Dr. Alston Callahan established what would become the UAB Callahan Eye Hospital over half a century ago with the goal of eradicating blinding eye diseases through groundbreaking research, world-class clinical care, and unparalleled education of future clinicians and scientists. We have experienced remarkable growth in our programs over the past 50 years and continue to strive to fully realize Dr. Callahan’s dream. Making his vision a reality is possible only because of our physicians’ and researchers’ dedication. Their tireless efforts and boundless ingenuity have inspired generations of trainees, uncovered novel disease mechanisms, and saved countless patients from a world of darkness.

Our department’s recent growth has been fueled by investments from philanthropic partners like the EyeSight Foundation of Alabama and the International Retinal Research Foundation, which created the Vision of Excellence Initiative in 2012. As the initiative comes to a close, we look back at the accomplishments and milestones it made possible in this Annual Report. The Vision of Excellence Initiative allowed us to expand our department from 29 to 51 faculty, which enhances our ability to provide comprehensive training to the next generation of ophthalmologists, develop cutting-edge research, and deliver high-quality care across all subspecialties. This growth has resulted in a substantial increase in federal research awards, and our department now ranks No. 5 in National Institutes of Health funding, up from No. 32 in 2012.

Our discoveries are laying the foundation for the next generation of care. The work presented in this Annual Report represents only a portion of the exciting advances happening in our clinics and laboratories. I am delighted to share our 2018 Annual Report with you. At the UAB Department of Ophthalmology and Visual Sciences, the future is brighter than ever.

Sincerely,

Christopher A. Girkin, M.D., MSPH, FACS
EyeSight Foundation of Alabama Chair
UAB Department of Ophthalmology and Visual Sciences
UAB School of Medicine
University of Alabama at Birmingham
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RESEARCH & FUNDING

Full-Time Department Faculty

NIH Funding and Ranking

<table>
<thead>
<tr>
<th>Year</th>
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Total UAB Vision Science Research Center NEI Funding

- Department of Ophthalmology and Visual Sciences: $9,309,000
- School of Optometry: $2,209,701
- P30: $736,500
- Department of Neurobiology: $622,356

Vision of Excellence and 2020 Discovery Initiative Funding Sources

- Other Donors: $9,627,619
- EyeSight Foundation of Alabama: $10,872,566
- Research to Prevent Blindness Inc.: $1,250,000
- International Retinal Research Foundation: $1,829,756

More than $23.5 million
Ambulatory Clinic Volume

More than 167,000 clinic visits in 2018

Surgeries by Type

12,191 surgical procedures

UAB Callahan Eye Hospital
1 of only 2 Ocular Trauma Centers in the nation
The only eye hospital in Alabama
Grant Distribution by Type

- **32 Federal** (Includes NIH and Subcontracts)
- **6 Other Federal**
- **3 UAB Internally Funded**
- **6 Foundations**
- **9 Industry**

ACTIVE GRANTS AND CONTRACTS

$10,121,374 Federal

$11.2+ MILLION TOTAL

$645,630 Industry

$360,860 Foundation

Active Awards by Sponsor Type
There is one word that is synonymous with UAB Ophthalmology’s research mission: discovery. The department currently has $10.6 million in National Institutes of Health Funding, an increase of over $8 million in seven years. The department now ranks No. 5 in the country in NIH funding. Our recent growth in research capacity is paving the way for our scientists to change the treatment landscape for patients living with blinding diseases. We are better able to translate knowledge from the lab to the patient’s bedside because of our ceaseless commitment to discovering treatments that help tomorrow’s patients.
In 2012, the UAB Department of Ophthalmology and Visual Sciences was in the middle of several transitions. Lanning Kline, M.D., stepped down as chair and handed the reins over to Christopher Girkin, M.D., who was named the new EyeSight Foundation of Alabama Professor and Chair. The department had 29 faculty members, $1.9 million in National Institutes of Health (NIH) funding, and was ranked No. 32 in the country according to Blue Ridge Institute for Medical Research. Dr. Girkin’s goal was to put the department in the “Top 20” nationally ranked ophthalmology departments.

With that in mind, the UAB Department of Ophthalmology and Visual Sciences partnered with the EyeSight Foundation of Alabama and other philanthropic foundations and donors to create the Vision of Excellence Initiative (VEI), which supported the vision of developing a world-class research program at UAB based at the Callahan Eye Hospital.

“We needed to take a step back to evaluate our priorities as a department, and a priority for me was research,” Dr. Girkin says. “The Callahan Eye Hospital has always provided outstanding clinical care to patients with complex eye disease, while educating the next generation of clinicians. Moreover, there was a productive group of highly impactful researchers. At the time, there was little synergy between the clinical and research worlds. We felt the support of the Vision of Excellence Initiative made us capable of so much more.”

ESFA’s capital investment, combined with the generous support from the University of Alabama at Birmingham and foundations like the International Retinal Research Foundation (IRRF), has enabled the department to attract and recruit a much larger interdisciplinary team of researchers. This has generated a five-fold increase in research funding since VEI’s inception, making the UAB Department of Ophthalmology and Visual Sciences the fastest-growing department in the country over the past five years. UAB Ophthalmology’s efforts have also been critical in renewing and enhancing the university-wide core grant while growing the UAB vision science community.

“The goal was to push the department into a nationally visible position on the research stage,” says Torrey DeKeyser, executive director of the EyeSight Foundation of Alabama. “Research was Dr. Girkin’s mission and focus, and we knew he could carry us across that finish line.”

To date, the department has surpassed the “Top 20” goal of the Vision of Excellence: In 2018, the department was ranked No. 5 in the country, with 51 faculty and $10.6 million in NIH funding. “It has been both rewarding and humbling to be a part of this tremendous period of growth over the past few years,” says Dr. Girkin. “The coalescence of philanthropic investment, intellectual capital, and supportive leadership has fueled our expansion thus far. I look forward to the future in which we can continue to build the synergies among our clinical, educational, and research domains in order to discover the cures for blinding eye diseases and train the scientists and clinicians of tomorrow while providing world-class care for our patients today.”
The **EyeSight Foundation of Alabama** (ESFA) began its work in 1997 with a $60 million endowment derived from the sale of the specialty eye hospital now known as UAB Callahan Eye Hospital (CEH). Since its inception, the foundation has awarded grants totaling over $68 million to more than 30 nonprofit organizations in Alabama, including $10.7 million to UAB Callahan Eye Hospital and $44.8 million to the UAB Department of Ophthalmology and Visual Sciences.

The EyeSight Foundation is proud of the eye health and research projects it has supported for the past two decades, ranging from vision screenings and summer camps for children with vision impairment to eye care for the medically indigent and research into prevention, treatment, and cures for blinding eye disease. We are particularly proud of the support we have contributed to UAB and are so excited about the state-of-the-art patient care provided at Callahan Eye Hospital and the acceleration of cutting-edge research in the Department of Ophthalmology and Visual Sciences through our funding partnership.”

- **Torrey DeKeyser**, ESFA Executive Director

Founded in 1997, the **International Retinal Research Foundation** (IRRF) is committed to accelerating sustained, targeted research efforts into the diseases of all structures of the human eye, and has awarded over $15 million in support of vision research worldwide.

Since its inception, the International Retinal Research Foundation has provided financial support for vision research to scientists in every corner of the globe, while focusing on discovery of causes, preventions, and cures of macular degeneration and diabetic retinopathy. In addition to research funding, IRRF supports training fellowships, public awareness programs, and promoting the exchange of scientific findings. To do this, we must maximize every dollar. Forming partnerships and collaborations with outstanding institutions has made it possible to effectively achieve a collective impact. For this reason, our support of the UAB Department of Ophthalmology and Visual Sciences over the years has proved to be a wise investment that has produced lasting and worthwhile results, which will positively affect the lives of many individuals and further scientific knowledge in the vision research community.”

- **Sandra Blackwood**, IRRF Executive Director

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**Powerful Partnerships**
The year 2012 was one of exciting changes for the UAB Department of Ophthalmology and Visual Sciences—the Vision of Excellence Initiative launched; Christopher Girkin, M.D., was named chair; and the department paved the way to become nationally recognized in research.

The department’s leadership and friends wanted to make the local community aware of these exciting advances. In 2012, they joined forces to tell the department’s story to community partners and donors interested in supporting the department’s mission by creating the 2020 Discovery Initiative. This initiative was a development project aimed at boosting the Vision of Excellence through community philanthropic support separate from contributions made by UAB, the EyeSight Foundation of Alabama (ESFA), and the International Retinal Research Foundation (IRRF). Designed as a $10 million fundraising campaign with the goal to help the department meet the eye care needs of the community, the 2020 Discovery Initiative targeted the local and regional community and grateful patients. In 2018, the department not only met but exceeded this goal by raising $10.8 million.

“We cannot thank our partners enough in this effort,” says Tom Brannan, vice president for UAB Advancement. “They have made an investment not only in the Department of Ophthalmology and Visual Sciences, but also in the faculty and staff who work here, in the students who learn here, in the patients who receive care here, and in the continuing progress of the field of eye health. On behalf of everyone who will benefit from their generosity, UAB thanks them.”

