
VISION2018
Duke Eye Center
Virtually Predictable

VISION

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COVER STORY

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From our Chair, Edward G. Buckley, MD

I am pleased to present the 2018 issue of Vision Magazine. I couldn't be prouder of the work of our faculty, trainees and staff perform every day to make Duke Eye Center one of the most well-respected ophthalmology hospitals in the country and the world. As the magazine illustrates research, education and patient care are the very core of our institution.

We were honored to have earned 6th in the 2017–18 US News and World Report Best Hospital Rankings. We are proud that we have remained in the top ten since the rankings were established—over 25 years ago. With the addition of exciting new programs along with our plans for future growth, I am confident that we will continue this long tradition.

Our dedicated faculty and staff are the reason for our outstanding reputation. They deliver high quality, compassionate care to our patients and work tirelessly to find cures for blinding eye diseases by conducting ground-breaking clinical research. We have the most committed trainees that are preparing to be tomorrow's leaders in ophthalmology. We have an outstanding clinical staff that care for our patients with graciousness and dignity. The administrative team supports our daily operations and partners with our physician leadership to strategically advance our department. Dedicated research staff collaborates with their investigators to pioneer novel research that is crucial for advancement in clinical care.

Our donors are the foundation of our success. We are grateful to those who support our ambitious desire to preserve and restore the sight of our patients and future generations. Because of these generous and forward-thinking individuals and organizations, we are leaders in the field and continue to create the future of Ophthalmology here at Duke.

I hope you enjoy reading about our accomplishments, achievements and advancements in the clinic and the lab over the last year. This issue includes articles about:

- Felipe Medeiros, MD, PhD and his research that is using ground breaking technology to predict risk for functional impairments and develop assistive technologies.
- The Duke Center of Retinal Degenerations and Ophthalmic Genetic Diseases has quickly become the referral center in the region.
- The new Sports Vision Center that will take athletes to the next level and help patients recover vision from injuries by participating in our vision training program.

- Our basic science led to the first new glaucoma drug to be FDA-approved in over 20 years.
- Our faculty, fellows and residents have been very successful this year with an abundance of honors, awards and grants.

It is with tremendous pride and gratitude that I get the opportunity to lead and collaborate with talented, devoted and individuals that make Duke Ophthalmology great.

Sincerely,

Edward G. Buckley, MD
Vice Dean for Education, School of Medicine
Chair, Department of Ophthalmology
Vice Chancellor for Duke-National University Singapore Affairs
James P. and Joy Gills Professor of Ophthalmology
Professor of Pediatrics
Duke University Medical School

Duke's new Visual Performance Lab is using virtual reality and other high-tech gear to predict risk for functional impairments and develop assistive technologies.

Virtually Predictable

A woman with glaucoma is walking down the street when she suddenly loses her balance, trips, and falls. Well, she doesn't actually fall, since the harness she's wearing keeps her upright and safe. She removes her virtual reality goggles and steps down from the multi-sensor platform, while lab technicians check the abundant data collected along her "virtual walk through town."

Nearby, a gentleman with macular degeneration is driving through city traffic on a simulator, while data is compiled to assess whether it is still safe for him to drive at this stage of his disease.

And across the room, a young boy is engrossed in a video game, unaware that the virtual reality goggles he's wearing are measuring his brain's responses to imperceptible peripheral stimuli and assessing his field of view.

Dr. Medeiros works with patient during a virtual reality driving assessment.


Duke Eye
A. Medeiros, M.D., Ph.D.
Dept. of Ophthalmology

It's all part of the present and future of Duke's new **Visual Performance Laboratory** (DVPL), a high-tech research lab created and led by Felipe Medeiros MD, PhD, who joined Duke in August 2017 as Professor of Ophthalmology, Vice Chair for Technology, and Director of Clinical Research.

Medeiros, a glaucoma specialist, is a pioneer in the development of innovative methods to diagnose glaucoma and detect its progression, and in the use of innovative technologies for assessment and prevention of functional impairment from the disease. The DVPL will use virtual reality and other high-tech applications to investigate how eye disease impacts patients' activities of daily living; develop better methods to predict patients who are at a higher risk for those functional impairments; and create assistive technologies to improve the lives of those with impairment.

"From a patient's standpoint, what really matters is whether their disease is going to affect their everyday lives: their ability to drive, read, or find things, or their risk of falling," Medeiros notes. "If we can predict their individual risk levels, we'll be able to make better decisions about how aggressively to treat them, and how to help them optimize their quality of life as the disease progresses."

In addition to finding new ways to assess functional performance and understand the mechanisms by which eye diseases like glaucoma and macular degeneration prosecute these impairments, Medeiros and the DVPL are linking the new tests with basic techniques for imaging the eye and traditional visual function assessments, as well as subjective assessments via patient questionnaires. These comprehensive datasets will help them build predictive models and testing devices that can be used in clinical practice—or even in the patient's home.

The nGoggle, developed by Dr. Medeiros, is a device being used to detect visual field defects and brain responses.

Applying innovative technologies

To achieve these goals, the DVPL embraces virtual reality, simulators and other devices. For instance, Medeiros and his colleagues have:

- Devised and patented the nGoggle, a device that integrates electroencephalogram (EEG) and eye tracking to virtual reality (VR) goggles. The nGoggle is able to objectively measure brain waves elicited by visual stimuli presented on the VR goggles, enabling for the first time a portable and objective way for assessing visual function in subjects with eye diseases. The device is being used to detect visual field defects in patients with glaucoma, as well as to investigate brain responses as subjects navigate through a series of scenarios that replicate daily life, like searching for an object in a home, "wayfinding" through a cityscape, or driving a car. While the nGoggle is still in development, its portability, affordability, and ability to transmit data wirelessly offers potential for widespread use, like home-based testing.
- Developed an innovative virtual reality paradigm to assess risk of loss of balance and falls in subjects with eye diseases. In this test, subjects use VR goggles while standing on a force platform that measures every little wobble they make in response to visual stimuli designed to perturb their balance, while being secured by a harness system to prevent falls. The postural responses under this environment have been shown to be predictive of risk of falling.
- Applied driving simulation to investigate fitness to drive and develop innovative metrics for predicting driving risk in subjects with eye diseases. Based on the simulator studies, they have crafted simple, tablet-based tests that assess visual function parameters most relevant to driving performance.
- Built new testing algorithms for diagnosing and monitoring eye diseases, using innovative statistical and artificial intelligence frameworks. One of Medeiros' algorithms, which combines

Dr. Medeiros adjusts harness for the fall risk assessment.

data from conventional visual field testing with imaging from optical coherence tomography, has been shown to improve diagnosis, staging and detection of progression in glaucoma compared to conventional metrics. The algorithm is being incorporated into commercially available devices and Medeiros is currently exploring ways to integrate additional data for developing a comprehensive model for assessing risk and monitoring disease progression in subjects with glaucoma.

- Begun to create game-based testing of visual function, a particularly enticing prospect for practitioners who work with young patients. In this paradigm, subjects play a game while their visual fields are being tested in a fun, imperceptible and objective manner.

Building a multidisciplinary team

A generous gift from Durham-based LC Industries has helped bring Medeiros, several members of his lab, and equipment to Duke from his previous post at the University of California, San Diego. (see next page) The gift is also helping Medeiros build a multidisciplinary team needed to do such complex, multifaceted work.

The DVPL already includes ophthalmologists, engineers, computer scientists and programmers, basic vision scientists and more—and Medeiros plans to mine the wealth of expertise at Duke and throughout the region to uncover new opportunities for collaboration, and to expand the DVPL's scope to address even more eye conditions. Although only here for a few months, he has already reached out to colleagues at the Duke Virtual Environment Lab, Pratt School of Engineering, Duke Big Data Initiative, Duke Ophthalmology Biomedical Engineering, and biomedical technology companies and game developers in the Research Triangle to explore potential partnerships.

As Duke Ophthalmology's vice chair for technology, Medeiros is excited to bring opportunities to Duke, like a new partnership with Google Brain to devise methods for diagnosing glaucoma that could be spread worldwide, especially to underserved communities. Medeiros can also envision using artificial intelligence to sift through Duke's extensive electronic medical records database to develop systems that can recommend treatment options for a current patient based on outcomes from previous patients under similar circumstances.

If Medeiros's plans sound highly ambitious, he's got the track record to back it up. Although relatively young, he has published over 300 peer-reviewed articles in the literature, which have been cited over 12,000 times. He has recently been named one of the Top 5 Glaucoma Specialists in the World

by the Annals of Library and Information Studies and Expertscape. Medeiros has received over 40 international honors and awards in ophthalmology, including the World Glaucoma Association Award, American Academy of Ophthalmology Senior Achievement Award and the Moacyr Alvaro Gold Medal (the most prestigious award in ophthalmology in Latin America). He will be the recipient of the ARVO's 2018 Cogan Award, widely regarded as the most prestigious award in ophthalmology for a researcher younger than 45. He is also Chair of the American Glaucoma Society (AGS) Program Committee and is responsible for coordinating the scientific program of the most important annual meeting of the subspecialty.

Felipe Medeiros, MD, PhD

"We are elated to have Felipe Medeiros join Duke Ophthalmology," said Department Chair Edward G. Buckley, MD. "He is one of the global drivers of technology applications worldwide, and to have him here at Duke, will undoubtedly reap great benefits, not only for our Duke Eye Center patients, but for people around the world."

Virtual

For decades, LC Industries has been one of the Duke Eye Center's most generous philanthropic partners. The Durham-based manufacturing, distribution, e-commerce, and retail enterprise, which exists to provide meaningful employment for people who are blind or visually impaired, has played a pivotal role in the Eye Center's growth as a world-class center for patient care and research. Over the years, strategic philanthropic investments by the company and its CEO, William Hudson, have helped start and build programs and create new spaces to serve patients, like the state-of-the-art Hudson Building on the main Duke campus.

This summer, LC Industries made another generous, strategic gift to help Duke recruit clinician-scientist and innovator Felipe Medeiros, MD, PhD, and

Impact

Latest gift from LC Industries helps make the Duke Visual Performance Lab a reality

establish the Duke Visual Performance Laboratory (DVPL). *(see story on page 2)*

"LC Industries' gift has been essential in allowing us to set up a state-of-the-art laboratory that incorporates innovative technology such as virtual reality, and providing funds to support the human capital that will help us pursue our ambitious goals," says DVPL Director Medeiros of the $600,000 gift.

Philanthropy like LC Industries' played a major role in attracting Medeiros to Duke. "It is the power of philanthropy that helps clinician-scientists like me advance cutting-edge research that has direct relevance to patients and the community. This type of early support can catapult subsequent funding by public organizations like the NIH and others, which may only consider projects for funding after initial studies have shown feasibility, clinical relevance, and potential impact. Without philanthropy, many projects that have led to impactful changes in the diagnosis and management of diseases would never have taken off."

Both Hudson and LCI President Jeffrey Hawting serve on the Eye Center's Advisory Board; Hudson is the current board chair.

"Technology is making a significant impact on the lives of people who are blind or have low vision," Hudson says. "The research that Dr. Medeiros is doing in the world of virtual reality is going to take this technology to a whole new level. I can only imagine the positive outcome on the work environment for the hundreds of people who are visually impaired who are employed at LC Industries once they are introduced to this new world. Once again, the Duke University Eye Center has taken the lead in making an impact."

The Duke Sports Vision Center

At the Top of Its Game

A goalie tracks a hockey puck as it flies back and forth across the ice rink, poised and ready to strike. A baseball player focuses on a fast pitch hurtling toward him at over 80 miles per hour and swings his bat at the precise moment needed to hit a home run. A boxer bobs and weaves with catlike reflexes, anticipating her opponent's every move.

The correlation between excellent vision and exceptional athletic ability is undeniable. What most people don't realize, however, is that much like athletic skill, vision, even *perfect* vision, is something that can be trained and enhanced. In fact, this is one of the primary goals of Duke's new Sports Vision Center (DSVC) which is attracting professional, non-professional, and recreational athletes of all ages seeking to gain an edge over the competition from across the country.

The DSVC: A Collaboration with DSSI

Launched the summer of 2017, the DSVC, which is a combined venture between the Duke Eye Center and the Department of Psychiatry and Behavioral Sciences. It is part of the James R. Urbaniak, MD, Sports Sciences Institute (DSSI)—the biggest and most robust sports sciences institute in academic medicine. With top-notch facilities and technology, the backing of the celebrated DSSI, and a world-class team at the helm, the DSVC is unlike any other

sports vision center in the world. It was developed by a dynamic trio:

- **Diane Whitaker, OD,** Chief of Duke Ophthalmology's Vision Rehabilitation & Performance Division and Director of the DSVC program
- **Terry Kim, MD,** Chief of Duke Ophthalmology's Cornea, External Disease, and Refractive Surgery Division, and official eye doctor for the Duke University Men's Basketball Team
- **L. Gregory Appelbaum, PhD,** Director of the Human Performance Optimization Lab at the Duke Institute for Brain Sciences and Assistant Professor in the Department of Psychiatry and Behavioral Sciences in the Duke University School of Medicine

They are joined by **Omar Mohiuddin, MS, OTR/L, MPH,** an Occupational Therapist specializing in visual rehabilitation and sports medicine, and plan to add an Athletic Trainer to the team in the near future.

