology)  
Joseph Griffith, MD (Pediatrics)  
Karen Revere, MD (CHOP Oculoplastics)

## 2016-2017 Residents

### First Year Residents

Jaclyn Gurwin, MD  
Lindsay Dawson, MD  
Michael Ammar, MD  
Michael Sulewski, MD  
Rebecca Bausell, MD

### Second Year Residents

Akosua Nti, MD  
Christopher Hwang, MD, PhD  
Iga Gray, MD, PhD  
Keirnan Willett, MD  
Preema Buch, MD

### Third Year Residents

Christiana Munroe, MD  
Daniel Sarezky, MD  
Katherine Uyhazi, MD, PhD  
Marisa Lau, MD  
Nicole Fuerst, MD

# Recruiting Clinical Studies

## DRY EYE

**Mina Massaro, MD**  
Corneal Nerve Structure and Vitamin D Level in  
Sjogren's Syndrome  
Trenton Rivera  
(215) 662-9393

## GLAUCOMA

**Eydie Miller-Ellis, MD**  
The Efficacy and Safety of Bimatoprost  
Sustained-Release in Patients with Open-Angle  
Glaucoma or Ocular Hypertension  
Judy Chen  
(215) 662-8691

## Eydie Miller-Ellis, MD

Ocular Hypertension Research Study 20 Year  
Follow-up  
Sheri Drossner  
(215) 662-8177

## Joan O'Brien, MD

The Primary Open-Angle African American  
Glaucoma Genetics Study  
Sai Merriam  
(215) 662-8673

## Victoria Addis, MD

Glaucoma Asymmetry Study  
Judy Chen  
(215) 662-8691

## NEURO-OPHTHALMOLOGY

**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  
Judy Chen  
(215) 662-8691

## OCULOPLASTICS

**Sonul Mehta, MD**  
Meibomian Gland Dysfunction and Botox for  
Blepharospasm  
Sonul Mehta  
(215) 662-8652

## Sonul Mehta, MD

Organ Culture of Dissected Eyelash Follicles  
Sonul Mehta  
(215) 662-8652

## RETINA

**Albert Maguire, MD** and  
**Manzar Ashtari, PhD**  
Longitudinal Functional and Structural  
Neuroimaging of Leber's Congenital Amaurosis  
of Phase 3 Patients  
Gloria Young  
(215) 746-5655

## Albert Maguire, MD

**Manzar Ashtari, PhD**  
Study of the Functional Neuroplasticity and  
Connectivity in Patients with Choroideremia who  
Undergo Unilateral Retinal Gene Therapy  
Gloria Young  
(215) 746-5655

## Alexander Brucker, MD

Intravitreal Anti-Vascular Endothelial Growth  
Factor Treatment for Prevention of Vision

Threatening Diabetic Retinopathy in Eyes at High Risk  
Sheri Drossner  
(215) 662-8177

**Alexander Brucker, MD**  
Smartphone Ophthalmoscopy (D-Eye fundus camera) for Evaluation of Posterior Segment Pathology  
Keirnan Willett  
(215) 662-8100

**Alexander Brucker, MD**  
A Natural History Study of Macular Telangiectasia  
Sheri Drossner  
(215) 662-8177

**Alexander Brucker, MD**  
A Multicenter, Prospective Epidemiologic Study of the Progression of Atrophy Secondary to AMD  
Trenton Rivera  
(215) 662-9393

**Alexander Brucker, MD**  
A Phase 3, Double-Masked, Randomized

Study of the Efficacy and Safety of Intravitreal Aflibercept Injection in Patients With Moderately Severe to Severe Nonproliferative Diabetic Retinopathy  
Michael Bezzerides  
(215) 662-8198

**Alexander Brucker, MD**  
A Randomized, Double-Masked, Active-Controlled, Phase 2 Study of the Efficacy, Safety, and Tolerability of Repeated Doses of Intravitreal REGN910-3 in Patients With Diabetic Macular Edema  
Michael Bezzerides  
(215) 662-8198