The 2020 Discovery Initiative’s pillars included accelerating research, expanding access to care, attracting top talent, training the next generation of ophthalmologists, and strengthening community outreach—the department’s core missions. As a nationally recognized leader in vision research, UAB Ophthalmology’s growth has reflected a 50-year commitment. Generous philanthropic support played a pivotal role in continuing our upward trajectory, and it helped us surpass our goal of becoming a Top 20 nationally ranked department. Some pivotal partners for UAB Ophthalmology and Callahan Eye Hospital include:

- Applied Genetics Technology Corp.
- Alabama Eye Bank
- Alabama Lions Sight
- Bright Focus Foundation
- UAB Callahan Eye Hospital & Clinics
- Carl G. and Pauline Buck Trust
- Dr. Ludwig Von Sallmann Memorial Fund
- Dr. and Mrs. John O. Mason III
- Shirley H. Sarks, M.D., and John P. Sarks, M.D.
- Dr. and Mrs. barnix E. Heersink
- Dr. and Mrs. Lanning B. Kline
- Dr. and Mrs. Martin L. Thomley
- Dr. and Mrs. Richard M. Feist Sr.
- Estate of Edith Leora Dennis
- Heidelberg Engineering
- Henry G. Sims & Henry U. Sims Memorial Foundation
- Hill Crest Foundation Inc.
- International Retinal Research Foundation
- Luke 6:38 Foundation
- Lions International
- MC Associates
- Mr. and Mrs. Clarence B. Blair
- Mr. and Mrs. Stephen A. Yoder
- Mr. and Mrs. Marnix E. Heersink
- Mr. and Mrs. Lanning B. Kline
- Mr. and Mrs. Martin L. Thomley
- Mr. and Mrs. Richard M. Feist Sr.
- Ms. Mary Olive Pierson
- Mr. and Mrs. Robert E. Perry
- National Christian Foundation of Alabama
- National Christian Foundation
- Research to Prevent Blindness Inc.
- The Boone Foundation Inc.
- The Eyesight Foundation of Alabama
- The Macula Foundation Inc.

*These donors made gifts above $25,000. UAB Ophthalmology has made every attempt to represent an accurate list. Please contact us if we made an omission at nmrobinson@uabmc.edu.*
Scientists Make Groundbreaking AMD Discovery

Age-related macular degeneration (AMD) is a common eye condition and a leading cause of vision loss among people age 50 and older. It causes damage to the macula, a small spot near the center of the retina and the part of the eye needed for sharp central vision that lets us see objects straight ahead. It is treatable for the 15 percent of patients who have neovascular complications (wet AMD). To help the other 85 percent of AMD patients, researchers are using precision medicine techniques to sequence patients’ DNA in hopes of uncovering the biological causes of the disease and developing new, vision-saving treatments. It is known that sequence variants in two genes, CFH and ARMS2, increase a person’s risk for AMD. Research by UAB scientists Cynthia Owsley, Ph.D., MSPH, holder of the Nathan E. Miles Chair of Ophthalmology and director of the Clinical Research Unit, and Christine A. Curcio, Ph.D., the White-McKee Endowed Professor in Ophthalmology and director of the AMD Histopathology Lab—along with researchers at the University of Iowa—have now linked these genes to early AMD’s most prominent visual dysfunction characteristic: difficulty seeing at night and adjusting to dark environments. In addition, the ARMS2 phenotype characteristic emerges in older adults even before they have the disease. While the ARMS2 gene is poorly understood by the scientific community, these new data suggest making ARMS2 a research priority will lead to new ways of treating AMD and preventing vision loss.

16 Labs Build World-Class Vision Research

UAB Ophthalmology Research Achieves Top 5 Ranking in NIH Funding

In 2018, the UAB Department of Ophthalmology and Visual Sciences reached a major milestone: It ranked No. 5 in the country for the amount of National Institutes of Health (NIH) grant funding it received, with over $10.6 million in NIH grant support during fiscal year 2018, according to figures available through the Blue Ridge Institute for Medical Research.

This represents an almost fivefold increase in research funding since the department’s Vision of Excellence program began in 2012, and it further establishes the department as the fastest-growing ophthalmology department in the country. Our scientists and clinician-scientists work with a multidisciplinary group of researchers and clinicians from across campus to advance knowledge and enhance the quality of vision care across the Birmingham area, region, and globe.

About 150,000 people in Alabama live with a visual disability, 50 million people worldwide are blind, and another 150 million are significantly vision-impaired. Blinding disease can be debilitating for patients and their families, and more research into developing new treatments is desperately needed. Great leaps forward in medicine happen when the right people come together in the right place, at a moment in time when knowledge and technology converge—this is the transformational change happening at UAB Ophthalmology.

UAB Ophthalmology’s research laboratories span two buildings that are dedicated to discovering the mechanisms of eye diseases and developing new technologies to treat blinding diseases. Our researchers come from across the country and around the world, bringing a wealth of knowledge and expertise to the UAB Department of Ophthalmology and Visual Sciences. Some researchers are studying basic science, while others are exploring root causes, preventative measures, and delivery models—making for a well-rounded, comprehensive research program. The following section offers a deeper look into the discovery taking place every day right here at UAB Ophthalmology.

*Publications listed in laboratory pages are within the past five years.
Dr. Boulton’s research is expanding upon a number of seminal observations made by his research group: A) mouse hematopoietic stem cells programmed with a unique differentiation factor and injected back into the circulation home to the retina, repair the injured retinal pigment epithelial (RPE) cell monolayer, and restore vision in mouse models of retinal injury; B) retinal repair and regeneration is under circadian control, and this is dysregulated in aging and age-related macular degeneration (AMD); C) autophagy is dysregulated in AMD and diabetic retinopathy; D) in endothelial cells, a dynamic translocation of VEGFRs to adherens junctions (AJs) and the nucleus occurs, which is dependent on the ratio of VEGFR1:VEGFR2 and the balance of growth factors in the local microenvironment. All these projects are ongoing, and the results of this work will improve understanding of retinal pathophysiology and hopefully lead to improved therapeutic intervention in retinal diseases.
Dr. Curcio’s laboratory is in its 35th year of digital pathology, which serves retinal diagnostic imaging and reduces the public health burden of age-related macular degeneration (AMD). One translational research program pertains to the cellular, subcellular, and molecular basis of multispectral autofluorescence imaging of the retinal pigment epithelium (RPE), a support layer for the photoreceptors and central to AMD pathogenesis. Another translational program pertains to the cellular and subcellular basis of clinical optical coherence tomography (OCT) imaging to comprehensively visualize all layers of the retina and choroidal vasculature.

### 2018 Funding

<table>
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<tr>
<th>Funding Source</th>
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<tr>
<td>National Eye Institute (R01)</td>
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<td>A Hyperspectral Approach to RPE Fluorophores in AMD</td>
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<td>National Eye Institute (R01)</td>
<td>Co-Investigator</td>
<td>Scleral Remodeling in Myopia</td>
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<td>National Eye Institute (R01)</td>
<td>Co-Investigator</td>
<td>In Vivo Ultrastructure of Chorioretinal Disease</td>
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<tr>
<td>National Eye Institute (R01)</td>
<td>Principal Investigator/Subcontract</td>
<td>Validated Autofluorescence in Age-Related Macular Degeneration</td>
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<tr>
<td>The Macula Vision Research Foundation</td>
<td>Principal Investigator/Subcontract</td>
<td>Single Cell Sequencing of Retinal Cells</td>
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<tr>
<td>F.Hoffmann-La Roche Ltd</td>
<td>Principal Investigator</td>
<td>Clinicopathologic Correlation in Age-related Macular Degeneration</td>
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### Key Discoveries

- Geographic atrophy (GA) expansion is currently the only FDA-approved endpoint for AMD clinical trials. Comprehensive OCT shows that viable photoreceptors end at a curved line that Dr. Curcio’s team named the descent of the external limiting membrane (ELM descent).
- Dr. Curcio’s lab and their clinical collaborators provided tissue-level confirmation of many OCT signatures, some new, and including all those indicating progression. This data will help the design of clinical trials to test new treatments.
- In an RPE cell culture system, Dr. Curcio’s lab and international collaborators showed how drusen form.
- Dr. Curcio’s lab provided the first comprehensive description of a new lipid-containing lesion between the photoreceptors and retinal pigment epithelium. The new deposit and soft drusen are in the same retinal regions as rod and cone photoreceptors, and may indicate new pathways of lipid trafficking in the outer retina.
- Dr. Curcio’s lab showed that lipofuscin, the long-lasting inclusion body responsible for clinical RPE autofluorescence imaging, decreased in AMD and not increased, contrary to widely held expectations resulting from two decades of research.
- Dr. Curcio’s lab provided the first tissue-level confirmation in the OCT era of three different subtypes of neovascularization.