The DSVC serves the following individuals:

1. Patients who sustained a brain injury, such as a concussion and want to return to their baseline vision
2. Patients seeking vision correction
3. Patients seeking to *enhance* dynamic visual ability and sports performance through vision training

Patients in the first two categories have been an important part of the patient demographic at the Duke Eye Center since its conception, and will continue to be a primary focus of the center. The DSVC will participate in various community vision screenings as a way to better serve this population.

The third category of patient, on the other hand, represents a new frontier. "We're very excited to be part of the first multidisciplinary sports institute in the nation that will incorporate the latest technologies and research to help optimize the visual and athletic performance of our patients," says Kim.

Vision Training at Duke

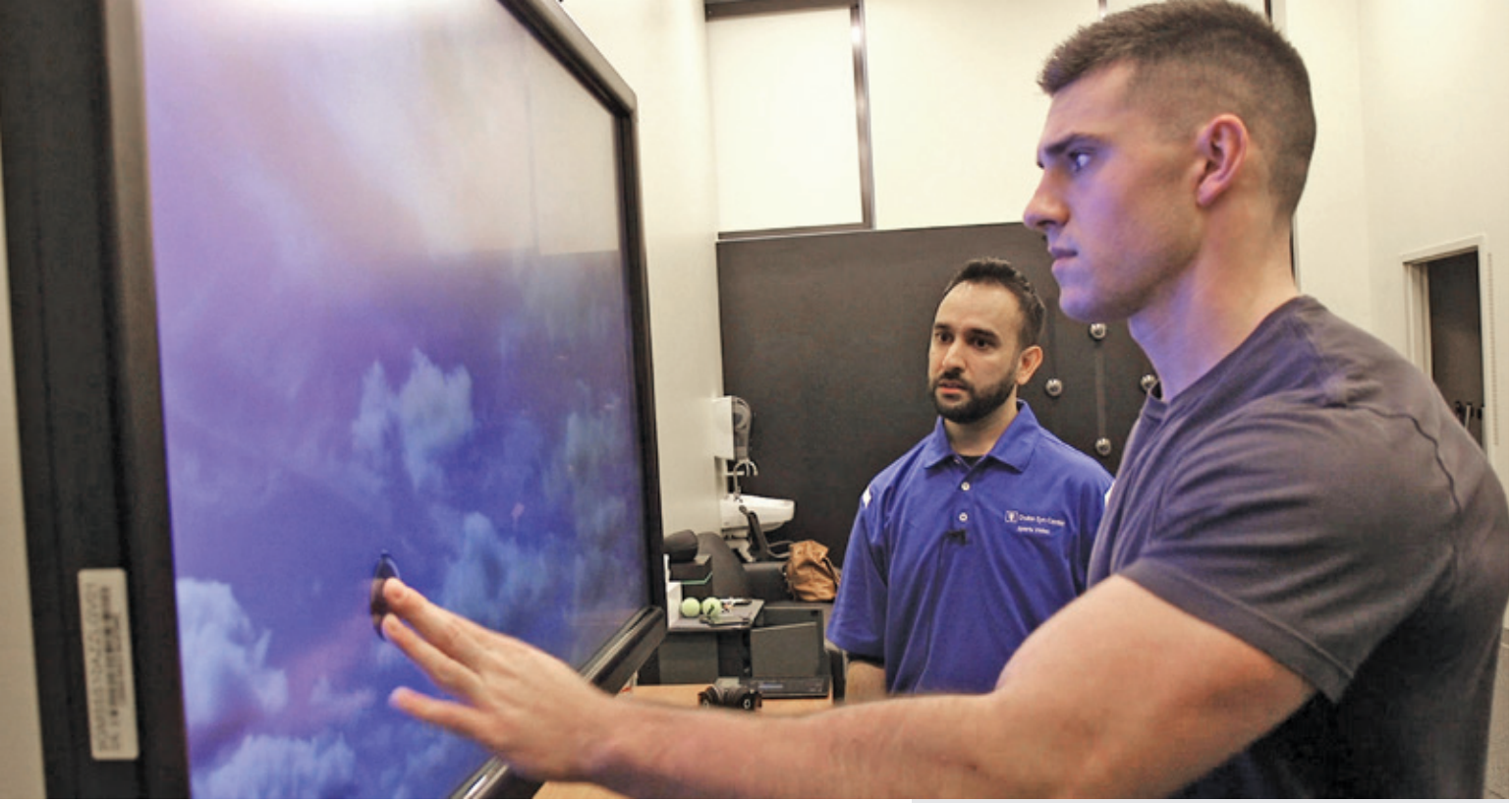
Vision training uses perceptual learning techniques to enhance visual skills by improving the brain's ability to process what is seen. The DSVC offers vision training for athletes of any age and every sport. Patients may be referred by a medical specialist or self-referred.

Upon arrival, patients are taken to the Vision Rehabilitation & Performance Center in the Duke Eye

Greg Appelbaum, PhD; Susan Hilbig; Terry Kim, MD; Omar Mohiuddin, MS, OTR/L, MPH; Diane Whitaker, OD and Latoya Lunsford (L to R).

Center to discuss their training goals, strengths, and weaknesses. Next, they undergo a comprehensive visual performance evaluation that includes both ocular and sensory motor assessments. The team then works together to design a personalized training protocol.

During training sessions, which take place in the Wallace Center on the Center for Living Campus, team members use a variety of tools such as digital and naturalistic instruments, virtual reality, Cognitive-Enhancement Training, and NeuroPriming to work on a variety of skills such as reaction time, visual perception span, multiple object tracking, visual clarity, and contrast sensitivity. Every technology featured in the center is completely customizable and can be easily transported to another location such as a playing field or gym if necessary.



Research Goals

At the completion of training, the patient undergoes an in-depth post evaluation eye exam. Researchers at the center are studying the outcomes of their interventions to see whether they can be validated by the standards of evidence-based medicine. "We already know that people can follow these protocols and get better at doing certain activities within a training device," Whitaker explains. "Anecdotally, people come back and report improvements in performance, but no one has done a study on the direct translation from device-based training to actual on-field or -court performance."

The technology used in the DSVC can also be useful in diagnosing conditions and diseases such as Autism, Parkinson's Disease, and Glaucoma. Consequently, advances made at the DSVC may have much broader implications. At this point it is too early to say what the future of the center holds, but one thing is certain: like its patients, the DSVC will continue to be at the top of its game.

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Sports Vision Research

Burris, K., Vittetoe, K., Ramger, B., Suresh, S., Tokdar, S.T., Reiter, J.P. & Appelbaum, L.G. (2018) Sensorimotor Abilities Predict on-field Performance in Professional Baseball. *Nature Scientific Reports*.

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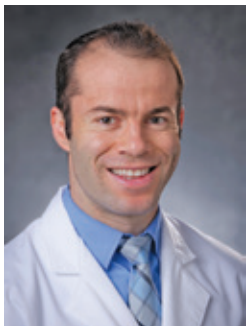
First Use of Cadaver Nerves
to **Repair Corneal Anesthesia** Shows Promise

A NEW, MINIMALLY INVASIVE PROCEDURE that replaces damaged corneal nerves using donor nerves harvested from cadavers restores feeling in the cornea and halts progressive eye damage caused by corneal anesthesia. The use of the cadaver donor nerve, an advance pioneered at Duke Ophthalmology, may help patients recover faster after surgery and could impact how other chronic eye conditions are treated.

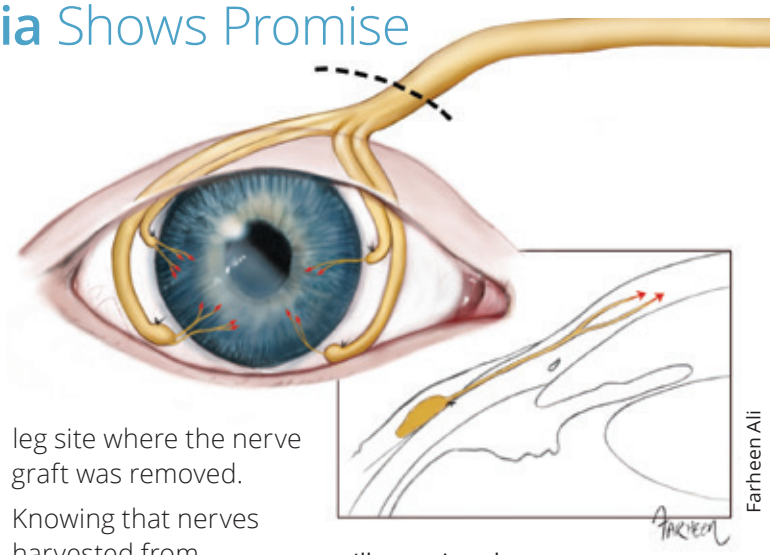
Corneal anesthesia (aka neurotrophic keratopathy) is a potentially devastating condition that can arise from certain viral infections of the eye, brain tumors or surgery, diabetes, contact lens abuse, and other causes. It occurs when the nerves to the cornea are damaged, leaving the eye unable to feel sensation when injured.

"Without the ability to sense pain, the eye cannot protect itself from, or heal properly after, scratches and injuries," says Ilya Leyngold, MD, a plastic and reconstructive eye surgeon at Duke. This can lead to severe infection and vision loss.



Ilya Leyngold, MD

Until recently, treatments for corneal anesthesia focused on protecting the eye from further damage, but didn't cure the lack of sensation itself. In the past few years, however, clinician-scientists have introduced corneal neurotization, a procedure in which healthy sensory nerves are transferred to the cornea. The originally described procedure was not ideal as it required a large surgical cut from ear to ear to transfer the nerves running from underneath the brow and the forehead to the eye. In the latest iteration of the surgery—performed by only a handful of surgeons across the world, including Leyngold—much smaller incisions are used to graft a segment of nerve from a patient's leg. Although significantly less invasive than the original technique, this approach carries an additional risk of complications at the leg site where the nerve graft was removed.



Farheen Ali

Illustration demonstrates the technique of corneal neurotization through this minimally invasive approach to relieve patients' corneal anesthesia.

Knowing that nerves harvested from cadavers have been used extensively to regenerate damaged nerves elsewhere in the body, Leyngold thought they could be a good option for treating corneal anesthesia as well. Using a deceased-donor nerve graft would be far less invasive (no need to cut into the patient's leg or across their scalp), which would minimize the risk of complications and decrease recovery.

In March of 2017, Leyngold performed the first corneal neurotization using a deceased-donor nerve graft on a patient with severe corneal anesthesia. Three months later, the patient's corneal sensitivity had improved dramatically. Subsequent surgeries on several other patients have also proven successful. A clinical trial is about to get underway.

Ideally, Leyngold says, this novel approach will allow people with corneal anesthesia to be treated earlier—hopefully as soon as the condition is diagnosed. This could halt its progression before serious eye damage occurs.

"Because the use of the cadaver donor nerve involves less surgery, less downtime, and potentially fewer complications, it's my hope that we can increase the number of patients we can help, and someday offer this procedure to people who have only partial loss of corneal sensation such as seen in other chronic eye conditions, including certain types of dry eye."

A **Bright** Future

Duke's **Ophthalmic Medical Technician** Program

AS THE POPULATION CONTINUES TO AGE AND MEDICAL TECHNOLOGY BECOMES MORE ADVANCED, THE DEMAND FOR SKILLED HEALTHCARE PROFESSIONALS CONTINUES TO RISE. Specifically, allied health professions for individuals who have completed four or less years of training are growing at an astonishing rate. Allied Ophthalmic Personnel (AOP) represent a highly-valued, yet often overlooked career in allied health. In addition to a high employment rate, these adept certified ophthalmic technicians report high job satisfaction and offer a unique skill set in a rapidly changing field, making them an integral part of the eye care team in both hospitals and private practices.

The Duke School of Medicine's Ophthalmic Medical Technician Certificate Program is the only certified technician (COT) level program in the state of North Carolina, and one of only thirty accredited AOP programs in the country.

The program is both accessible and affordable. Students come to the program from all walks of life, various former careers, and with education credentials ranging from high-school diplomas to graduate degrees. They are a diverse group of individuals, each with a unique story of how they were inspired to come to our program. All students are excited by the prospect of launching a new career in eye care without a lengthy and expensive course of study. Although technician level programs usually require two years to complete, Duke Ophthalmic Medical Technician students can obtain their certificate after only one-year of study. The Duke program is one of only two, one-year technician programs in the country. The accelerated structure of the program helps to keep tuition affordable. Financial aid for eligible students is available through the Duke School of Medicine, and our veterans may use their military education benefits to cover the cost of the program.