**Benjamin Kim, MD**  
Optical Coherence Tomography Imaging of the Retina of Frontotemporal Lobar Degeneration Patients  
Benjamin Kim  
215-662-8675

**Benjamin Kim, MD and Joshua Dunaief, MD, PhD**  
The GALA (Geographic Atrophy Lipoic Acid) Study, a Phase II Study of Lipoic

Acid as a Treatment for Geographic Atrophy  
Benjamin Kim  
215-662-8675

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

**Samuel Jacobson, MD, PhD and Artur Cideciyan, PhD**  
The Center for Retinal Hereditary Retinal Degenerations is currently preparing for clinical trials for a number of inherited and otherwise incurable retinal degenerations.  
N/A

**UVEITIS**  
**Nirali Bhatt, MD**  
PeriOcular and INTravitreal Corticosteroids for Uveitic Macular Edema (POINT) Trial  
Dominique Caggiano  
(215) 662-8696

## Faculty Publications

(July 1, 2015 – July 1, 2016)

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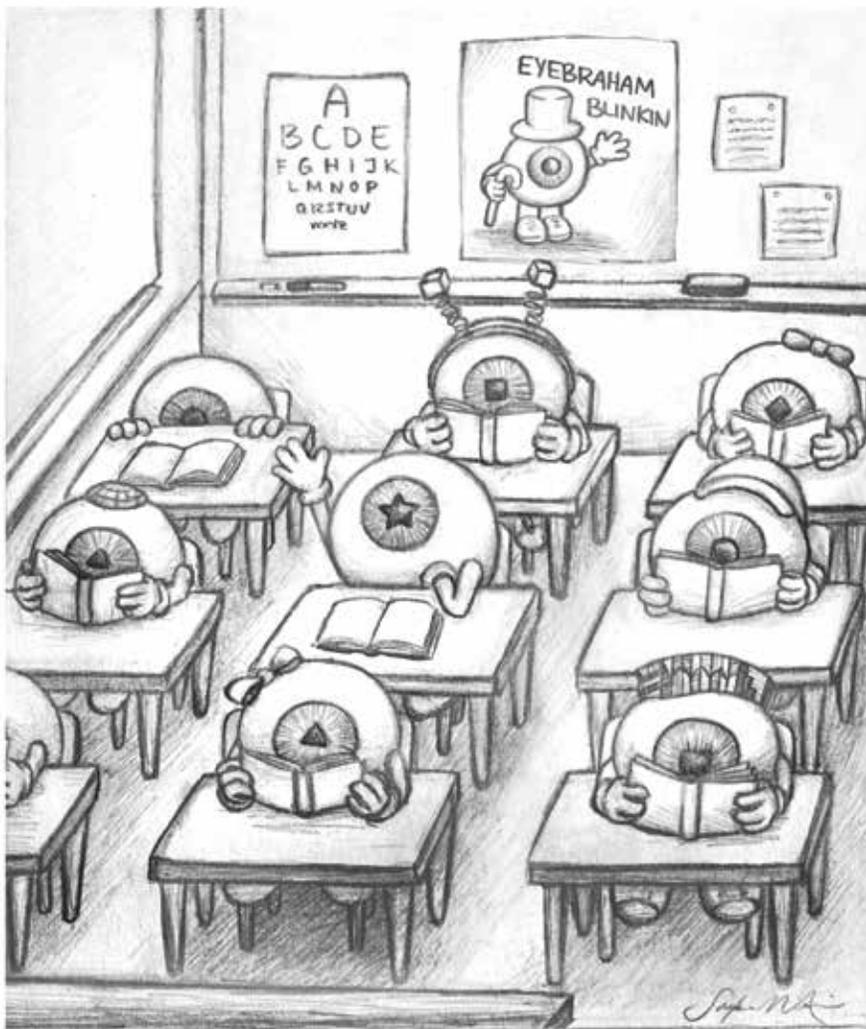
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# Faculty Awards