Top left: Clinical optical coherence tomography shows the retina and one druse. The druse’s dark interior indicates increased risk of progressing to advanced AMD. (Tan et al 2018). Top right: When a druse goes dark in OCT, it has filled with calcified (bone-like) material. (Tan et al 2018). Bottom: Globules of lipid (fat) in a normal human eye are part of a complex lipid landscape that contribute to drusen in AMD. (Dolz-Marco et al 2018)
As a clinician-scientist, Dr. DeCarlo’s research goal is to better understand the visual abilities of people living with vision impairment and to use this understanding to provide better rehabilitation strategies and equipment to enhance vision-specific, health-related quality of life. Her most recent project studies young children with vision impairment to evaluate visual, cognitive, and behavioral factors that contribute to reading. Children with vision impairment frequently lag behind their sighted peers with respect to reading. The visual requirements for reading and the implications of vision impairment on reading in adults have been fairly well characterized. However, very little work has been done to understand reading development among children with impaired sensory input. The long-term goal is to develop interventions to improve reading among children with low vision.

2018 Funding

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<td>Biolight Engineering LLC</td>
<td>Co-Investigator</td>
<td>A Holographic Waveguide Display Based Low Vision Eyewear</td>
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<tr>
<td>Administration for Community Living/DHHS</td>
<td>Principal Investigator</td>
<td>Prognostic Indicators for Reading and Pediatric Vision Impairment</td>
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Recent work has shown that visual acuity is not associated with reading ability in kindergarten and first grade children with low vision. Automaticity (the ability to perform a task effortlessly) for identifying letters, numbers or colors, however, is strongly associated with reading ability. Dr. DeCarlo’s lab will be following these children as they develop reading fluency to determine which factors are most important for reading.
The eye is a pressure vessel, and Dr. Downs’ research team believes that the eyes of each person deform differently in response to intraocular pressure (IOP). To investigate the relationship between IOP and glaucoma, the team studies the eye as a mechanical pressure vessel using a combination of engineering-based experimental and computational approaches. Experimentally, they build high-resolution, 3D reconstructions of the optic nerve head to characterize the changes in its morphology that occur in response to elevated IOP, and harvest cells from the eye to study their responses to elevated cyclic mechanical stretch (mechanobiology). The results of this work will help improve the understanding of the role of IOP in glaucoma that will lead to improved clinical screening and diagnostic tools and eventual new treatments for this blinding disease.

**Key Discoveries**
- IOP, ocular perfusion pressure (OPP), and cerebrospinal fluid pressure (CSFP) are all incredibly dynamic. They change at multiple timescales from second-to-second through day-to-day. This is an important discovery, as these are the principle pressures (mechanical stresses) that affect biomechanics of the optic nerve head, the principle site of damage to the retinal axons in glaucoma. There is mounting evidence that suggests that mechanical strain fluctuations could be the driving force behind the tissue restructuring seen in glaucoma and could thereby directly contribute to the nerve death that causes blindness in this disease. Reducing IOP and CSFP fluctuation magnitudes could represent an entirely new treatment modality for the disease.
- Glaucoma is primarily a disease of the elderly, and it affects people of African descent at almost double the rate of those of European descent. The Downs’ Laboratory is the only group capable of measuring these pressures in awake unrestrained research subjects.
Living with a chronic health condition or traumatic injury can be life-altering for patients and their families. While many individuals adapt well, a subset are at increased risk for poor adjustment which, if unaddressed, can further compromise health outcomes, quality of life, and recovery. Dr. Dreer’s clinical research lab has a lifespan approach (e.g., pediatric to geriatric) across various medical issues (e.g. eye diseases; traumatic brain injuries) and among civilians and military. Broadly speaking, the focus of her research aims to understand the relationships between biopsychosocial factors and health outcomes among patients and their caregivers when adjusting to a chronic medical condition or traumatic injury; develop cutting-edge, behavioral health interventions designed to improve health outcomes including emotional, physical, social, and functional adaptation; and reduce health disparities.

2018 Funding

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<td>Administration for Community Living/DHHS</td>
<td>Co-Investigator</td>
<td>University of Alabama at Birmingham Traumatic Brain Injury Model System: Disability and Rehabilitation Research Program</td>
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Dr. Dreer runs a group at UAB Callahan Eye Hospital called UAB Connections, a psychoeducational support group that provides a more comprehensive clinical service that can help both patients and their families adjust to the challenges of living with an eye condition or injury. This group is open to adults over the age of 18, as well as their family or close friends.

Top Publications


Key Discoveries

• Several key findings, particularly in understudied areas of health outcomes research, highlight the importance of an integrative medicine approach for patients beyond traditional medical treatments alone (e.g., surgery, medications). In particular, Dr. Dreer’s findings in the areas of resilience, health, and lifestyle behaviors, as well as the influential yet understudied role of spirituality on patient health care behaviors and perception of chronic disease, demonstrate that they are important aspects of patient beliefs and should be taken into consideration.

• Several key discoveries have demonstrated the influential role of behavioral health-related factors in chronic disease management. Dr. Dreer’s work in behavioral health program development and implementation in understudied areas has shown that, by addressing these factors as part of an integrative medicine approach, health outcomes as well as patient and caregiver adjustment can be significantly improved.
**Massimo A. Fazio, Ph.D.**
Assistant Professor

**Dr. Fazio’s work is focused on developing customized methods and non-contact optical techniques to measure full-field deformations on loaded materials. The aim is to gain a better and deeper understanding of the local biomechanical properties of ocular tissues and the ocular coats. His research efforts are focused on improving the technical ability to quantify, estimate, and predict the biomechanical response of the ocular tissue coats to intraocular pressure (IOP). He has developed next-generation imaging techniques to measure local IOP-dependent deformations of the ocular coats at an unmatched nanometer precision. As a mechanical engineer with a solid foundation in machine construction, experimental mechanics, and biomechanical characterization of soft tissues, Dr. Fazio has gained the multidisciplinary expertise needed to investigate the biomechanical properties of the ocular coats and how they change due to age, race, and ocular diseases like glaucoma and myopia.**

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### 2018 Funding

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<td>African Descent and Glaucoma Evaluation (ADAGES) IV: Alterations of the Lamina Cribrosa in Progression</td>
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<tr>
<td>National Eye Institute (R01)</td>
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<td>Determinants of the Biomechanical Behavior of the Human Lamina Cribrosa</td>
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<td>Co-Investigator</td>
<td>Scleral Remodeling in Myopia</td>
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<td>National Eye Institute (R01)</td>
<td>Co-Investigator</td>
<td>The Influence of Ocular Remodeling on Glaucoma</td>
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<tr>
<td>National Eye Institute (R01)</td>
<td>Co-Investigator</td>
<td>Targeting Calcification/ Stiffness in Glaucoma with Matrix Gla</td>
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<tr>
<td>Research To Prevent Blindness</td>
<td>Co-Investigator</td>
<td>Physician Scientist Award</td>
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### Top Publications


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### Key Discoveries

- Determined that regions of highest biomechanical strain within the laminar cribrosa correlate with regions of glaucomatous injury, and validated multi-camera speckle interferometer for dynamic full-field 3D displacement measurement during inflation testing of a human eye sclera.

- Demonstrated that the changes in the biomechanical behavior of the lamina cribrosa differ significantly across individuals of African and European ancestry. These changes may explain the differential susceptibility to glaucomatous injury seen with age between these two population groups. Using next-generation imaging techniques to measure local IOP-dependent deformations of the ocular coats at an unmatched nanometer precision, Dr. Fazio has determined that the sclera becomes significantly more rigid with aging in individuals of African ancestry compared to those of European ancestry. These changes may explain the differential susceptibility to glaucomatous injury seen with age between these two population groups.
Dr. Gamlin’s research focuses on the visual system and eye movements in health and disease. In one line of research, Dr. Gamlin is studying the way the brain controls the eye movements required to look at objects at different distances (i.e., vergence, ocular accommodation, and pupillary responses). The goal of this line of research is to understand the ways the brain normally processes visual information to guide these eye movements in order to better understand the abnormal processing that underlies amblyopia and strabismus. In a separate line of research, Dr. Gamlin is investigating the use of gene therapy targeted to either photoreceptors or retinal ganglion cells for the treatment of blinding diseases.