Now in its thirty-first year, the program has a proven history of success and attracts trainees from across the country. In the past five years, graduates boast a 93 percent pass rate for the national certified ophthalmic technician multiple-choice exam. Also, 95 percent of students have obtained a full-time position within one month of graduation with many securing a good position prior to graduation. Many of our graduates have quickly advanced to important leadership positions in the clinic.

The program, which was formerly located in the Duke South Clinic Building, recently celebrated the completion of its first year in its new location; the highly-acclaimed Hudson Building, that opened in 2015. As the newest addition to the Duke Eye

The new learning facility for Duke's Ophthalmic Medical Technical program with a state-of-the-art classroom and 2 high-quality eye lanes for practice.

Fulfilling my Dream of Helping People

I feel like I was destined to work as an ophthalmic medical technician. During college, I was interested in working in the medical field where I could help others, but a job in the technology sector led me down a different path. However, the desire to help others remained. Many years after college I was laid off and wanted to update my skills.

During my career transition, I was caring for my aging father and I took him to an appointment at Duke Eye Center. I was intrigued by the technician working with my father and asked if her job required special training or a degree and then she told me about the Duke Ophthalmic Technician program.

Instead of staying in technology, I decided to try something completely new by applying to the Duke University Ophthalmic Medical Technician program.

The Duke program appealed to me for several reasons; it is only one year, it is reasonably priced, it would allow me to get into an interesting medical field, and it would fulfill my goal of helping other people.

Certified Ophthalmic Technicians (COTs) have many opportunities for career advancement in the expanding field of Allied Ophthalmic Personnel. After graduating I was hired by Duke Eye Center, Cary and I now work in the same clinic where I brought my father for his eye care. I was able to advance quickly, learning many new and interesting skills. A few years after I started my new career, I was offered the position as Joint Commission Liaison for the office. About a year later, I was offered the position of clinical operations manager.

I am a testament to the abundant benefits for those who choose to invest in themselves by becoming a COT after completing the Duke Ophthalmic Technician program. This program changed my life and I am happier in my career now, more than ever.

Michael LeCher, COT
Duke Eye Center, Cary Clinical Operations Manger
Class of 2013

Now in its thirty-first year, Duke's Ophthalmic Medical Technician Program has a proven history of success and attracts trainees from across the country.

Deborah K. Smith, BS, COMT
Program Director

Center campus, every aspect of this facility is state-of-the-art from the architecture, to the exam rooms, to the technology and equipment. That, combined with mentorship and daily interaction with the Duke Eye Center's world-renowned faculty and staff, provides these trainees with a rich learning environment unlike anywhere else.

The larger space afforded by the move to the Hudson Building will enable the School of Medicine program to accept a greater number of students in the future. Program size is expected to increase from an average of ten students per year to around eighteen. "This will allow us to better address the national need for highly-trained Certified Ophthalmic Technicians while maintaining the intimate learning environment and spirit of camaraderie that our students enjoy," says Program Director Deborah Smith, BS, COMT.

Not only is the space larger, it offers a more up-to-date classroom setting and two high-quality vision lanes. "In the past, students took turns practicing in our one vision lane," says Smith. "Now that we have a second lane, students completing their initial basic skills training, are better prepared for their clinical rotations, because they have had more hands-on experience to develop their skills.," she explains. "With the rich resources and supportive, engaged faculty and staff at the Duke Eye Center, I can say without hesitation that if you are looking for a career as a Certified Ophthalmic Technician, there is no better place to complete your training than Duke." The future of the program has literally never looked so bright.

From Bench to Bedside

Duke Eye Center's Basic Science Research Led to Development of the **First New Glaucoma Drug** to be FDA-Approved in 20 Years

The U.S. Food and Drug Administration (FDA) has approved a new drug for the treatment of glaucoma that was developed based on basic research conducted at Duke Ophthalmology.

In December 2017, the FDA approved Rhopressa® (netarsudil ophthalmic solution 0.02%) for the reduction of elevated eye pressure in patients with glaucoma. Rhopressa is the first new glaucoma drug class to be FDA-approved in 20 years, and the first to target and inhibit Rho kinase as a way to lower intraocular pressure.

The journey from discovery to drug development is a prime example of the bench-to-bedside translational research and teamwork taking place daily at Duke Ophthalmology.

Identifying a Novel Therapeutic Target

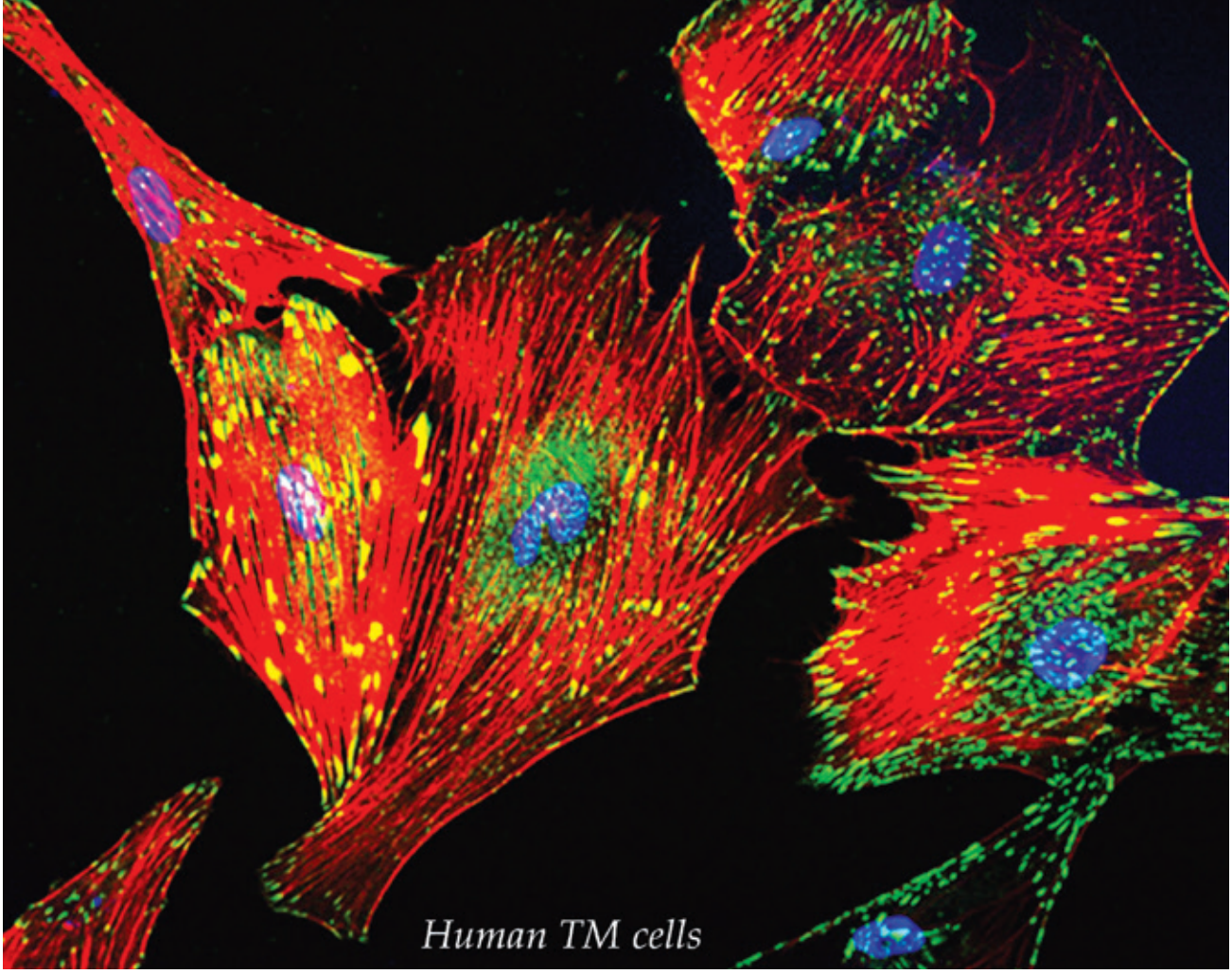
Glaucoma is a leading cause of irreversible blindness worldwide. In the U.S. alone, more than 2.5 million people suffer from glaucoma, and the impact here and abroad is expected to be increased significantly over the next decade.

Unfortunately, until now, glaucoma therapies aimed at lowering intraocular pressure (IOP) to delay progression of optic neuropathy and vision loss have not worked well in many patients—due, in part, to lack of a thorough understanding of the molecular and cellular mechanisms involved. Aqueous humor (AH), the clear fluid in the front portion of the eye, plays a crucial role in not only supplying nutrients to the lens, cornea and other avascular tissues but also in maintaining IOP, which is required for normal function of the eye. Decreased AH drainage/outflow resulting in the elevation of IOP is recognized to increase risk for primary-open angle glaucoma (POAG), a prevalent type of glaucoma. The most common glaucoma drugs have not specifically targeted the trabecular meshwork, the tissue that drains the AH and whose functional impairment underlies increased IOP.

Over the last 20 years, basic and preclinical research conducted at Duke Eye Center in the laboratory of Vasantha Rao, PhD, Professor of Ophthalmology, and pharmacology and Cancer Biology in collaboration with the late David Epstein, MD, former chair of the Department of Ophthalmology and a world-renowned glaucoma expert, has focused on elucidating the molecular mechanisms regulating trabecular meshwork contractile activity, cell shape, and cell adhesive interactions. The Rao laboratory identified and characterized Rho kinase, the key downstream signaling target of Rho GTPase, as a promising and novel therapeutic target for lowering IOP in glaucoma patients, and demonstrated that inhibition of Rho kinase increases AH outflow through the trabecular meshwork. These studies have been funded by the NIH and Research to Prevent Blindness.

Rao's group not only identified Rho kinase as a therapeutic target, but also demonstrated the significance of dysregulation of this kinase signaling pathway in the pathobiology of ocular hypertension. Prior to joining Duke, Rao's work at the National Eye Institute demonstrated a role for Rho GTPase function in ocular lens development and

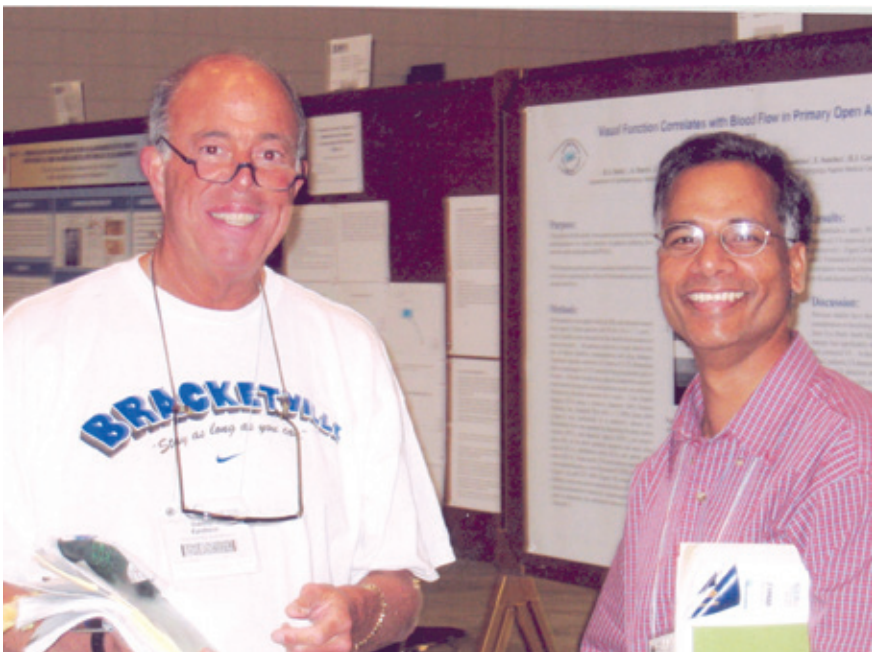
Prior to joining Duke, Rao's work at the National Eye Institute demonstrated a role for Rho GTPase function in ocular lens development and architecture. These earlier studies helped Rao hypothesize that inhibition of Rho kinase might lower IOP in glaucoma patients.



architecture. These earlier studies helped Rao hypothesize that inhibition of Rho kinase might lower IOP in glaucoma patients.