(July 1, 2015 – July 1, 2016)

## Tomas Aleman, MD

- 2015 Penn Medicine Innovation Accelerator Program Award
- Invited Speaker, Department of Ophthalmology, University of Pittsburgh Medical Center
- Keynote Speaker Progress in Ophthalmology, International Course, Monterey, Mexico

## Jean Bennett, MD, PhD

- Co-Recipient of ICON Award, Germination Project, Philadelphia, PA
- Inducted into American Academy of Arts and Sciences
- Invited Speaker, Philadelphia Thinkfest, Drexel University
- Penn Presbyterian Hospital Hero (with Albert M. Maguire, MD)
- Top 100 Ophthalmologist Power List

## Gil Binenbaum, MD, MSCE

- Best of Show Poster, 2015 AAOPOS Annual Meeting, New Orleans, LA
- Honor Award, American Association of Pediatric Ophthalmology and Strabismus
- South Jersey Magazine Top Docs for Kids, Ophthalmology
- Visiting Professor, St. Peters University Hospital, Department of Pediatrics, New Brunswick, NJ

## César Briceño, MD

- Best Doctors in America, 2015-2016
- Induction into the Academy for Educational Excellence and Scholarship, University of Michigan

## Alexander Brucker, MD

- 2016 Top Doctors, Philadelphia Magazine
- Best Doctors in America
- Guest of Honor at the Third International OCT Angiography Congress, Rome, Italy

## Qi Cui, MD, PhD

- Fellowship Award, The Heed Ophthalmic Foundation
- Members-In-Training Outstanding Poster Award Finalist, Association for Research in

- Vision and Ophthalmology
- Travel Grant, Association for Research in Vision and Ophthalmology

## Artur Cideciyan, PhD

- Silver Fellow, Association for Research in Vision and Ophthalmology

## Josh Dunaief, PhD

- Selected to serve as reviewer for NIH study sections (BVS and Special Emphasis Panel)
- Selected to give annual "Mentor" talk to Thomas Jefferson School of Medicine's MD/PhD students

## Thomasine Gorry, MD, MGA

- 2015 Penn Medicine Innovation Accelerator Program Award
- 2016-2017 Carol Emmott Fellowship

## Deborah Herrmann, MD

- Penn Medicine Health Care Hero

## Eve Higginbotham, SM, MD

- AOA Visiting Professor at the Ohio State University
- President-Elect of the AOA Medical Honor Society
- Visiting Committee of the Institute for Medical Engineering and Science at MIT

## Samuel Jacobson, MD, PhD

- Member (Honorary), La Sociedad Columbiana de Oftalmologia

## John Kempen, MD, MPH, MHS, PhD

- Appointed Editor-in-Chief of *Ophthalmic Epidemiology*

## Benjamin Kim, MD

- APAO (Asia-Pacific Academy of Ophthalmology) 2015 Travel Grant Award for promising young faculty
- Jeffrey W. Berger Golden Apple Teaching Award (Scheie Eye Institute)

## Albert Maguire, MD

- Penn Presbyterian Hospital Hero (with Jean Bennett, MD, PhD)
- Top 100 Ophthalmologist Power List

## Maureen Maguire, PhD

- Invited Speaker, Distinguished Lecture Series, Cole Eye Institute, Cleveland Clinic

## Eydie Miller-Ellis, MD

- 2015 Penn Medicine Innovation Accelerator Program Award
- Best Doctors of America
- David E. Eifrig Distinguished Alumnus Lecture, Department of Ophthalmology, University of North Carolina at Chapel Hill

## Monte Mills, MD, MS

- Letson Memorial Lecture, University of Minnesota Department of Ophthalmology

## Joan O'Brien, MD

- 2015 Penn Medicine Innovation Accelerator Program Award
- American Academy of Ophthalmology's Secretariat Award
- Best Doctor in America
- Newsweek's Best Cancer Doctor in America