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<td>Principal Investigator</td>
<td>Intrinsically Photosensitive Retinal Ganglion Cells and their Central Projections</td>
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<td>National Eye Institute (R01)</td>
<td>Principal Investigator</td>
<td>Midbrain Circuitry for Neuronal Control of Gaze</td>
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<td>Research To Prevent Blindness</td>
<td>Principal Investigator</td>
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<td>Editas Medicine</td>
<td>Principal Investigator</td>
<td>Gene Editing using the CRISPR/Cas9 System in Primate Retina</td>
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<td>Lacerta Therapeutics Inc.</td>
<td>Principal Investigator</td>
<td>Lacerta-Pitzer joint project to identify Optimum AAV Variants for CNS Gene Therapy</td>
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<td>National Science Foundation</td>
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<td>RII Track-2 FEC Bridging Cognitive Science and Neuroscience Using Innovative Imaging Technologies</td>
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<td>Developing Efficient AAV Vectors for Photoreceptor Targeting via the Vitreous</td>
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<td>University of Florida</td>
<td>Co-Investigator</td>
<td>Clinical Trial Readiness for AAV-Mediated Gene Therapy in Friedrich’s Ataxia</td>
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<tr>
<td>National Institute of Neurological Disorders and Stroke</td>
<td>Co-Investigator</td>
<td>Optimizing AAV Vectors for Central Nervous System Transduction</td>
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<td>Co-Investigator</td>
<td>UAB Vision Science Research Center - Instrument Core</td>
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<tr>
<td>Bright Focus Foundation</td>
<td>Other (Collaborator)</td>
<td>Continuous Telemetric Measurement and Chronic Control of Cerebrospinal Fluid Pressure</td>
</tr>
<tr>
<td>University of Pittsburgh</td>
<td>Consultant</td>
<td>Melanopsin Photosensitivity and Psychopathology</td>
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</table>

### Key Discoveries

- Dr. Julie Quinet from Dr. Gamlin’s laboratory reported the existence of a previously unknown class of neuron in the primate midbrain that appears to encode the requisite signals to rapidly make the correct eye movements in depth to objects at different locations. The Gamlin lab has also shown the use of CRISPR/Cas9 to edit the DNA of primate photoreceptors.
- Dr. Gamlin’s lab, with collaborators, has optimized a therapeutic AAV vector construct by showing that GRK1 (rather than IRBP) is a more efficient promoter for targeting gene expression to both rods and cones in nonhuman primates. His result provides the critical molecular components to construct a therapeutic viral vector optimized for RPGR-XLRP patients.

### Top Publications

Dr. Girkin’s research explores the mechanisms underlying the greater predilection to develop glaucomatous injury in individuals of African descent. This is explored through patient-oriented research, including: 1) structural and functional evaluation of the optic nerve; African Descent and Glaucoma Evaluation Study (ADAGES I and II); 2) in-vivo studies imaging the lamina cribrosa (ADAGES IV); 3) 3D histomorphometric studies optic nerve; Digital Optic Nerve Reconstruction (DONOR) study; and 4) in-vivo and ex-vivo ocular biomechanical testing; Alabama Living Eye Project (ALEP).

### 2018 Funding

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<td>Determinants of the Biomechanical Behavior of the Human Lamina Cribrosa</td>
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<td>African Descent and Glaucoma Evaluation (ADAGES) IV: Alterations of the Lamina Cribrosa in Progression</td>
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<tr>
<td>National Eye Institute (R01)</td>
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<td>Enhancing Glaucoma Medication Adherence Among African Americans</td>
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<td>National Eye Institute (R01)</td>
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<td>Perceptual Mechanisms Underlying Reading Difficulties in Glaucoma</td>
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<td>Early Detection of Glaucoma Progression Using a Novel Individualized Approach</td>
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<td>National Eye Institute (R01)</td>
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<td>Optic Nerve Head Mechanobiology in Glaucoma</td>
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<td>National Eye Institute (R21)</td>
<td>Consultant</td>
<td>Validation of the Tree Shrew as a Model of Glaucoma</td>
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</table>

### Top Publications


### Key Discoveries

- Defined age- and race-related differences in the three-dimensional histoarchitecture of the load bearing connective tissue of the human optic nerve head that may drive differences in ocular biomechanics.
- Demonstrated that aging alters the morphology and biomechanical behavior of the lamina cribrosa differentially across individuals of African and European ancestry.
- Drs. Girkin and Fazio demonstrated that regions of highest strain within the human optic nerve co-localizes to regions of severe glaucomatous remodeling of the lamina cribrosa.
Discovery

Maria Grant, M.D.
Eivor and Alston Callahan, M.D., Endowed Professor

Dr. Grant’s research team is focused on understanding the molecular mechanisms responsible for the pathogenesis of diabetic retinopathy. They have examined the impact of bone marrow on retinopathy progression. Specifically, they have shown that diabetes results in denervation of the bone marrow, resulting in a shift in hematopoiesis toward the generation of increased numbers of myeloid cells and reduced numbers of vascular reparative cells. More recently, Dr. Grant’s lab has shown the microbiome in diabetes can be favorably altered by intermittent fasting, which results in modification of secondary bile acid synthesis and the production of TUDCA, a neuroprotective bile acid that prevents development of diabetic retinopathy.

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<td>National Eye Institute (R01)</td>
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<td>A Critical Role for Intracellular VEGF Receptor Translocation in Ocular Angiogenesis</td>
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<tr>
<td>National Eye Institute (R01)</td>
<td>Principal Investigator</td>
<td>Human iPSC for Repair of Vasodegenerative Vessels in Diabetic Retinopathy</td>
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<td>National Eye Institute (R01)</td>
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<td>LXR as a Novel Therapeutic Target in Diabetic Retinopathy</td>
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<td>National Eye Institute (R01)</td>
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<td>Somatostatin Blockade of CNS Autonomic Hyperactivity for Treatment of Diabetic Retinopathy</td>
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<td>National Eye Institute (R01)</td>
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<td>ACE2 Modulates the Bone Marrow- Gut Axis in Diabetic Retinopathy</td>
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<td>State University of New York</td>
<td>Principal Investigator</td>
<td>Optimizing Systemic Stem/Progenitor Cell Therapy for AMD</td>
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<td>Indiana University</td>
<td>Principal Investigator</td>
<td>Regulation and Function of the Matricellular Protein CCN-1 in Ischemic Retinopathy</td>
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<tr>
<td>Michigan State University</td>
<td>Principal Investigator</td>
<td>Dyslipidemia and Diabetic Retinopathy</td>
</tr>
<tr>
<td>Indiana University</td>
<td>Co-Investigator</td>
<td>Ferrochelatase as a Mediator of Ocular Angiogenesis</td>
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</table>

Key Discoveries

- Her lab has identified that intermittent fasting can prevent the development of diabetic retinopathy. It also showed that limb electroacupuncture (EA) performed in rats and humans increased functional connectivity between the anterior hypothalamus and the amygdala, and mobilized mesenchymal stem cells (MSCs) into the systemic circulation. In human subjects, the source of the MSC was found to be primarily adipose tissue, whereas in rodents the tissue sources were considered more heterogeneous.

Left: Long-term intermittent fasting results in prevention of diabetic retinopathy. It does so by restructuring the microbiome, which leads to the generation of secondary BAs such as TUDCA. TUDCA can elicit protective effects in the retina via activation of TGR5.

Right: Dr. Grant’s lab is focused on understanding the molecular mechanisms responsible for the pathogenesis of diabetic retinopathy.
Our eyes are composed of living tissues, which grow and remodel in response to mechanical, chemical, and visual stimuli. The Grytz lab seeks to understand the biomechanical mechanisms that underlie growth and remodeling in the eye during physiological conditions and diseases such as myopia, glaucoma, and keratoconus. Ongoing projects include the investigation of visually guided mechanisms controlling the axial length of the eye through scleral remodeling, loss and weakening of stromal collagen in keratoconus, and the IOP-dependent remodeling of the optic nerve head in glaucoma. The Grytz lab develops experimental and computational methods to image, quantify, alter, and simulate growth and remodeling mechanisms at various length scales that range from the molecule to the organ. The laboratory's goal is to develop personalized treatment strategies to control pathologic growth and remodeling in ocular diseases using predictive computational simulation tools.

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<td>Scleral Remodeling in Myopia</td>
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<tr>
<td>National Eye Institute (R01)</td>
<td>Principal Investigator</td>
<td>The Influence of Ocular Remodeling on Glaucoma</td>
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</table>

**Top Publications**


**Key Discoveries**

- Dr. Grytz's research results suggest that scleral growth and scleral remodeling are two independently controlled mechanisms during eye development, where scleral growth is mainly controlled by genetic factors and scleral remodeling is driven by genetic factors and the eye’s visual experience.
- Additional findings suggest that eye elongation in myopia is caused by a remodeling mechanism that modulates the crimp of the scleral collagen microstructure.
- Dr. Grytz also identified age- and race-related differences in scleral material properties that result in a loss of scleral compliance due to a higher shear stiffness and a lower level of stretch at which the collagen fibrils uncrimp. This loss of compliance may contribute to higher susceptibility to glaucoma in the elderly and in persons of African ancestry.
As our population ages, a growing number of people must adapt to normal and pathological aging processes and learn to cope with sensory and cognitive impairments. The main focus of Dr. Kwon’s research is to understand how visual perception and visual cognition can optimally adapt to structural and functional changes across the lifespan with the following specific goals:

- To characterize the statistical properties of the visual world altered by vision loss
- To understand how the brain encodes and learns to interpret degraded sensory information
- To understand how visual and cognitive processing adjusts and adapts to vision loss
- To understand how training/learning modifies visual processing in impaired vision

Top Publications


Kwon M, Nandy AS, Tjan BS. Rapid and persistent adaptability of human oculomotor control in response to simulated central field loss. *Current Biology*.