From the Laboratory to the Patient

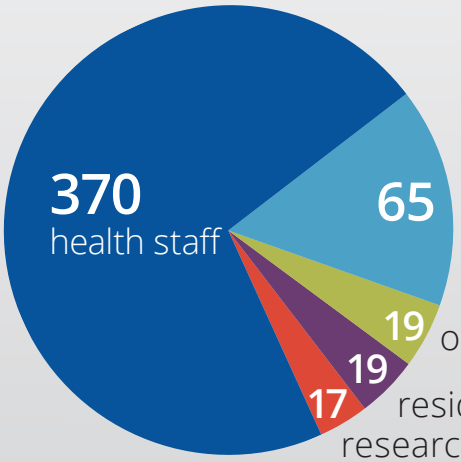
While work on Rho kinase was progressing at Duke, Epstein, in collaboration with former Duke Professor of Chemistry Eric Toon, PhD, and pharmaceutical industry veteran Casey Kopczynski, PhD, formed the company Aerie Pharmaceuticals. Using the protocol developed by Rao and Epstein for screening Rho kinase inhibitors, Aerie scientists discovered the active ingredient in Rhopressa® (netarsudil), which in preclinical and clinical studies was found to lower IOP primarily by increasing AH outflow through the trabecular meshwork. The new drug performed well in human clinical trials, and late last year, the FDA officially approved Rhopressa® for the reduction of elevated intraocular pressure in patients with open-angle glaucoma or ocular hypertension. The ophthalmic solution will be available in spring 2018.



The late David Epstein, MD, former chair of the Department of Ophthalmology with Vasantha Rao, PhD, Professor of Ophthalmology

Duke Eye Center
2017 Stats

Employees



16

10 Duke Eye Center Locations

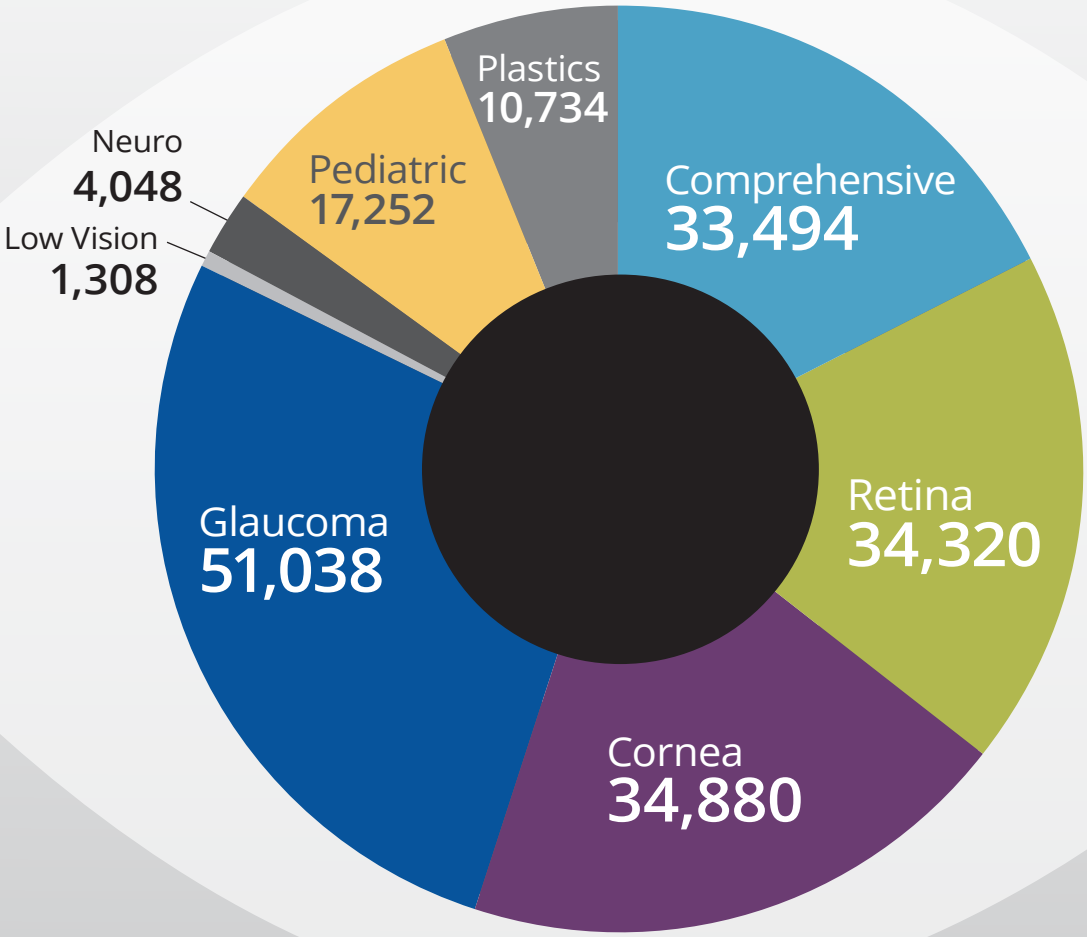
Main Duke Eye Center
Duke Medical Center Campus
Page Road
South Durham
North Durham
Cary
Raleigh
Winston-Salem
Aesthetic Center
Danville, Virginia (Retina)
Fayetteville (Retina)

Ranking

6

BEST HOSPITALS U.S.News & World Report NATIONAL OPHTHALMOLOGY 2017-18

US News & World Report
Best Hospitals in
Ophthalmology



Patients

Total: 187,074

Surgeries

14,071

Total Grants

44

awarded in 2017

Award Funding

$9,946,354
Non-Federal

$8,092,799
Federal

Total: $18,039,153

Government Officials Direct Fundraising to Eye Program for Kids

Gift honors North Carolina girl who battles degenerative retinal disease with courage and optimism

Every year, the International Association of Government Officials (iGO) selects a different organization as the focus of its annual fundraising campaign. This year, iGO decided to support a program that has meant so much to one of their own.

iGO officer Wayne Rash, register of deeds for Caldwell County, North Carolina, is very familiar with the Duke Pediatric Retina and Optic Nerve Center (DPROC), one of the top pediatric retinal centers in the country. His daughter Caroline was referred to Duke two years ago when, at age ten, her vision began to blur. After a battery of tests, Caroline was diagnosed with Stargardt disease, a progressive form of macular dystrophy that affects children.

"Although there currently is no cure, Caroline's ophthalmologist at Duke, Dr. [Lejla] Vajzovic, has given us hope about the research that's being done, particularly in gene therapy," Rash says.

"As a parent, it's awfully hard to be told that there's nothing that can be done to fix your child's vision. Down the road we fully expect there will be something that can help correct this, hopefully before it progresses to the point that it becomes debilitating for her."

Rash's professional colleagues agree, and earlier this year, he was surprised and humbled to learn that iGO's executive board had decided to designate this year's fundraising campaign to support research at the Duke Eye Center in Caroline's honor.

Wayne and Caroline Rash proudly show off the "iGO for Caroline" bracelets that were part of the fundraising campaign for Duke Eye Center.

"I was so touched that they wanted to do that for our family, and it just blew me away how much money they raised," Rash says appreciatively. "Caroline came to the summer iGO conference, and they had made 'iGO for Caroline' bracelets. She felt very honored. She still keeps the ceremonial check from that day, because it meant the world to her that people would want to raise money to find a cure for what she's going through."

Linda von Nessi, iGO's president at the time, recalls a quote from the movie *Mulan:* "The flower that blooms in adversity is the most rare and beautiful of all."

"Caroline is *our* flower," von Nessi says. "It is with great pride that iGO raised $17,000 for the DPROC Research Fund in her honor. Raising funds for Caroline and all children with juvenile macular dystrophy is a proud moment for us."

Those who've had the good fortune to meet Caroline, now 12, say she is a remarkable young woman who keeps a positive attitude and takes challenges in stride. Although her vision remains blurred, she is able to navigate school with the help of technology and aides. At this point, there's no way to predict the pace that her retinas will deteriorate.

"Caroline has been an inspiration in how well she deals with this," her proud dad says. "If they can find a cure, it would sure make things easier for her, so we're hoping for that day."

Vajzovic knows what a difference this gift will make. "A heartfelt thank you to the Rash family and iGO for their generous donation to help conduct leading-edge research in pediatric retinal development and find treatments for pediatric retinal diseases.

"Our team at DPROC aspires to provide exceptional, individualized clinical care to young patients and their families," the vitreoretinal specialist notes. "In addition, we contribute to leading vision research and education. With this support, our pediatric care, research, and education will extend far beyond the clinic and will help shape the field of pediatric retina."

Leadership Gift Helps Launch Ocular Immunology Center

A multimillion-dollar gift from Dr. C. Stephen and Frances Foster is helping the Duke Eye Center open an Ocular Immunology Center and recruit a highly regarded clinician-scientist as its director.

The Fosters have been generous contributors to the Duke Eye Center for many years. Previously, they established a professorship that enabled Duke Ophthalmology to recruit Victor L. Perez, MD. Perez, who joined the faculty in September 2017, specializes in cornea and uveitis, with a specialty in ocular immunology.

The Frances and Stephen Foster Center for Ocular Immunology will offer evaluation, diagnosis, and treatment for patients with uveitis and other inflammatory eye diseases, and conduct research that uncovers new understanding of the basic mechanisms of inflammation in and around the eye and translates this knowledge into effective treatments.

The center, which will be located on the Eye Center's main campus in Durham, will publicly launch later this year. A second leadership gift from the Fosters will underwrite the center and an annual lectureship in ocular immunology and ocular inflammatory diseases.

Stephen Foster, MD, a two-time Duke graduate (T'65, MD'69), is founder and president of the Massachusetts Eye Research and Surgery Institution (MERSI) and its Ocular Immunology & Uveitis Foundation. He is a world leader in the field of ocular immunology. Frances Foster, a nurse practitioner and manager at MERSI, helps propel the couple's mission to increase education and awareness of uveitis and other inflammatory eye diseases.

Victor L. Perez, MD

Perez had the good fortune to train under Foster, and is very grateful for his mentor's generosity. "I really thank Stephen and Frances for supporting the program, which is going to make a big difference in the care of our patients and in our ability to discover new avenues for treatment of uveitis and other diseases of the eye that have an inflammatory component."

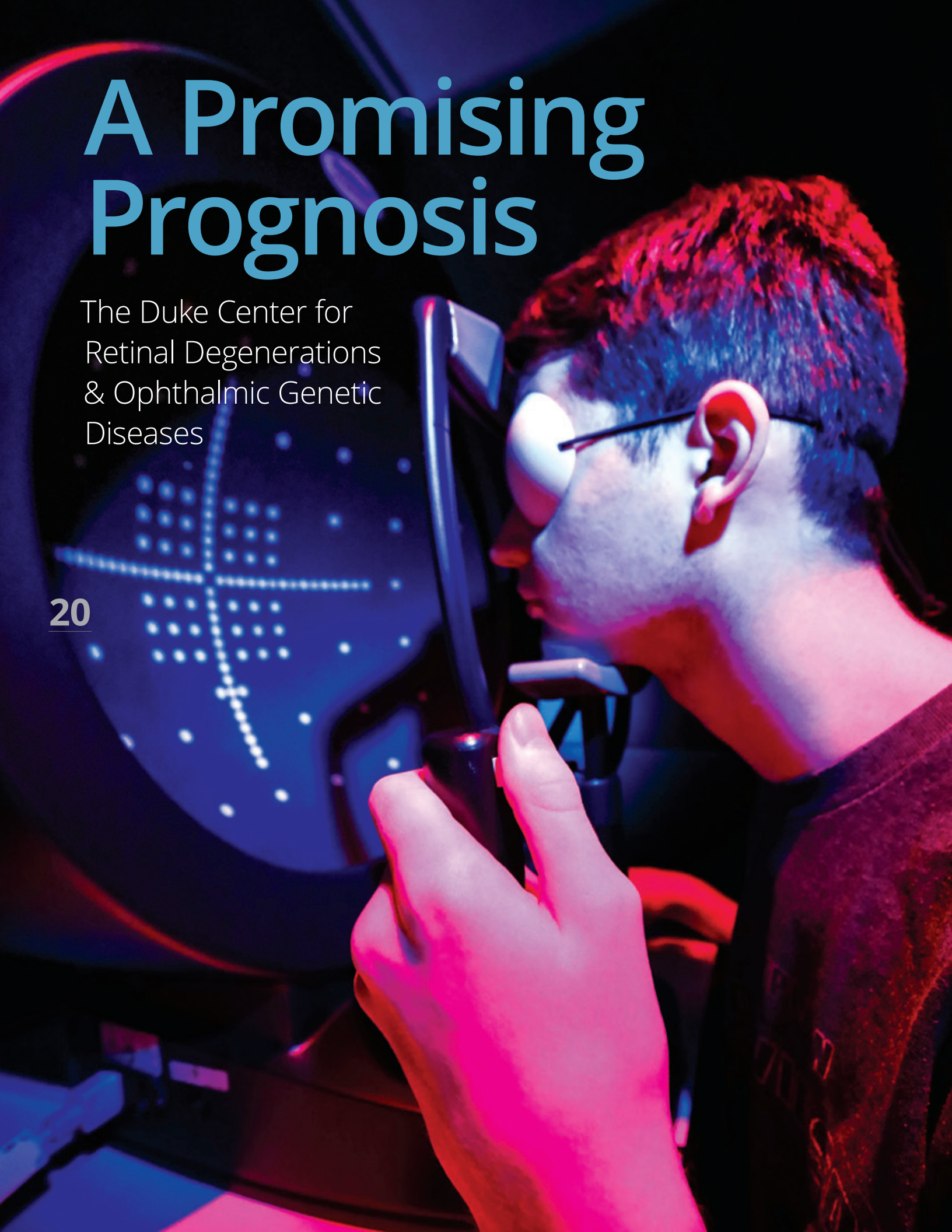
Frances Foster and C. Stephen Foster, MD

"The name 'Foster' is synonymous with leadership in the field of ocular immunology," notes Duke Ophthalmology Chair Edward G. Buckley, MD. "So the fact that the Fosters have chosen to invest in Duke's capacity to impact this field means a tremendous amount to us. In making this generous gift, Stephen and Frances are creating a legacy that will improve the lives of patients here and elsewhere for years to come."