## Stephen Orlin, MD

- American Academy of Ophthalmology Achievement Award.
- Honored Life Member, Greater Philadelphia Ophthalmic Society (GPOS)
- Master Clinician Award, University of Pennsylvania Perelman School of Medicine.
- Surgical Teaching Award, Scheie Eye Institute
- Top Doctor, Cornea Specialist, Philadelphia Magazine

## Kenneth Shindler, MD, PhD

- Research To Prevent Blindness Physician-Scientist Award

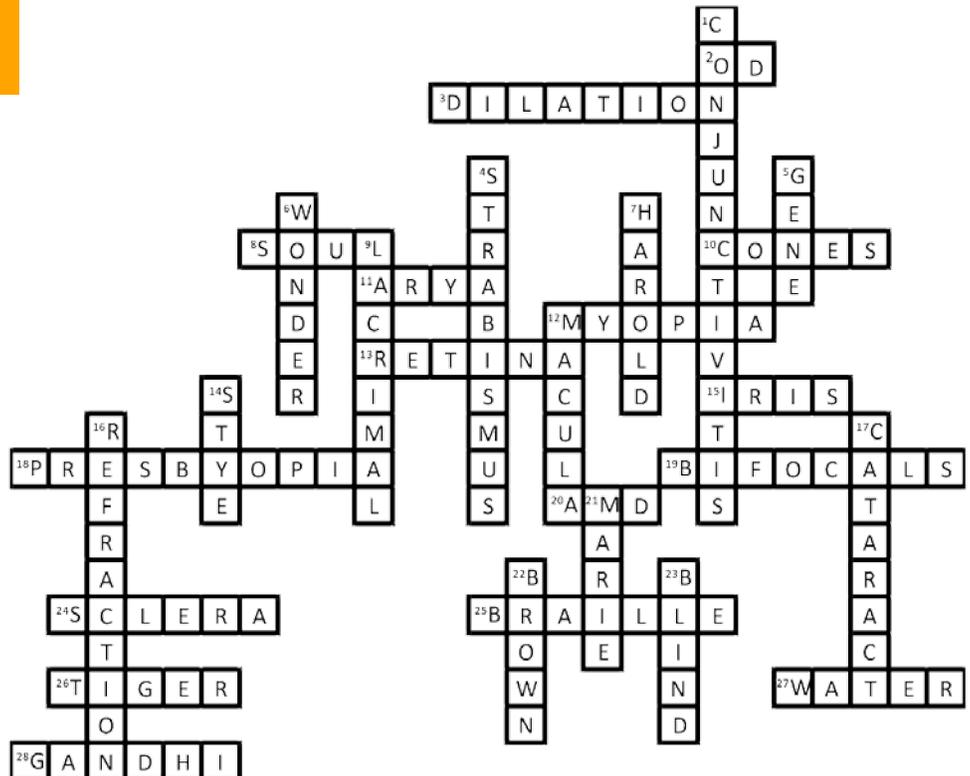
## Dwight Stambolian, MD, PhD

- Loris and David Rich Lecture in Visual Science, Lecturer Award, University of Alabama

## Gui-shuang Ying, PhD

- American Academy of Ophthalmology Achievement Award

# Answer Key



# SCHEIE EYE INSTITUTE

The Scheie Eye Institute is the Department of Ophthalmology at the University of Pennsylvania. Scheie has been a leader in the field of ophthalmic research, education, and patient care for 142 years. Many of our greatest advancements in vision saving therapy have been made possible by donations from individuals and organizations.

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## Will you join the Scheie Eye Institute?

For more information contact us at

**215.662.8415**

Or by email:

**[Rebecca.Salowe@uphs.upenn.edu](mailto:Rebecca.Salowe@uphs.upenn.edu)**

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**[PennMedicine.org/supportscheie](http://PennMedicine.org/supportscheie)**