Key Discoveries

- Dr. Kwon’s lab investigates the impact of retinal ganglion cell pathology on human pattern vision. She is currently working on a set of studies aimed at evaluating structural and functional changes associated with ganglion cell damage.
- Dr. Kwon’s work has addressed how the visual system responds to drastic changes in visual inputs following the loss of foveal vision. Her lab has discovered that when foveal vision was disturbed by a simulated scotoma, observers quickly adopted a region in the peripheral retina for guiding eye movements. Her subsequent studies further revealed the development of a preferred retinal locus led to significant functional benefits, i.e., a reduction in crowding, increased reading speed, and improved spatial attention.

Using a high-speed eye tracker, the gaze positions of a patient’s eyes are being recorded while the patient is engaged in a reading task. This study aims to examine abnormalities in patterns of binocular eye movements following and its impact on reading performance.
Cynthia Owsley, Ph.D., MSPH
Nathan E. Miles, M.D., Endowed Chair of Ophthalmology

Dr. Owsley’s research focuses on aging-related vision impairment and eye disease. It uses a variety of research techniques, including psychophysics, epidemiology, clinical trials, and health services research methods and involves many types of multidisciplinary collaborations. Current focus areas include: (1) Functional biomarkers in early age-related macular degeneration (AMD) and relationships to retinal structure; (2) Vision impairment and driving, including the identification of visual risk factors for increased motor vehicle collision rates; (3) Health services research to improve the quality of and access to eye care for underserved older populations, including strategies to increase eye care utilization rates and the use of telemedicine; (4) Vision impairment and everyday task performance and quality of life, including the development and validation of patient-centered outcomes.

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<td>National Eye Institute (R01)</td>
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<td>Older Drivers and Vision Impairment: Naturalistic Driving Studies</td>
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<td>National Eye Institute (R01)</td>
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<td>In Vivo Ultrastructure of Chorioretinal Disease</td>
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<td>National Eye Institute (R01)</td>
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<td>Processing Speed Training to Preserve Driving and Functional Competencies in MCI</td>
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<td>National Institute of Child &amp; Human Development (R01)</td>
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<td>Promoting Transportation Safety in Adolescence</td>
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<td>National Eye Institute (K23)</td>
<td>Co-Mentor</td>
<td>Using Telemedicine to Improve Glaucoma Care: An Emerging Eye Care Delivery Model</td>
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<td>Center for Translational Research on Aging and Mobility - Core A: Management and Administration Core</td>
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<td>University Hospital Wuerzburg, Germany</td>
<td>Principal Investigator</td>
<td>Intracellular Granules of Human Retinal Pigment Epithelium Cells</td>
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<td>University of Alabama Health Services Foundation</td>
<td>Principal Investigator</td>
<td>In-Vehicle Recording System Core Resource for Naturalistic Driving Research</td>
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<td>Research To Prevent Blindness</td>
<td>Co-Investigator</td>
<td>Unrestricted Grant</td>
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<tr>
<td>Virginia Tech Transportation Institute</td>
<td>Co-Investigator</td>
<td>Examining the FMCSA Vision Standard and Vision Waiver for Commercial Motor Vehicle Drivers</td>
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Top Publications


Key Discoveries

- Older drivers using cell phones while driving have a 3.8 times higher risk of collision involvement as compared to those who did not use their cell phones. Findings highlight the need for improved education of ophthalmologists and ophthalmology residents about referral for low-vision rehabilitation services for these vulnerable patients.
- Identified the first functional biomarker (risk factor) for incident age-related macular degeneration (AMD), namely slowed rod-mediated dark adaptation. Slowed dark adaptation is also associated with other risk factors for AMD.
The key to determining how aggressive therapy should be for glaucoma patients hinges on determining the presence and rate of progression. The primary goal of Dr. Racette’s clinical research lab is to develop methods to minimize vision loss in patients with glaucoma. Her current NIH-funded research focuses on developing an individualized approach to detect and monitor glaucoma progression as early as possible in the disease process. To achieve this goal, the lab jointly uses different measures of structural and functional integrity within an individualized framework. The team is also interested in understanding the impact of race and adherence on glaucoma progression.

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<td>National Eye Institute (RO1)</td>
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<td>Early Detection of Glaucoma Progression Using a Novel Individualized Approach</td>
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This is an illustration of how progression is determined using the individualized dynamic structure-function model for early detection of glaucoma progression. The solid black circle represents the amount of change observed for a pair of structural and functional tests over time. By comparing this point to the distribution of all possible values of change for this patient, we can determine whether progression has occurred based on different criteria.

### Top Publications

- Chu FI, Marin-Franch I, Ramezani K, Racette L. Associations between structure and function are different in glaucoma and healthy eyes. *PLOS One.* 2018.13(5).

### Key Discoveries

- In a short follow-up series, retinal nerve fiber layer thickness is the best parameter to identify progressing eyes. Combining this parameter with other structural or functional measurements does not improve the detection of progression in glaucoma patients. Each test, however, uniquely identifies some eyes as progressing, suggesting that the use of retinal nerve fiber layer thickness alone would lead to some progressing eyes being missed. The study also showed that individualized models can identify visual field progression at least as effectively as models based on population statistics. After adjusting for the false positive rates, the study found that individualized models perform better than models based on population statistics. This suggests that individualized models may improve the detection of glaucoma progression.
- The lab has developed an individualized dynamic structure-function model to detect and identify glaucoma progression. This model has been validated in an independent cohort and has better prediction accuracy in short follow-up series. The lab has shown that progression occurs differently in different patients. While retinal nerve layer fiber thickness is the best parameter to identify progression, other tests and parameters uniquely identify progression in some patients. Progression can be detected on structure up to three years before its detection occurs on function and vice versa in different patients. Taken together, these findings show that all patients do not progress in the same manner. This underscores the need to use an individualized approach to identify glaucoma progression.
As a clinician-scientist focusing on health services research, Dr. Rhodes’ public health and research goal is to explore and develop novel methods of health care delivery—such as telemedicine—to efficiently and effectively increase access to care and prevent blindness. She aims to do this by providing quality, cost-effective glaucoma and eye care to a rapidly growing aging population.

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<td>National Eye Institute (R01)</td>
<td>Co-Investigator</td>
<td>IOP and OPP Fluctuation as Risk Factors for Glaucoma</td>
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<td>University of California, San Diego</td>
<td>Co-Investigator</td>
<td>ADAGES III: Contribution of Genotype to Glaucoma Phenotype</td>
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</table>

Above: This image shows slight changes over seven years from glaucoma damage. Right: Dr. Rhodes reviews fundus photos taken of a patient at a remote clinic.

Top Publications


Key Discoveries

- Dr. Rhodes has developed and tested an evidence-based eye health education program provided within a retail-based telemedicine model that is effective at improving at-risk patients’ knowledge and perception about glaucoma.
- Dr. Rhodes’ lab has demonstrated a high patient acceptance of telemedicine-based approaches to glaucoma management.
Dr. Samuels is a clinician-scientist whose research interests are heavily aligned with his clinical interests. His independent laboratory focuses on understanding how glaucoma occurs and finding new treatment options for patients with this blinding disease. Through this work, he has become an expert in understanding the role of both intraocular pressure and intracranial pressure in the development of many ocular diseases such as glaucoma, idiopathic intracranial hypertension, and Spaceflight-Associated Neuro-ocular Syndrome (SANS), experienced by astronauts spending extended periods of time in microgravity. In addition to his independent work, Dr. Samuels maintains collaborations with world experts in glaucoma and ocular biomechanics both at UAB and throughout the country. He serves as a consultant for NASA and is co-primary investigator on their prospective Ocular Health Study in International Space Station astronauts.

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<td>National Eye Institute (U24)</td>
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<td>Retinal Ganglion Cell Replacement in Clinically Relevant Models of Optic Neuropathy</td>
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<td>National Eye Institute (R21)</td>
<td>Principal Investigator</td>
<td>Validation of the Tree Shrew as a Model of Glaucoma</td>
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<td>National Aeronautics and Space Administration (NASA): Solicitation</td>
<td>Co-Investigator</td>
<td>VIIP Simulations of CSF, Hemodynamics and Ocular Risk (VIIP SCHOLAR)</td>
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<td>Research to Prevent Blindness</td>
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<td>Tree Shrew Optic Nerve Head Biomechanics</td>
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<td>ADAGES III: Contribution of Genotype to Glaucoma Phenotype</td>
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### Top Publications


### Key Discoveries

- Dr. Samuels, in collaboration with Dr. Chris Girkin, has recently developed and validated a novel small animal model of glaucoma in the tree shrew. This model will be a valuable bridge between studies currently being done in rodents and those being considered for translation to humans. This work has led to an NIH-funded collaboration with Dr. Rafael Grytz on the connection between myopia (near-sightedness) and glaucoma. In addition, this work has led to an NIH Audacious Goals Initiative Grant in collaboration with Drs. Tonia Rex and Petr Baranov from Vanderbilt University and Harvard/Massachusetts Eye and Ear Infirmary, respectively.
- Dr. Samuels’ laboratory has discovered that stimulation of the dorsomedial/perifornical hypothalamic region of the brain causes increases in both intraocular and intracranial pressure. Interestingly, there is a time delay between the peak of these two responses. This leads to a significant shift in the translaminar pressure difference and may underlie part of the reason that glaucoma appears to progress with intraocular pressure fluctuation. In addition, his laboratory has discovered that the cells responsible are highly localized to this region of the brain and use a unique neurotransmitter. He has found a drug to target the receptors activated by these neurons and it appears that the fluctuations of eye pressure can be blocked in animal models.
Dr. Wang’s research aims to induce photoreceptor cell regeneration in-situ in the eye to replace faulty ones without cell transplantation procedures and the associated risks and complications. Because of the mammalian neural retina unable to regenerate its lost neurons, her research contrives a novel approach to photoreceptor regeneration—awakening, or tapping into, the regenerative potential of non-neural tissue/cells in the eye to produce new photoreceptors. Currently, her lab is investigating photoreceptor regeneration from Müller glia, which has become the center of attention in the field of retinal regeneration.