Philanthropic support is integral to advancing the work of Duke Eye Center. For information on giving, please contact Jillian Ream at 919-385-3197 or eyegiving@duke.edu.

A Promising Prognosis

The Duke Center for Retinal Degenerations & Ophthalmic Genetic Diseases



FOR PATIENTS WITH INCURABLE RETINAL DEGENERATIVE DISEASES, THE DUKE CENTER FOR RETINAL DEGENERATIONS & OPHTHALMIC GENETIC DISEASES IS A BEACON OF HOPE. The Center is at the forefront of a number of innovative treatments and is conducting groundbreaking research focused on gene therapy and other neuroprotective strategies with the potential to transform lives.

The goal of the Center is to improve diagnosis, provide optimal treatment, and find cures for retinal degenerative diseases that are both genetic and non-genetic in nature. There are fewer than 20 centers of its kind in the United States and it is the only center between Baltimore and Miami.

The Center brings together the expertise of both medical and surgical specialists, genetic counselors, researchers, and imaging specialists. "We stress the importance of a multidisciplinary approach, frequently working in conjunction with other specialists across Duke," says Director Alessandro Iannaccone, MD, MS, FARVO. "There are a number of factors that come into play when managing these patients. It is often more than just a retina problem. It's a complex body wide situation that needs to be dealt with," he explains.

Duke Center for Retinal Degenerations & Ophthalmic Genetic Diseases' state-of-the-art Visual Function Diagnostic lab has allowed for faster and more accurate diagnosis and prognosis for these rare diseases than ever before. The team uses electrophysiological and psychophysical methods as well as retinal imaging. Once diagnosed, patients are systematically categorized and genotyped.

Treatment for these incurable diseases often focuses on mitigating their devastating effects. For example, Iannaccone often recommends dietary changes as a way to preserve the retina. Other times, the focus is on treating related complications such as cystoid macular edema, inflammatory changes, and even neovascular events. Patients receive specialized genetic counseling and optometric visual rehabilitation whenever necessary.

The Center brings together the expertise of both medical and surgical specialists, genetic counselors, researchers, and imaging specialists.

"Our goal is to provide the best possible standard of care using what is available today while actively working toward developing the innovative treatments of tomorrow," explains Iannaccone.

Gene therapy is one highly promising new treatment method that the Center plans to provide to its patients in the near future. The team is currently investigating the ideal method of injecting the corrective genetic material into the retina so that it can more efficiently penetrate the inner limiting membrane. Iannaccone is serving as Site Principal Investigator in a number of multicenter studies and clinical trials focusing on gene therapy for a variety of conditions. Examples include X-linked retinoschisis, Usher syndrome, X-linked retinitis pigmentosa, choroideremia, achromatopsia and blue cone monochromacy. Ongoing research at the Center focuses also on developing new treatment methods that hold promise to benefit affected patients across the board. "While gene therapy is exciting, very elegant, and on paper ideal, there are more than 300 genes responsible for retinal degenerations and related ophthalmic genetic diseases. It will take a long time to develop gene therapy for *each* condition. Thus, parallel efforts focused on developing new treatments that can help most if not all patients remain essential".

In the future, the Center hopes to more easily identify patients who qualify for participation in these, and other cutting-edge clinical trials, thanks to a new regional registry. In addition to developing a registry, Iannaccone plans to work in close conjunction with The Duke Biobank to build awareness and increase the number of ocular specimens available for use. The registry and biobank will serve as an invaluable resource for the Center by providing important data to help better understand these diseases.

Established less than two years ago, the Duke Center for Retinal Degenerations and Ophthalmic Genetic Diseases has become the regional leader in treatment of these rare retinal disorders. The Center aims to continue to expand its sphere of influence to become the finest of its kind in the country. Thanks to the ongoing efforts of this unique new facility, the future for these patients has never been so clear.

Duke Ophthalmic Oncology Center

expands **multidisciplinary services**

To meet growing demand, Duke Eye Center now offers a vast, full-service Ophthalmic Oncology Center that provides a comprehensive approach to diagnosis and treatment for tumors in and around the eye.

THE DUKE OPHTHALMIC ONCOLOGY CENTER PROVIDES THE LATEST CARE AND TREATMENT FOR PRIMARY OCULAR TUMORS and collaborates with the world-renowned Duke Cancer Institute to address ophthalmic issues related to systemic cancers and their treatments. Duke has one of the few dedicated multidisciplinary patient care and research centers for ophthalmic oncology on the East Coast, and is the major referral center for North Carolina and the surrounding region.

"Our dedicated care team includes top specialists in radiation oncology, medical oncology, pediatric oncology, neurosurgery, neuro-oncology, and pathology," says Miguel Materin, MD, who leads the center as Director of Ophthalmic Oncology. "We are also working closely with Duke's new Center for Ocular Immunology, which creates exciting new possibilities for innovative research and treatment."

Materin joined Duke in 2016 to fulfill the Department of Ophthalmology's vision to build a premier, extensive ocular oncology program. He previously held positions at Wills Eye Hospital and Smilow Cancer Hospital at Yale-New Haven. While at Yale, he was responsible for building their robust ocular oncology program. Materin is a member of the Duke Cancer Institute (DCI) as well as DCI's Solid Tumor Therapeutics Program and the Cancer Genetics and Genomics Program.

As part of the Ophthalmic Oncology Center expansion, Kristen Johnston, PA-C joined Materin's team in January 2018 from MD Anderson Cancer Center, to assist in directing patient care with both benign and malignant tumors of the eye.

As a result of the center's move to full-time status, patients experience reduced wait times for services requiring expedited care, Materin notes. The accomplished team has extensive experience diagnosing and treating patients with tumors and conditions like retinoblastoma, uveal melanoma, ocular lymphoma, choroidal hemangiomas, ocular metastases, retinal astrocytic tumors and ocular tumors related to phacomatoses. Where appropriate, the center can also enroll patients in multi-center clinical trials, which will expand and advance treatments for their conditions. The program will also have its inaugural fellow in July for the newly-formed ocular oncology fellowship.

"In recent years, Duke has seen an increased demand for specialty treatment of ocular tumors and eye-related effects of systemic tumors and treatments," Duke Department of Ophthalmology Chair Edward Buckley, MD, notes. "We are thrilled to have Miguel Materin, an internationally respected specialist in this field, here to build a program where referring providers and patients can count on the most current and effective treatments in this growing field."

For questions or to refer a patient, please call Crystal Solomon, ocular oncology program coordinator at (919) 684-8434 or email crystal.solomon@duke.edu.

Meet the Duke **Ophthalmic Oncology Team**

Ophthalmology

Miguel A. Materin, MD
Director
Intra and ocular surface tumors

Edward G. Buckley, MD
Neuro-ophthalmology
Pediatrics

M. Tariq Bhatti, MD
Neuro-ophthalmology

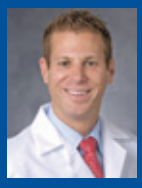
Gargi Vora, MD
Ocular surface tumors

Ilya Leyngold, MD
Orbit and eyelids

Julie Woodward, MD
Orbit and eyelids

Victor Perez, MD
Ocular immunology

Kristen Johnston, PA-C
Ophthalmic oncology
Physician Assistant



Jason Liss, MD
Orbit and eyelids

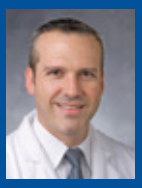
Cathy DiBernardo, CDOS
Ophthalmic Ultrasonographer

Oncology

April Salama, MD
Medical oncology

Susan Kreissman, MD
Pediatric oncology

David Kirsch, MD
Radiation oncology



Brent Hanks, MD, PhD
Medical oncology

Pathology

Alan Proia, MD, PhD
Pathologist

Thomas Cummings, MD
Pathologist

Neurosurgery

L. Fernando Gonzalez, MD
Neurosurgery

Crystal Solomon
Ophthalmic Oncology Center
Program Coordinator

Honors and Awards

Mohsin Ali, MD received the VitreoRetinal Surgery Foundation (VRSF) Research Award for his proposal "The role of alpha melanocyte stimulating hormone in Alzheimer's and Ocular Disease." Second year VR surgery fellow **Avni Finn, MD** assisted with ocular disease portion of this project. Dr. Ali also received the Heed Award.

Sanjay Asrani, MD delivered the Schonberg Memorial Lecture at the University of Illinois at Chicago.

Berry

Walter

Duncan Berry, MD; Xi Chen, MD PhD; Scott Walter, MD and **Sharon Fekrat, MD** received the Rhett Buckler Trophy from the American Society of Retina Specialists (ASRS) annual meeting in Boston at ASRS' 19th Annual Film Festival, an international competition, for their surgical video Frag Bag: A Novel Technique for Removal of Retained Lens Material.

M. Tariq Bhatti, MD received an American Academy of Ophthalmology Secretariat Award for Clinical Education.

Catherine Bowes-Rickman, PhD received an RPB/IRRF Catalyst Award for Innovative Research Approaches for Age-Related Macular Degeneration.

Heidi Campbell, COT, Clinical Operations Director, **Adrienne Lloyd,** MHA Chief Administrator and **Amanda Mestler, COT** received the Blue Ribbon Award for "Effective Clinic Flow in a Multi-Specialty Clinic" at the Duke University Health System 2017 Patient Safety and Quality Conference. Campbell also received the Karcher Award for her poster "Ambulatory Fall Prevention Program."

Xi Chen, MD PhD received the Research to Prevent Blindness Career Development Award. She was inducted to Duke School of Medicine Chapter of AOA Medical Honor Society.

#ILookLike A Surgeon: Vitreoretinal Surgeons Avni Finn, MD, MBA; Cynthia A. Toth, MD; Xi Chen, MD, PhD; Lejla Vazjovic, MD; Wenlan (Wendy) Zhang, MD; Sharon Fekrat, MD.

Mays El-Dairi, MD received the American Academy of Ophthalmology Achievement Award; was promoted to Associate Professor of Ophthalmology.

Melissa Daluvoy, MD was named co-director of NC Opening Eyes—a screening program for the Special Olympics organization.

Sharon Fekrat, MD was invited to be part of the American Society of Retina Specialists' Fellowship Directors' Standards Committee for 2017-2018. She is the Director of the Vitreoretinal Surgery Fellowship at Duke, one of the top fellowships in the country. She was promoted to Professor of Ophthalmology.

DUKE EYE CENTER **2018 CONTINUING MEDICAL EDUCATION**

CME EVENTS

Controversies in Cornea & Cataract Surgery

February 10, 2018

Fellows Advanced Vitreous Surgery Course (fAVS)

April 13-14, 2018

Trainee Day Scientific Session and Grand Rounds

June 15-16, 2018

Duke Glaucoma Fellows Course

October 26, 2018

Duke Glaucoma Symposium

October 27, 2018

Grand Rounds

February, 8, 2018
March 15, 2018
April 12, 2018
May 10, 2018
September 10, 2018
October 18, 2018

Now streamed LIVE! Visit the website for details.

CE EVENTS

Duke Community Education Series for Optometrists

February, 26, May 14, August 20, November 12

Vision Quest for Ophthalmic Medical Technicians

March 3, 2018

LECTURES

Science Visiting Professor Lecture

February 22, 2018

Lawrence Tychsen, MD

John F. Hardesty, MD, Distinguished Professor of Ophthalmology and Visual Sciences

Washington University Physicians

Washington University School of Medicine in St. Louis

Joseph M. Bryan Research Lecture

March 5, 2018

Shigeru Kinoshita, MD, PhD

Professor and Chair, Department of Ophthalmology

Kyoto Prefectural University of Medicine

Kyoto, Japan

Science Visiting Professor Lecture

March 29, 2018

Jeffrey L. Goldberg, MD, PhD

Professor and Chair of Ophthalmology

Byers Eye Institute

Stanford University

Distinguished Stephen & Frances Foster Lecture

Fall 2018

Reza Dana, MD, MPH, MSc

Claes H. Dohlman Professor of Ophthalmology

Vice Chair for Academic Programs

Director, Harvard-Vision Clinical Scientist Development Program

Co-Director, Cornea Center of Excellence

Massachusetts Eye and Ear

Chairman Science of Disease Lecture

October 23, 2018

Casey Kopczynski, PhD

Chief Scientific Officer

Aerie Pharmaceuticals, Inc.