Despite the substantial resources devoted to the subject, two major limitations of Müller glia remain: (1) they lack robust cell proliferation activity and (2) they have limited capacity to give rise to photoreceptor cells. To overcome these barriers, we hypothesize that (1) Müller glia’s proliferation activity can be boosted by calorie restriction, a lifestyle intervention currently viewed as a powerful anti-aging strategy with an effect on rejuvenating aging stem cells and (2) the progeny cells of Müller glia proliferation have the potential to differentiate toward photoreceptor cells when primed by a proneural gene ngn1/3.

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<td>Research to Prevent Blindness</td>
<td>Other Significant Contributor</td>
<td>Unrestricted Grant</td>
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**Top Publications**


**Key Discoveries**

- Dr. Wang’s lab has preliminarily tested their hypothesis with experiments. Using cell cultures derived from Müller glia, they observed that a mimetic of calorie restriction promoted the development of stemness and ngn1/3 induced photoreceptor-like traits in otherwise Müller glia cells. The results supported an in-depth study using calorie restriction to activate an endogenous photoreceptor regeneration mechanism.
- Dr. Wang’s studies using mammalian RPE cell cultures and transgenic mice have produced results supporting the possibility of engaging endogenous cells, particularly RPE cells, for photoreceptor regeneration in the mammalian eye. Of particular importance is the presence of photoreceptor-like cells, RPE-like cells/tissue, and, less frequently, retina-like tissue at ectopic locations in transgenic mice created with DNA expressing proneural gene ngn1 from Bestrophin1 promoter (PVMD2-ngn1) or ngn3 from RPE65 promoter (PRPE65-ngn3). These results provided the first evidence for the feasibility of regenerating a significant number of photoreceptor cells and/or regenerating a retina in the mammalian eye through reprogramming non-photoreceptor-lineage cells.

Retina-like tissue in the subretinal space of a two-week-old PRPE65-ngn3 transgenic mouse. Shown are cross-section of the eye, with the anterior to the left and the posterior to the right. Panels from left to right: Bright-field view; Epi-fluorescence of DAPI staining of the nuclei; Epi-fluorescence of anti-recoverin immunostaining to mark photoreceptor cells.
Partnership

Since the Vision of Excellence Initiative’s inception in 2012, philanthropic partnerships have been a pivotal component of the UAB Department of Ophthalmology and Visual Sciences’ continued success. Supporters from the local community and beyond are an invaluable catalyst in creating tomorrow’s breakthroughs. We thank our philanthropic partners for making us one of the nation’s most productive and dynamic ophthalmology departments.
Committed to Pediatric Eye Care

Children are a population in need of routine eye exams, and early intervention and vision screenings are the most effective means of identifying children who may be at a high risk for eye diseases. More parents are having their children screened at an earlier age, creating an increased demand for pediatric eye care services. UAB Ophthalmology is prepared to meet this growing need through our Pediatric Eye Care Initiative.

The UAB Department of Ophthalmology and Visual Sciences is improving our pediatric eye care delivery by expanding clinical programs, developing novel telemetric approaches, educating the next generation of clinicians, and conducting innovative translational research. Since 2012, we have expanded our pediatric clinical service to include pediatric specialists who have over 65 combined years of practice experience, two low-vision providers, and five researchers. This represents the largest pediatric program of ophthalmologists, optometrists, and researchers in the region.

UAB Callahan Eye Hospital and the Department of Ophthalmology and Visual Sciences served over 167,000 children and adults last year, many of whom have the most vision-threatening conditions. UAB Callahan Eye Hospital is now the largest integrated subspecialty eye care group in Alabama. Our Pediatric Eye Care Initiative would not be possible without the support of our community partners. Gifts from the Monday Morning Quarterback Club, for example, support a pediatric ophthalmologist, optometrist, and eye care navigator. These specialists not only increase the number of patients we can serve in our community but also decrease the amount of time patients wait to be seen.

By supporting UAB’s Pediatric Eye Care Initiative, you can help us address these patients’ needs. To learn more, contact Morgan Quarles at nmrobinson@uabmc.edu.

Investing in the Future of AMD Research

Age-related macular degeneration (AMD) is a leading cause of vision loss among people age 50 and older. The disease strikes close to home for Jim Davis, an EyeSight Foundation of Alabama board member and a UAB Ophthalmology philanthropic partner, whose father, uncle, and grandmother were diagnosed with AMD. Davis says he knew there was a great need for AMD research and that scientific advancements in this area were entirely possible. To meet this demand and combat this devastating disease, he established the Dorsett Davis Discovery Fund in his father’s honor.

With the help of generous community partnerships such as the Dorsett Davis Discovery Fund, two of our leading researchers made a breakthrough in AMD research by discovering that certain genes are linked to the most prominent visual dysfunction characteristic of early AMD. To learn more about UAB Ophthalmology AMD research and this recent breakthrough discovery, please see page 13.
The following is a timeline of endowments created by our philanthropic partners that have fueled our department’s success since the inception of the Vision of Excellence Initiative.

**WINTER 2014**
Russell W. Read, M.D., Ph.D., is the Lorayne and Max Cooper Endowed Professor. He also serves as the residency training director for the UAB Ophthalmology Residency Training Program. Dr. Read’s clinical practice and research focuses on uveitis and ocular inflammatory disease.

**WINTER 2015**
Michael Boulton, Ph.D., serves as the Susan and Dowd Ritter/RPB Endowed Chair in Ophthalmology Research. Dr. Boulton has had a longstanding, highly prolific research career and is widely regarded as one of the world’s experts in macular degeneration and neovascularization of the retina.

**SPRING 2017**
Maria Grant, M.D., serves as the Eivor and Alston Callahan, M.D., Endowed Chair in Ophthalmology. Dr. Grant is a highly accomplished researcher in diabetes and retinal disease.

**SUMMER 2018**
The department’s glaucoma division has grown significantly since its inception in 1999 and now includes eight fellowship-trained glaucoma specialists. The Heersink Family Endowed Glaucoma Fellowship will help train the next generation of glaucoma specialists who will provide care and develop better treatment options for patients suffering with glaucoma.

**FALL 2018**
The department’s newest endowed chair, the Kelley and C.T. Fitzpatrick Endowed Chair in Ophthalmology, will reward a faculty member’s professional contributions, recognize the value of his/her research endeavors, safeguard the funding needed to continue our pioneering efforts in ophthalmology, and help us attract the very best talent to UAB.

Christine A. Curcio, Ph.D., is the inaugural holder of the White-McKee Endowed Professorship in Ophthalmology. Dr. Curcio focuses on aging and age-related macular degeneration (AMD). Her current research focuses on validating imaging technology to help ophthalmologists understand retinal microstructure using optical coherence tomography and retinal lipids using fundus autofluorescence imaging.

Brian C. Samuels, M.D., Ph.D., director of the Glaucoma Division and chief of staff of the UAB Callahan Eye Hospital, is the inaugural holder of the Dennis Endowed Professorship in Glaucoma Research. In addition to seeing general ophthalmology patients, Dr. Samuels’ area of expertise is the diagnosis and treatment of patients with glaucoma.
Readiness

UAB Ophthalmology is preparing the next generation of ophthalmologists to care for an aging population of patients living with blinding diseases. Glaucoma and age-related macular degeneration diagnoses are dramatically increasing with each passing year, and we continue to train those who will care for future patients with state-of-the-art treatment techniques and novel diagnostic tools. The UAB Ophthalmology Residency Training Program is at the graduate medical education forefront, and we are continuously adapting for ophthalmic care’s future.
Residents and Fellows

Third-Year Residents

- Bernard Dib, M.D.
- Robert "Hogan" Knox, M.D.
- Richard Martindale, M.D.
- Alex McGaughey, M.D.
- Nishi Shah, M.D.

Second-Year Residents

- Crystal Daigle, M.D.
- Setu Patel, M.D.
- Amol Sura, M.D.
- Jeffrey Tapley Jr., M.D.
- Robert "Connor" Wana, M.D.

First-Year Residents

- Jonathan Fuerst, M.D.
- Catherine "Cate" Gasper, M.D.
- Cole Gross, M.D.
- Allison McAlpine, M.D.
- Phillip "Barrett" Paulk, M.D.

Fellows

- Zakeya Al-Sadah, M.D.
- Logan Christensen, M.D.
- Peter Daniel, M.D.
- Luke Dolezal, M.D.
- Richard "Reese" Feist Jr., M.D.
- Matthew West, M.D.
- Christopher Lee, O.D.
- Katherine Orman, M.D.
- Hershel Patel, M.D.
- Kevin Wells, M.D.

- Neuro-Ophthalmology
- Retina
- Glaucoma
- Optometry Fellow
- Oculoplastics
- Retina
- Retina
- Retina
Glaucoma is the leading cause of irreversible blindness worldwide, and its prevalence is projected to more than double by 2050. In 1999, Christopher Girkin, M.D., MSPH, EyeSight Foundation of Alabama Chair, founded the Glaucoma Division within the UAB Department of Ophthalmology and Visual Sciences. He was the sole glaucoma specialist until Jason Swanner, M.D., joined UAB in 2003. Over the past 15 years, Drs. Girkin and Swanner have guided the division’s strategic growth, which now includes eight fellowship-trained glaucoma specialists and six Ph.D. research faculty, and offers two glaucoma fellowship training positions. It has established itself as one of the largest groups of clinicians and researchers in the country focused on treating patients and developing new methods to reduce the burden of blindness from glaucoma.

Brian Samuels, M.D., Ph.D., the Dennis Endowed Professor, Glaucoma Division director, and fellowship chair, addressed recent changes in the training programs aimed at preparing for the increased need for glaucoma patient care. “To date, our residency program has trained approximately 40 percent of the practicing ophthalmologists in the state of Alabama,” he says. “The UAB Department of Ophthalmology and Visual Sciences will always be prepared to accept any tertiary glaucoma referrals. However, we can reduce the travel burden on patients by ensuring that our residents, the future ophthalmologists of Alabama, are comfortable diagnosing and treating routine glaucoma cases. For this reason, we have doubled the time residents spend on the glaucoma rotation during the second year, with a focus on honing their expertise in the clinical and surgical management of glaucoma.

“Today, Dr. Girkin and the glaucoma faculty have trained 17 glaucoma clinical fellows and four research fellows. Last year, we also increased the number of glaucoma fellowship positions here at UAB from one to two per year. Many of our fellows remain in Alabama or the southeastern U.S., and they will be prepared to assist our general ophthalmology partners in caring for the most advanced glaucoma cases.”

Carson Bee, M.D., a recent fellowship graduate, has joined UAB Ophthalmology as an assistant professor with a focus on glaucoma care. “I was thrilled to match at UAB Ophthalmology because of the opportunity to train under world-class glaucoma specialists at one of the busiest programs in the country,” says Dr. Bee. “I knew I would complete the fellowship well-prepared to treat glaucoma patients of all types and complexities. I decided to stay at UAB Callahan Eye Hospital and join UAB Ophthalmology because it is a fantastic environment to practice ophthalmology and because of the department’s commitment to excellence in patient care.”

In addition to these clinical advances, the UAB Department of Ophthalmology and Visual Sciences continues to be a national leader with over $4 million in NIH-funded glaucoma research in fiscal year 2017-2018. Our glaucoma specialists, clinician-scientists, and researchers are focused on delivering unrivaled care for glaucoma patients and conducting groundbreaking research aimed at accelerating new discoveries for the diagnosis and treatment of glaucoma. Our glaucoma research program ranges from exploring the basic mechanisms of the disease to performing clinical studies in current patients to conducting community-based research that explores novel health care delivery models.
The Year in Review
Noteworthy accomplishments, highlights, and accolades from fiscal year 2018

October 2017
UAB School of Medicine recognized the EyeSight Foundation of Alabama for its significant philanthropic commitment to UAB over the past 20 years.

November 2017
UAB Ophthalmology held a reception for alumni and friends at Manning’s during the American Academy of Ophthalmology (AAO) annual meeting in New Orleans.

Parisa Dudley, O.D., joined UAB Ophthalmology as a clinical assistant professor.

December 2017
UAB Callahan Eye Hospital and Clinics and UAB Ophthalmology celebrated another successful year at the annual holiday party at B&A Warehouse.

UAB participated in the inaugural Southeastern Vision Research Conference. The conference is a collaboration among Emory University, the University of Alabama at Birmingham, and Vanderbilt University, which celebrates excellence in vision research and “nearest neighbor” interaction.

January 2018
UAB Ophthalmology hit a major milestone by ranking 6th in the U.S. in National Institutes of Health (NIH) funding, earning over $7.9 million in NIH grant support during calendar year 2017. The department now ranks fifth in FY 2018.

February 2018
UAB Connections, a group that provides support for those living with visual impairments, hosted its annual Dinner in the Dark. The event provides an opportunity for friends, family, and health care providers to experience a few hours without sight and gain some understanding of the daily challenges presented by vision impairment.

March 2018
The UAB Department of Ophthalmology changed its name to the UAB Department of Ophthalmology and Visual Sciences. The change reflects the comprehensive scope of services the department provides—from state-of-the art patient care to comprehensive education for the next generation of ophthalmologists to groundbreaking research.

April 2018
Christine A. Curcio, Ph.D., professor, was named the inaugural holder of the White-McKee Endowed Professorship in Ophthalmology.
Brian C. Samuels, M.D., Ph.D., associate professor, director of the Glaucoma Division, and chief of staff of UAB Callahan Eye Hospital, was named the inaugural holder of the Dennis Endowed Professorship in Glaucoma Research.

Sarah Jacobs, M.D., assistant professor, was selected as oculoplastics section editor for OphthoQuestions.

**May 2018**

UAB Ophthalmology hosted a successful Annual Clinical and Research Symposium at Ross Bridge Resort.

Harold Skalka, M.D, professor and former chair of UAB Ophthalmology, retired from the department.

**June 2018**

UAB Callahan Eye Hospital and Clinics hosted the inaugural Callahan Night at the Ballpark, an event for faculty, staff, and their families to come together for food, fun, and a ballgame at Regions Field.

UAB Ophthalmology celebrated with graduating residents and fellows at an event at the UAB Alumni House.

**July 2018**

Carson Bee, M.D., who completed his fellowship with UAB Ophthalmology, joined Callahan Eye Hospital and UAB Ophthalmology as an assistant professor.

UAB Ophthalmology welcomed the Class of 2021.

The Heersink family of Dothan made a gift to establish the Heersink Family Endowed Glaucoma Fellowship.

**August 2018**

UAB Ophthalmology held a reception at Galley & Garden to thank the International Retinal Research Foundation (iRRF) and honor Maria Grant, M.D., on her appointment to the Eivor and Alston Callahan, M.D., Endowed Chair.

Kelley and C.T Fitzpatrick made a generous gift to support the UAB Department of Ophthalmology and Visual Sciences’ mission.

**September 2018**

UAB Ophthalmology held a reception at the Wine Loft to celebrate several faculty achievements and say goodbye to a faculty member. Christine A. Curcio, Ph.D., was honored as the White-McKee Endowed Professor; Brian Samuels, M.D., Ph.D., was honored as the Dennis Endowed Chair in Glaucoma Research; and Yuhua Zhang, Ph.D., received well wishes on his future endeavors as he leaves the department.

Michael Callahan, M.D., joined UAB Callahan Eye Hospital.

Timothy Thompson, O.D., joined UAB Ophthalmology as an assistant professor.

Rett J. Grover, MSHA, was named the UAB Callahan Eye Hospital & Clinics CEO.

The 2020 Discovery Initiative came to a close after raising over $10 million.

Christine A. Curcio, Ph.D., presented on Capitol Hill at a congressional briefing titled “Understanding the ‘Dry’ Form of AMD to Develop Effective Treatments.”
Michael A. Albert Jr., M.D.  
Associate Professor  
Medical School: West Virginia University School of Medicine  
Residency: University of Alabama at Birmingham  
Fellowship: Retina Consultants of Alabama

Michael A. Callahan, M.D.  
Director, Oculoplastics; Professor  
Medical School: University of Alabama at Birmingham  
Residency: University of California, San Francisco  
Fellowship: Indiana University

Ann Marie Arciniegas-Bernal, M.D.  
Assistant Professor  
Medical School: University of Alabama at Birmingham  
Residency: Henry Ford Hospital, Detroit  
Fellowship: W. K. Kellogg Eye Center, University of Michigan

Martin S. Cogen, M.D.  
Director, Pediatric Ophthalmology and Strabismus; Professor  
Medical School: University of Alabama at Birmingham  
Residency: University of Alabama at Birmingham  
Fellowship: James Hall Eye Center/Scottish Rite Children’s Hospital

Rita Armitage, M.D.  
Assistant Professor  
Medical School: University of Kentucky  
Residency: University of Alabama at Birmingham

R. Jeffrey Crain, M.D.  
Director, Birmingham Veterans Affairs Medical Center Ophthalmology Service; Associate Professor  
Medical School: University of Alabama at Birmingham  
Residency: University of Alabama at Birmingham

Carson Bee, M.D.  
Assistant Professor  
Medical School: Oregon Health & Science University  
Residency: Medical College of Wisconsin  
Fellowship: University of Alabama at Birmingham