Joseph M. Bryan Research Lecture

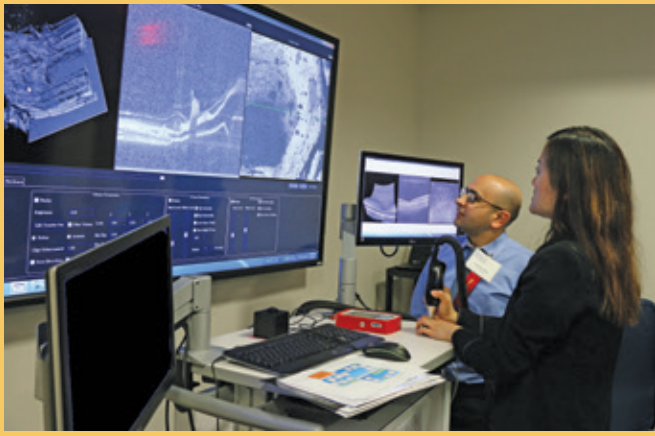
November 15, 2018

Martin Friedlander, MD, PhD

Professor

Department of Molecular Medicine

The Scripps Research Institute



Complimentary Online CME by Duke Ophthalmology Experts
clinicalpracticetoday.com/AAO

Visit the website for more information about Duke Continuing Medical Education
dukeeyecenter.duke.edu/cme

Honors and Awards


Finn


Thomas

Avni Finn, MD, MBA and **Akshay Thomas, MD, MS** received the 2017 Ronald G. Michels Fellowship Award.

Preethi S. Ganapathy, MD, PhD, glaucoma fellow is a recipient of the Heed Fellowship.

Dilraj Grewal, MD received the ASRS Rhett Buckler Award at the 19th Annual ASRS Film Festival during the ASRS 35th Annual Meeting in Boston for the educational video "Surgeons' Point-of-View Intraoperative Video Recording in Ocular Oncology."

Divikar Gupta, MD was selected as a Duke Clinical Leadership Program (DCLP) Fellow, a highly competitive program designed for clinical faculty who show high potential to assume larger leadership roles across Duke Health.
He received an American Glaucoma Society (AGS) Mentoring for Advancement of Physician-Scientists (MAPS) Award. The MAPS award is a multi-faceted mentoring program designed to assist its early career physician scientist members by providing tools and resources to further their careers as potential leaders in the specialty of glaucoma care.

Preeya Gupta, MD received an American Academy of Ophthalmology Achievement Award. She was promoted to Associate Professor of Ophthalmology.

2017 Faculty Promotions

Kelly W. Muir, MD
Associate Professor of Ophthalmology, with tenure

Paloma B. Liton, PhD
Associate Professor of Ophthalmology, with tenure

Mays A. El-Dairi, MD
Associate Professor of Ophthalmology

Sharon Fekrat, MD, FACS
Professor of Ophthalmology

Preeya Gupta, MD
Associate Professor of Ophthalmology

Eleonora (Nora) Lad, MD, PhD
Associate Professor of Ophthalmology

Jullia A. Rosdahl, MD, PhD
Associate Professor of Ophthalmology

Daniel R. Saban, PhD
Associate Professor of Ophthalmology

Julie Woodward, MD
Professor of Ophthalmology

Leon Herndon, MD was elected to nominating chair for the American Glaucoma Society (AGS).

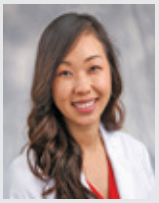
Glenn Jaffe, MD was among Charter Inductees of the Retina Hall of Fame.

Former chair Robert Machemer, MD (1978-1992) was among Charter Inductees of the Retina Hall of Fame.

Eleonora Lad, MD, PhD received a Duke Health Scholars Award. These highly competitive awards are designed to support the research efforts and enhance the academic success of early to mid-career clinician-scientists in Duke School of Medicine clinical departments. Award recipients are nominated by their department chairs and selected through a competitive peer review process. Receipt of these awards recognizes both past achievements and future potential for continued success as clinician-scientists. Duke Health Scholars are generally mid-career and more established investigators and will receive substantial awards to expand their research in new directions. Dr. Lad received $300,000 to

fund her research on biomarkers of age-related macular degeneration.
Dr. Lad became a member of the Macula Society. Founded in 1977, the international Macula Society is a forum for new research in retinal vascular and macular diseases. Membership is by application, with very competitive acceptance criteria including extensive contribution to retinal literature. The Macula Society recognizes outstanding achievement by its members and others through awards and lectures.
She was promoted to Associate Professor of Ophthalmology.

Nicholas Katsanis, PhD, the George W. Brumley, Jr., MD Professor of Developmental Biology, received the Research to Prevent Blindness Stein Innovation Award.



Michelle Kim MD was selected to receive the 2016-17 Robert Machemer Resident Research Award for her work titled "Comparison of Pre-operative and Post-operative thickness of Descemet stripping endothelial keratoplasty grafts by anterior segment optical coherence tomography." Her work was presented at the Trainee Scientific Sessions in June 2017.

Paloma B. Liton, PhD was promoted to Associate Professor of Ophthalmology, with tenure.

Miguel Materin, MD was named 2018-2019 President of Pan American Association of Ocular Oncology.

Duke Ophthalmology Receives Multiple Prominent Research to Prevent Blindness Awards

The Duke School of Medicine and the Department of Ophthalmology has been granted several prestigious Research to Prevent Blindness Awards.

The Department of Ophthalmology has been granted an Unrestricted Grant by Research to Prevent Blindness (RPB) in the amount of $115,000 a year for 5 years to support eye research. This funding has been awarded based on a thorough review of criteria including the department's research activities, laboratory environment, and clinical and scientific staff, as evaluated by RPB's renowned Scientific Advisory Panel.

The funds will be deployed at the discretion of the Department Chair, to provide maximum flexibility in developing and expanding eye research programs, and to provide opportunities for creative planning that go beyond the scope of restricted project grants.

Duke University School of Medicine holds one of 37 RPB Unrestricted Grants nationwide.

Catherine Bowes-Rickman, PhD received a $300,000 Research to Prevent Blindness (RPB) / International Retinal Research Foundation (IRRF) *Catalyst Award for Innovative Research Approaches for AMD* to support her research. The Award is designed to support novel, ground-breaking research into age-related macular degeneration (AMD), with the ultimate goal of creating effective treatments for this increasingly common and debilitating condition.

Xi Chen, MD, PhD has been granted a $300,000 RPB Career Development Award by Research to Prevent Blindness (RPB) to support her research. The support is provided over a four-year period. The RPB Career Development Award Fund was established in 1990 to attract young physicians and basic scientists to eye research. To date, the program has given awards to 199 vision research scientists in departments of ophthalmology at universities across the country.

Nicholas Katsanis, PhD, of The Duke University School of Medicine, has been granted a Research to Prevent Blindness (RPB) Stein Innovation Award. Up to $300,000 will be provided over three years. This award provides flexible funding to scientists actively engaged in research with the goal of understanding the visual system and the diseases that compromise its function. New technologies and cutting-edge research that apply to blindness are supported through this award. Dr. Katsanis is one of 22 researchers who have received the award since it was established in 2014.

Since it was founded in 1960, RPB has channeled more than $355 million into eye research. As a result, RPB has been identified with nearly every major breakthrough in vision research in that time. For information on RPB's grants program, listing of RPB institutional and individual grantees, and findings generated by these awards, go to www.rpbusa.org.

Honors and Awards

Felipe Medeiros, MD, PhD received The Association of Research in Vision and Ophthalmology (ARVO) Cogan Award. (See box right)

Kelly W. Muir, MD was promoted to Associate Professor of Ophthalmology, with tenure.

Jullia A. Rosdahl, MD, PhD was promoted to Associate Professor of Ophthalmology.

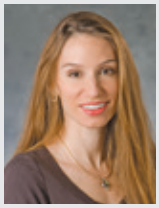
Daniel Saban, PhD received Duke School of Medicine Bridge Funding for his research "The role of adaptive immune responses in the causation of meibomian gland dysfunction." He was promoted to Associate Professor of Ophthalmology.

Dianna Seldomridge, MD, MBA received the American Academy of Ophthalmology Secretariat Award for Communication and has been named the Secretary for Communications for AAO.

Atalie Thompson, MD, MPH won the Joanne Angle Poster of Distinction Award at the Women in Ophthalmology Summer Symposium. She collaborated with Mays El-Dairi, MD and was invited to give a platform talk, "Bruch's Membrane Opening in Papilledema and Pseudopapilledema: Optical Coherence Tomography in a Pediatric Population."
Dr. Thompson Received a travel award from the National Eye Institute for a project presented during ARVO 2017, "Association of Low Luminance Questionnaire with Objective Functional Measures in Age-related Macular Degeneration." This project was in collaboration with Eleonora Lad, MD, PhD.

Cynthia Toth, MD was among Charter Inductees of the Retina Hall of Fame. She was awarded an Academic Writing Residency by the Rockefeller Foundation to support her work on infant eye imaging. (See next page)

Lejla Vajzovic, MD was selected as a Duke Clinical Leadership Program (DCLP) Fellow, a highly competitive program designed for select mid-career clinical faculty who show high potential to assume larger leadership roles across Duke Health.
Dr. Vajzovic was elected to Active Membership in The Retina Society.
She received Best Cowgirl Award for the best female vitreoretinal surgeon at Vit-Buckle Society.
She was named to The Ophthalmologist Power List.
She received the Duke Institute for Brain Sciences Incubator Award with Sina Farsiu, PhD
Mentee Award: ARVO Travel Grant Recipient, Karim Sleiman, for project: "Four-dimensional microscope-integrated optical coherence tomography (4D MIOCT) guidance in subretinal surgery."
Mentee Award: ARVO Travel Grant Recipient, Brittany Wong, for project: "Retinal microanatomy development on spectral domain optical coherence tomography and visual acuity in preterm infants."



Julie Woodward, MD was invited to the 43rd Annual Conference of the Israeli Society of Plastic and Aesthetic Surgery to moderate live filler injections and to give two podium presentations. She was the course director for the first ever aesthetic surgery course at Duke that included national and international speakers.
She was promoted to Professor of Ophthalmology.

Medeiros Receives ARVO Cogan Award

Felipe Medeiros, MD, PhD is the recipient of The Association of Research in Vision and Ophthalmology (ARVO) Cogan Award, given annually to a researcher age 45 or younger. This person will have made important and worthwhile contributions to research in ophthalmology or visual science which is directly related to disorders of the human eye or visual system, and who shows substantial promise for the future.

Toth receives Academic Writing Residency: Cynthia Toth, MD in front of a painting of Hermann von Helmholtz, German physician and physicist, who revolutionized the field of ophthalmology with the invention of the ophthalmoscope.

Rockefeller Foundation Supports Infant Eye Imaging

The Rockefeller Foundation awarded an Academic Writing Residency to **Cynthia A. Toth, MD,** Joseph AC Wadsworth Professor of Ophthalmology and Professor of Biomedical Engineering at Duke Eye Center, to support her efforts on "Improving Global Tools to Evaluate Infant Eye and Brain Development."

Dr. Toth participated in a four-week residency program at The Rockefeller Foundation Bellagio Center in Italy, developing and writing her Handbook of Pediatric Retinal Optical Coherence Tomography.

"I was honored to be able to spend the time building on the significant improvements we've made at Duke Eye Center in infant eye imaging to reveal early brain development," said Dr. Toth. "It has been a privilege to be able to attend this program and develop the means to communicate some of our key discoveries for medical professionals worldwide."

Participants in the residency program share in the Foundation's pioneering mission to "promote the well-being of humanity around the world." The Bellagio Center has a record of major impact, from meetings that led to the Green Revolution and the Global AIDS vaccine initiative, to residencies that have furthered the work of some of the world's finest artists, writers, and scholars.

2017–2018 RESIDENTS

Duncan Berry
Chief Resident

Third-Year Residents

Ryan Constantine, MD
Tanya Glaser, MD
Katy Liu, MD
Morgan Rogers Godin, MD
Atalie Thompson, MD, MPH
Amy Tong, MD

Second-Year Residents

Henry L. Feng, MD
Sonja Galeb, MD
Jennifer Lira, MD
Samuel F. Passi, MD
Adam L. Rothman, MD
Daniel M. Vu, MD

First-Year Residents

Faith Birnbaum, MD
Mark Goerlitz-Jessen, MD
Jane Kim, MD
Nikolas Raufi, MD
Obinna Umunakwe, MD, PhD
Clayton Wisely, MD

2017–2018 CLINICAL FELLOWS

Mohsin Hasan Ali, MD
Vitreoretinal Surgery
Jay Berdia, MD
Medical Retina
Avni Patel Finn, MD, MBA
Vitreoretinal Surgery
Nicole Fuerst, MD
Cornea
Preethi Ganapathy, MD, PhD
Glaucoma
Wajiha Jurdi Kheir, MD
Medical Retina
Michelle Kim, MD
Cornea
Narae Ko, MD
Cornea
Daniel Lattin, MD
Pediatrics
Michelle Latting, MD
Oculoplastics
Andrew Lee, MD
Pediatrics
Landon Meekins, MD
Neuro-Ophthalmology
Courtney Ondeck, MD
Glaucoma
Andrew Perin, MD
Glaucoma
Roshni Ranjit-Reeves, MD
Oculoplastics
Jill Rotruck, MD
Pediatrics

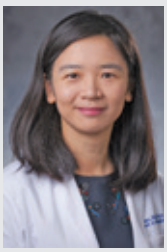
Romain Cartoni, PhD joined Duke University Medical School in January 2018 as Assistant Professor of Ophthalmology and Pharmacology and Cancer Biology.

Cartoni

Dr. Cartoni's scientific career has focused on mitochondrial adaptations to neuronal stress. A Switzerland native, he obtained a PhD in Biology from the University of Geneva (Switzerland) where he worked in the Cell Biology Department under the supervision of mitochondrial apoptosis pioneer Professor Jean-Claude Martinou. His doctoral work studied the role of mitochondrial fusion defect in the diseased peripheral nervous system.

After a transitional post-doc at the University of Lausanne (Switzerland), Dr. Cartoni was offered a research fellow position at the F.M. Kirby Neurobiology Center in Boston Children's Hospital, Harvard Medical School to work in the laboratory of Professor Zhigang, he who spearhead the field of axonal regeneration. In close collaboration with his department neighbour Professor Thomas L. Schwarz, Dr. Cartoni discovered that a mitochondrial protein called Armcx1 was sufficient to mobilize mitochondria, and promote axonal regeneration and survival of retinal ganglion cells after optic nerve injury. This study provided a strong evidence for the role of mitochondria during neuronal repair and opened new horizons for mitochondrial medicine.

The research conducted in Cartoni's laboratory will focus on finding mechanisms and regulators that promote neuronal survival and axonal regeneration by modulating mitochondrial function and dynamics. The laboratory's main interests are the blinding diseases affecting the retinal ganglion cell axons and how one can help make the optic nerve regenerate.



Xi Chen, MD, PhD completed her vitreoretinal fellowship at Duke and joined the department as Assistant Professor of Ophthalmology in July 2017. She is dedicated to being a retina specialist and clinician-scientist who provides great medical and surgical care to patients with vitreoretinal diseases, with a research focus in retinal neurovascular development and disease.

Chen

Prior to coming to Duke, Chen pursued her ophthalmology residency at Massachusetts Eye and Ear Infirmary, and earned her medical degree at Harvard Medical School and doctoral degree in neuroscience at Johns Hopkins University School of Medicine.

Her basic science training in neural development gives her a unique perspective in her research of human retinal development. She hopes to eventually bring the information gathered from the bedside back to the laboratory in order to develop strategies to improve care of premature infants, and pediatric and adult patients with retinal vascular diseases. She is very excited to work closely with Dr. Cynthia Toth and Dr. Joseph Izatt, who have pioneered the world in the development of bedside OCT technology and its adaptation for pediatric use. Her current research interest is to study human retinal and vascular development and their coordination using advanced imaging techniques.

Dr. Chen is very grateful to work alongside amazing colleagues and wonderful staff at Duke Eye Center who work hard and go out of their way to provide the best possible care to each and every patient.

Sidney M. Gospe, III, MD, PhD joined Duke Ophthalmology on August 1, 2017 following his neuro-ophthalmology fellowship training at Duke. His research interests center on developing novel genetic mouse models of severe mitochondrial dysfunction in retinal ganglion cells (RGCs) and other retinal neurons in order to recapitulate the RGC degeneration seen in human optic neuropathies and the poorly understood pigmentary retinopathy that may accompany these diseases.

Mitochondria are the powerhouse of our cells, efficiently generating energy through oxidative metabolism. When mitochondria function improperly, cells are deprived of needed energy and are subjected to the adverse effects of reactive oxygen species. Mitochondrial dysfunction is an important cause of vision loss and is believed to play a mechanistic role in a number of optic neuropathies, most notably in primary mitochondrial optic neuropathies like Leber hereditary optic neuropathy and dominant optic atrophy, but also secondarily in more common diseases like optic neuritis, ischemic optic neuropathy, and glaucoma. Currently there are no pharmacotherapies for mitochondrial optic neuropathies that are of more than marginal clinical benefit to affected patients.

Gospe

Dr. Gospe employs biochemical, histologic, and electrophysiological approaches to characterize the metabolic perturbations and aberrant signaling pathways leading to degeneration of retinal neurons in the face of reduced oxidative metabolism. The mutant mouse lines he is developing may serve as useful preclinical models to identify and validate therapeutic targets for future human trials. Ultimately, the hope is that strategies to modulate mitochondrial physiology may be neuroprotective not only in primary mitochondrial optic neuropathies but also in other optic neuropathies causing significant visual morbidity in patients.

Majda Hadzihametovic, MD joined Duke Eye Center following completion of her medical retina fellowship in July 2017. Her expertise involves diagnosis and treatment of medical disorders affecting retina. She is committed to delivering personalized treatment to each patient while providing high-level patient care.

Dr. Hadziahmetovic is a clinician scientist with present research agenda focused on community-based trials and teleophthalmology. She is particularly interested in employing telemedicine in early diagnosis and timely treatment of diabetic retinopathy and

Hadziham-etovic

age-related macular degeneration using cutting-edge noninvasive optic coherence tomography (OCT) imaging and fundus photography. She also has great interest in translational research, particularly investigating new mouse models of retinal diseases.

Dr. Hadziahmetovic received her M.D. from University of Belgrade School of Medicine in 2006, followed by Postdoctoral Fellowship at the University of Pennsylvania, Scheie Eye Institute, from 2007 to 2012. After finishing a year of General Surgery training at Drexel University College of Medicine in 2012, she completed Ophthalmology Residency at Drexel in 2016, where she served as a chief resident during her final year.

Dr. Hadziahmetovic is very excited about staying at Duke Eye Center. Dr. Hadziahmetovic finds the atmosphere at Duke to be very inspiring and looks forward to working with world renowned clinicians and scientists in helping patients via direct clinical care, and through basic and clinical research. She is also passionate about teaching new generations of medical retina specialists, finding it enjoyable and immensely rewarding.

Felipe A. Medeiros, MD, PhD is Professor of Ophthalmology and Vice-Chair for Technology at the Department of Ophthalmology, Duke University. He is also Director of the Clinical Research Unit, where he leads clinical research efforts in the Department of Ophthalmology.

Dr. Medeiros' research has been focused on the development of innovative methods and technologies for early diagnosis, prediction and detection of glaucoma progression. His laboratory is also currently evaluating the impact of eye diseases on activities of daily living, using innovative techniques such as virtual reality. He has published over 300 peer-reviewed scientific articles and 6 books in ophthalmology, and is one of the most cited researchers in the

Medeiros

field. He has recently been named as one of the Top 5 Glaucoma Specialists in the world (Expertscape) and one of the Top 10 Glaucoma Researchers of the Decade (Annals of Library and Information Studies). As a result of his contributions, Dr. Medeiros was recently selected to be the first scientist to have a profile featured by *Ophthalmology* (October 2016 issue), the Journal of the American Academy of Ophthalmology and the leading publication in the field. Dr. Medeiros has been the recipient of over 40 international awards, including the prestigious Cogan Award from the Association for Research in Vision and Ophthalmology (ARVO), the World Glaucoma Association Research Award, the American Academy of Ophthalmology (AAO) Senior Achievement Award, among others. Most recently, he received the Moacyr Alvaro Gold Medal, the most prestigious award in Ophthalmology in Latin America.

Dr. Medeiros serves as the Chair of the American Glaucoma Society (AGS) Program Committee and he is also Member of the Program Committee of the prestigious Glaucoma Research Society. Dr. Medeiros has acted as Editorial Board Member for several journals, including the *Journal of Glaucoma.* He has trained numerous students, fellows and postdocs from many parts of the world.

Victor Perez, MD joined Duke Ophthalmology in September 2017 as Professor of Ophthalmology and Director of Duke's new Center for Ocular Immunology. He is an established clinician-scientist investigator in the field of ocular immunology and ocular surface diseases. Dr. Perez spends fifty percent of his time in his laboratory researching ocular immunology, ocular graft versus host disease (OGVHD) and transplantation. He complements this with his work evaluating and treating patients with ocular inflammatory diseases such as conditions of the anterior segment associated with auto-immune disorders and uveitis. Additionally, Dr. Perez has

Perez

an active program in the surgical reconstruction of the anterior segment including high risk corneal transplants, limbal stem cell transplantation and keratoprostheses.

Dr. Perez's laboratory focuses primarily on researching immunology of corneal transplantation and ocular Graft vs Host Disease (GVHD). Dr. Perez and his colleagues use a mouse model of corneal transplantation and Ocular GVHD that allows for translational research relevant to patients with penetrating keratoplasty and ocular GVHD. Dr. Perez's grant from the National Eye Institute supports his lab's work on the immunological mechanisms involved in high-risk corneal transplant rejection and OGVHD.

Members of Dr. Perez's lab have used the mouse eye as an in vivo imaging platform to study T cell recruitment and in situ activation. The aim of this work is to develop a translational research clinic to study the natural history of disease progression in ocular GVHD and to test the role of cytokines in this process. One of the most innovative aspects of this program is the multidisciplinary team—consisting of scientists from the ophthalmology, basic immunology, and oncology units—whose members work together to comprehensively tackle the research and care of patients with GVHD. The knowledge and development of potential new preventive therapies that is being generated in the laboratory will have a direct translational impact on the care of Duke Eye Center patients with GVHD.

Dr. Perez says that he joined Duke because it provides the perfect environment for clinician scientists to grow and establish translational research programs to cure diseases. Duke's vision of the future in translational research led to the creation of the center to study inflammatory diseases of the eye. The components of his work support the goal to preserve vision through innovation, personalized medicine, and a passion for advancement of ophthalmic science.

Duke Eye Center Administration, Faculty and Staff

FACULTY LEADERSHIP

Edward G. Buckley, MD	Chair, Department of Ophthalmology Vice Dean of Medical Education, Duke University School of Medicine Vice Chancellor Duke-NUS Affairs
Scott W. Cousins, MD	Vice Chair of Research Director, Translational Research Program Director, Center for Macular Diseases Director, Ophthalmic Imaging Medical Director, Duke Eye Center Durham
Felipe Medeiros, MD, PhD	Vice Chair, Technology Director, Clinical Research Unit
Eric A. Postel, MD	Vice Chair, Clinical Affairs and Chief, Ambulatory Eye Surgery
Cynthia A. Toth, MD	Chair, Department APT Committee
Sanjay Asrani, MD	Medical Director, Duke Eye Center of Cary
Christopher Boehlke, MD	Medical Director, Duke Eye Center, Raleigh
Laura Enyedi, MD	Medical Director, Duke Eye Center, South Durham
Preeya Gupta, MD	Medical Director, Duke Eye Center at Page Road, PDC At-Large Member
Robin R. Vann, MD	Medical Director, Perioperative Services
Carol Ziel, MD	Medical Director, Duke Eye Center of Winston Salem
Vadim Arshavsky, PhD	Scientific Director of Research
Glenn J. Jaffe, MD	Director, Duke Reading Center
Eleonora Lad, MD, PhD	Associate Director, Clinical Research Unit
Catherine Bowes-Rickman, PhD	Director, Third-Year Medical Student Program
Pratap Challa, MD	Director, Residency Program
Sharon Fekrat, MD, FACS	Associate Chief of Staff for Surgery Durham VA Medical Center, Director, Faculty Mentoring and Development
Kelly Muir, MD, MHSc	Director, Fellowship Program Chief, Division of Ophthalmology, Durham VA Medical Center
Tina Singh, MD	Director, Second- and Fourth-Year Medical Student Program
Lejla Vajzovic, MD	Director, Continuing Education Program
Diane B. Whitaker, OD	Director, Optometry Education
Jullia A. Rosdahl, MD, PhD	Director, Patient Education
Julie A. Woodward, MD	Director, Public Education Program Faculty Liaison Director, Ophthalmic Technician Program

ADMINISTRATION

Adrienne Lloyd, MHA, FACHE	Chief Administrator
Elizabeth Hunter, MHA, CFM	Director of Finance
Heidi Campbell, COT	Director of Clinical Operations
Tammy Clay, MHA	Division Administrator
Martha Wilson, MHA	Division Administrator
Lauren Walls, MHA	Health Center Administrator
Tori Hall	Director, Marketing and Communications
Robert Hayford, MBA	Administrative Manager
Jillian Ream	Executive Director of Development
Michael Flintosh, MBA	HR Manager
Renee Wynne	Program Director, Continuing Medical Education Program Director, Special Events

COMPREHENSIVE OPHTHALMOLOGY

Anna Bordelon, MD	Assistant Professor of Ophthalmology
Thomas Devetski, OD	Assistant Professor of Ophthalmology
Anupama Horne, MD	Assistant Professor of Ophthalmology, *Division Chief*
Thomas Hunter, MD	Assistant Professor of Ophthalmology
Charlene James, OD	Assistant Professor of Ophthalmology
Nicola (Nicky) Kim, MD	Associate Professor of Ophthalmology, *Assoc. Director Main Eye Center*
John T. Petrowski III, OD, FAAO	Assistant Professor of Ophthalmology
Laurie K. Pollock, MD	Assistant Professor of Ophthalmology
William Rafferty, OD	Assistant Professor of Ophthalmology
Dianna Seldomridge, MD	PDC Consulting Professional Employee
Tina Singh, MD	Assistant Professor of Ophthalmology
Robin R. Vann, MD	Assistant Professor of Ophthalmology

CORNEA AND REFRACTIVE SURGERY

Christopher S. Boehlke, MD	Assistant Professor of Ophthalmology
Alan N. Carlson, MD	Professor of Ophthalmology
Melissa Daluvoy, MD	Assistant Professor of Ophthalmology *Fellowship Director, Cornea and Refractive Surgery*
Preeya Gupta, MD	Associate Professor of Ophthalmology
Terry Kim, MD	Professor of Ophthalmology, *Division Chief*
Anthony Kuo, MD	Associate Professor of Ophthalmology
Victor Perez, MD	Professor of Ophthalmology
Terry Semchyshyn, MD	Assistant Professor of Ophthalmology
Gargi Vora, MD	Assistant Professor of Ophthalmology

GLAUCOMA

R. Rand Allingham, MD	Richard and Kit Barkhouser Professor of Ophthalmology
Sanjay Asrani, MD	Professor of Ophthalmology
Pratap Challa, MD	Associate Professor of Ophthalmology
Divakar Gupta, MD	Assistant Professor of Ophthalmology
Leon W. Herndon, MD	Professor of Ophthalmology, *Division Chief*
Jill B. Koury, MD	Assistant Professor of Ophthalmology

Stuart J. McKinnon, MD, PhD	Associate Professor of Ophthalmology, Associate Professor in Neurobiology ++
Felipe Medeiros, MD, PhD	Professor of Ophthalmology
Frank J. Moya, MD	Assistant Professor of Ophthalmology
Kelly W. Muir, MD	Associate Professor of Ophthalmology with Tenure, *Fellowship Director*
Jullia Rosdahl, MD, PhD	Associate Professor of Ophthalmology
Henry Tseng, MD, PhD	Assistant Professor of Ophthalmology
Molly M. Walsh, MD, MPH	Assistant Professor of Ophthalmology
Carol J. Ziel, MD	Assistant Professor of Ophthalmology

VISION REHABILITATION

Diane Whitaker, OD	Assistant Professor of Ophthalmology, *Division Chief*

NEURO-OPHTHALMOLOGY

M. Tariq Bhatti, MD	Professor of Ophthalmology, *Division Chief* Professor of Neurology and Neurosurgery ++
Mays El-Dairi, MD	Associate Professor of Ophthalmology
Sidney Gospe III, MD, PhD	Medical Instructor of Ophthalmology

OCULOPLASTICS

Ilya Leyngold, MD	Assistant Professor of Ophthalmology
Jason Liss, MD	Assistant Professor of Ophthalmology
Erica Sudyk, PA-C	Oculoplastics Division
Julie A. Woodward, MD	Professor of Ophthalmology, *Division Chief* Associate Professor in Dermatology ++

PEDIATRIC OPHTHALMOLOGY AND STRABISMUS

Edward G. Buckley, MD	James P. and Joy Gills Professor of Ophthalmology Professor in Pediatrics ++, *Department of Ophthalmology Chairman*
Nathan Cheung, OD	Assistant Professor of Ophthalmology
Laura B. Enyedi, MD	Associate Professor of Ophthalmology Assistant Professor in Pediatrics ++
Sharon F. Freedman, MD	Professor of Ophthalmology, *Division Chief* Professor in Pediatrics ++ *Fellowship Director, Pediatrics*
Faramarz Hidaji, MD	Consulting Assistant Professor of Ophthalmology
S. Grace Prakalapakorn, MD, MPH	Assistant Professor of Ophthalmology
Yos Priestley, OD, FAAO	Assistant Professor of Ophthalmology

VITREORETINAL DISEASES AND SURGERY

Michael Allingham, MD, PhD	Assistant Professor of Ophthalmology
Xi Chen, MD PhD	Assistant Professor of Ophthalmology
Scott W. Cousins, MD	Robert Machemer, MD, Professor of Ophthalmology Professor in Immunology ++
Sharon Fekrat, MD, FACS	Professor of Ophthalmology, *Director of Vitreoretinal Surgery Fellowship* Associate Professor of Surgery ++
Dilraj Grewal, MD	Associate Professor of Ophthalmology
Majda Hadziahmetovic, MD	Medical Instructor of Ophthalmology
Alessandro Iannaccone, MD, MS, FARVO	Professor of Ophthalmology
Glenn J. Jaffe, MD	Robert Machemer, MD Professor of Ophthalmology, *Division Chief*
Kirsten Johnston, PA-C	Physician Assistant
Eleonora Lad, MD, PhD	Associate Professor of Ophthalmology
Miguel Materin, MD	Professor of Ophthalmology, *Director Ophthalmic Oncology* Professor of Radiation Oncology ++
Prithu Mettu, MD	Assistant Professor of Ophthalmology
Eric A. Postel, MD	Professor of Ophthalmology
Stefanie G. Schuman, MD	Assistant Professor of Ophthalmology
Cynthia A. Toth, MD	Joseph A.C. Wadsworth Clinical Professor of Ophthalmology, Professor in Biomedical Engineering++
Lejla Vajzovic, MD	Assistant Professor of Ophthalmology

RESEARCH OPHTHALMOLOGY

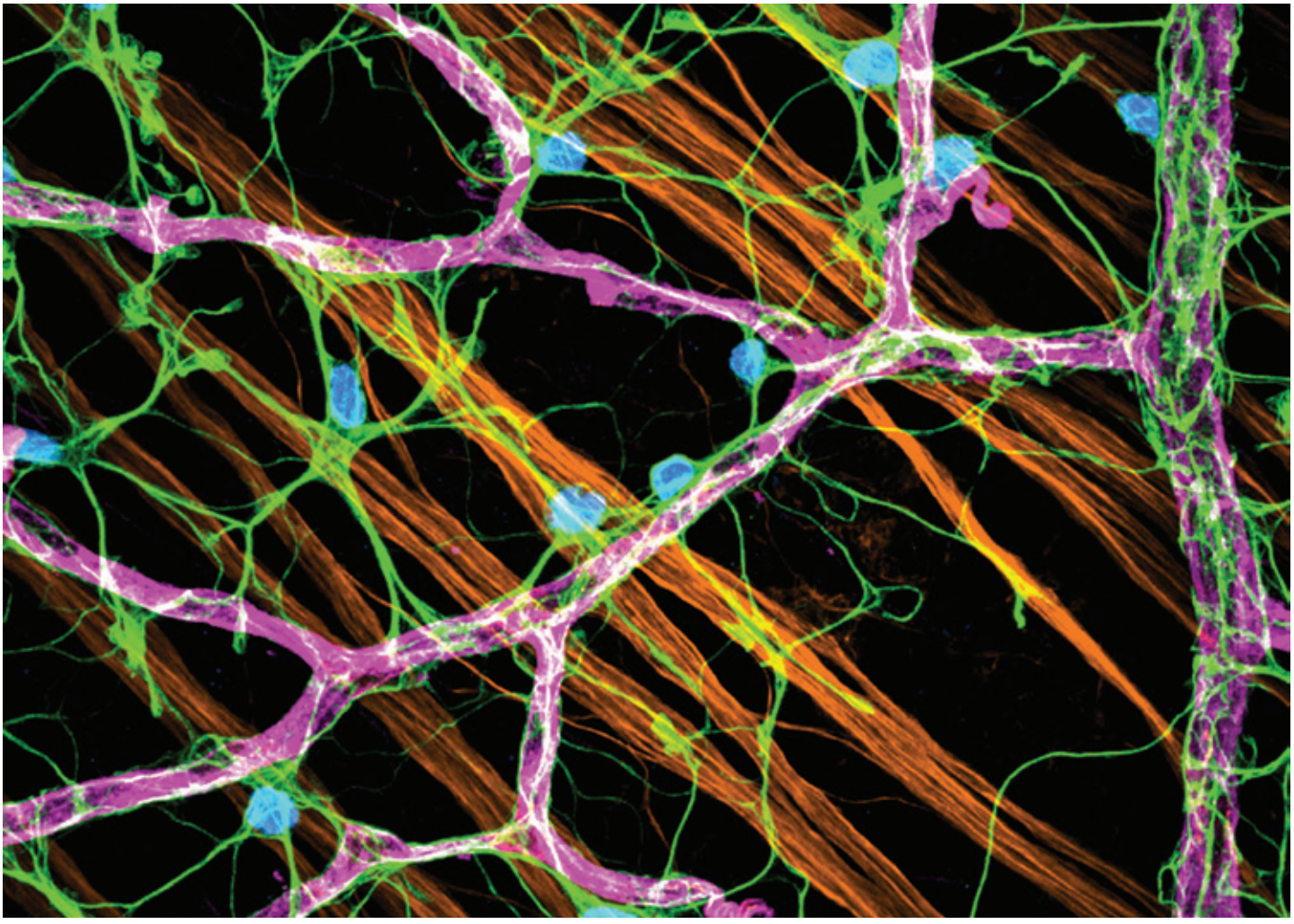
Vadim Arshavsky, PhD	Helena Rubinstein Foundation Professor of Ophthalmology Professor in Pharmacology & Cancer Biology ++
Catherine Bowes-Rickman, PhD	Associate Professor of Ophthalmology Associate Professor in Cell Biology ++
Romain Cartoni, PhD	Assistant Professor of Ophthalmology, Assistant Professor of Pharmacology and Cancer Biology ++
Sina Farsiu, PhD	Associate Professor of Biomedical Engineering – Joint with Associate Professor of Ophthalmology, Associate Professor in Electrical and Computer Engineering ++ Associate Professor in Computer Science++
Paulo Ferreira, PhD	Associate Professor of Ophthalmology Associate Professor in Pathology ++
Pedro Gonzalez, PhD	Associate Professor of Ophthalmology Associate Professor in Pathology ++
Jeremy Kay, PhD	Joint Appointments – Assistant Professor of Ophthalmology, Assistant Professor of Neurobiology, Assistant Professor in the Duke Institute for Brain Sciences ++
Paloma Liton, PhD	Associate Professor of Ophthalmology with Tenure Associate Professor in Pathology ++
Goldis Malek, PhD	Associate Professor of Ophthalmology, Associate Professor in Pathology ++
P. Vasantha Rao, PhD	Professor of Ophthalmology, Professor in Pharmacology & Cancer Biology ++
Daniel R. Saban, PhD, MS	Associate Professor of Ophthalmology
Nikolai Skiba, PhD	Associate Professor of Ophthalmology
W. Daniel Stamer, PhD	Joseph A.C. Wadsworth Research Professor of Ophthalmology, Professor in Biomedical Engineering++
Sandra Stinnett, DrPH	Associate Professor of Biostatistics & Bioinformatics Associate Professor in Ophthalmology ++
Fulton Wong, PhD	Professor Emeritus of Ophthalmology, Professor in Neurobiology and Pathology ++, Assistant Professor in Pathology ++

Secondary appointment ++

Duke Eye Center

Duke University Health System
Office of Marketing and Communications
DUMC 3802 Durham, NC 27710

dukeeye.org



Nerve fiber layer of mouse retina, which contains nerves (red), blood vessels (purple), and supporting cells called astrocytes (blue, green). Image courtesy of Matthew O'Sullivan/Kay Lab.