Christine A. Curcio, Ph.D.  
White-McKee Endowed Professor in Ophthalmology; Professor  
Doctoral Degree: University of Rochester  
Postdoctoral Training: Boston University School of Medicine; University of Washington School of Medicine

J. Waid Blackstone, M.D.  
Assistant Professor  
Medical School: University of Alabama at Birmingham  
Residency: University of Alabama at Birmingham

Dawn K. DeCarlo, O.D., M.S., MSPH  
Director, UAB Center for Low Vision Rehabilitation; Professor  
Master’s Degrees: University of Alabama at Birmingham School of Optometry; University of Alabama at Birmingham School of Public Health  
Doctoral Degree: University of Alabama at Birmingham School of Optometry  
Residency: Hines Central Blind Rehabilitation; Chicago West Side Veterans Administration Medical Center

Michael E. Boulton, Ph.D.  
Susan and Dowd Ritter/RPB Endowed Chair in Ophthalmology Research; Professor  
Doctoral Degree: Council for National Academic Awards, United Kingdom  
Fellowship: Institute of Ophthalmology, United Kingdom
J. Crawford Downs, Ph.D.
Professor
Master’s Degrees: Tulane University
Doctoral Training: Tulane University
Postdoctoral Training: LSU Eye Center, Louisiana State University

Laura E. Dreer, Ph.D.
Associate Professor
(Clinical Medical Rehabilitation Psychologist)
Master’s Degree: University of Hartford
Doctoral Degree: Central Michigan University
Postdoctoral Training: Duke University Medical Center (Neuropsychology); University of Alabama at Birmingham (Medical Rehabilitation Psychology)

Parisa Dudley, O.D.
Clinical Assistant Professor
Optometry Degree: University of Alabama at Birmingham School of Optometry

Andrew W. Everett, M.D.
Assistant Professor
Medical School: University of South Alabama
Residency: University of Alabama at Birmingham
Fellowship: University of Alabama at Birmingham

Massimo Antonio Fazio, Ph.D.
Assistant Professor
Master’s Degree: University of Calabria, Calabria, Italy
Doctoral Degree: University of Calabria, Calabria, Italy
Postdoctoral Fellowship: Devers Eye Institute, Portland, Oregon

Richard M. Feist, M.D.
Associate Professor
Medical School: University of Alabama at Birmingham
Residency: University of Illinois, Eye and Ear Infirmary
Fellowship: University of Iowa

Priscilla Fowler, M.D.
Director, Cornea Service; Assistant Professor
Medical School: University of South Alabama
Residency: University of Alabama at Birmingham
Fellowship: Wills Eye Institute

Marcela Frazier, O.D., MPH, FAAO
Associate Professor
Doctoral Degree: University of Alabama at Birmingham School of Optometry
Residency: University of Alabama at Birmingham School of Optometry

Paul D. Gamlin, Ph.D.
Professor
Doctoral Degree: Stony Brook University, New York
Postdoctoral Training: University of Alabama at Birmingham

Christopher A. Girkin, M.D., MSPH, FACS
Chair; EyeSight Foundation of Alabama Endowed Chair; Professor
Medical School: University of Arkansas
Residency: University of Alabama at Birmingham
Fellowship: Wilmer Eye Institute, Johns Hopkins University; Heed Fellow, Shiley Eye Center, University of California San Diego

Maria Grant, M.D.
Eivor and Alston Callahan, M.D., Endowed Chair in Ophthalmology; Professor
Medical School: University of Florida
Residency: University of Florida
Fellowship: University of Florida; The Wilmer Eye Institute, Johns Hopkins University

Rafael Grytz, Ph.D.
Associate Professor
Master’s Degree: Ruhr University Bochum, Germany
Doctoral Degree: Ruhr University Bochum, Germany
Postdoctoral Training: Devers Eye Institute, Portland, Oregon
**Tyler A. Hall, M.D.**
**Assistant Professor**
*Medical School:* Wright State University School of Medicine, Dayton, Ohio
*Residency:* University of Alabama at Birmingham
*Fellowship:* Emory University

**Sarah Mireles Jacobs, M.D.**
**Assistant Director, Oculoplastic; Assistant Professor**
*Medical School:* Mayo Medical School
*Residency:* Washington University in St. Louis
*Fellowship:* University of Washington

**D. Wade Joiner, M.D.**
**Associate Professor**
*Medical School:* University of South Alabama
*Residency:* University of Alabama at Birmingham
*Fellowship:* New York Eye and Ear Infirmary

**Lanning B. Kline, M.D.**
**Professor**
*Medical School:* Duke University
*Residency:* McGill University
*Fellowship:* Bascom Palmer Eye Institute, University of Miami; Montreal Neurological Institute

**MiYoung Kwon, Ph.D.**
**Assistant Professor**
*Doctoral Degree:* University of Minnesota
*Postdoctoral Training:* University of Southern California; Schepens Eye Research Institute, Harvard Medical School

**Sarah Dille Lee, O.D., MSPH, FAAO**
**Assistant Professor**
*Doctoral Degree:* University of Alabama at Birmingham School of Optometry
*Postdoctoral Training:* University of Alabama at Birmingham School of Public Health

**Marissa K. Locy, O.D.**
**Instructor**
*Doctoral Degree:* University of Alabama at Birmingham School of Optometry
*Postdoctoral Training:* University of Alabama at Birmingham

**Virginia Lolley, M.D., FACS**
**Assistant Professor**
*Medical School:* Tulane University School of Medicine
*Residency:* University of Alabama at Birmingham

**John O. Mason, M.D.**
**Associate Professor**
*Medical School:* University of Alabama at Birmingham
*Residency:* University of Alabama at Birmingham
*Fellowship:* Wills Eye Hospital, Philadelphia

**Andrew Mays, M.D.**
**Associate Professor**
*Medical School:* University of Alabama at Birmingham
*Residency:* University of Alabama at Birmingham
*Fellowship:* University of Florida

**Cecil James McCollum, M.D.**
**Director of Emergency Services, Clinical Assistant Professor**
*Medical School:* University of Alabama at Birmingham
*Residency:* University of Alabama at Birmingham
*Fellowship:* Duke University

**Cynthia Owsley, Ph.D., MSPH**
**Nathan E. Miles Chair of Ophthalmology; Director, Clinical Research Unit; Professor**
*Master’s Degree:* University of Alabama at Birmingham
*Doctoral Degree:* Cornell University
*Postdoctoral Training:* Northwestern University
Lyne Racette, Ph.D.
Associate Professor
Doctoral Degree: Carleton University, Ottawa, Canada
Postdoctoral Fellowship: University of California San Diego

Russell W. Read, M.D., Ph.D.
Residency Director; Max and Lorayne Cooper Professor of Ophthalmology Residency Training
Residency: University of Washington Seattle
Fellowship: Doheny Eye Institute, University of Southern California

Shilpa Register, O.D.
Clinical Assistant Professor
Optometry Degree: University of Alabama at Birmingham School of Optometry
Graduate Education: Ohio State University College of Education and Human Ecology
Postdoctoral Training: University of Alabama at Birmingham School of Medicine, Harvard University Extension School

Lindsay Rhodes, M.D.
Assistant Professor
Medical School: Northwestern University Feinberg School of Medicine
Residency: University of Alabama at Birmingham
Fellowship: University of Alabama at Birmingham

Carol Rosenstiel, O.D., FAAO
Director, Contact Lens Service; Associate Professor
Doctoral Degree: University of Alabama at Birmingham School of Optometry

Brian C. Samuels, M.D., Ph.D.
Dennis Endowed Professor in Glaucoma Research; Director, UAB Glaucoma Division; Director, UAB Glaucoma Fellowship; Chief of Staff, Callahan Eye Hospital; Associate Professor
Medical School: Indiana University
Residency: University of Alabama at Birmingham
Fellowship: Duke University

Harold Skalka, M.D.
Professor
Medical School: New York University
Residency: New York University
Fellowship: New York University

Jason C. Swanner, M.D., FACS
Medical Director of Callahan Eye Hospital Clinics; Professor
Medical School: University of South Alabama College of Medicine
Residency: University of Alabama at Birmingham
Fellowship: Massachusetts Eye and Ear Infirmary, Harvard School of Medicine

Kayla L. Thomason, O.D.
Clinical Instructor
Doctoral Degree: University of Alabama at Birmingham School of Optometry

Timothy Thompson, O.D.
Assistant Professor
Doctoral Degree: University of Alabama at Birmingham School of Optometry

Martin Thomley, M.D.
Associate Professor
Medical School: University of Alabama at Birmingham
Residency: Bascom Palmer Eye Institute, University of Miami
Fellowship: Bascom Palmer Eye Institute, University of Miami

Michael S. Vaphiades, D.O.
Director, Neuro-Ophthalmology and Electrophysiology Services; Professor
Medical School: University of New England
Medical Internship: Brown University
Residency: Loyola University
Fellowship: Michigan State University
Shu-Zhen Wang, Ph.D.
**Professor**
*Doctoral Degree:* Virginia Polytechnic Institute & State University  
*Postdoctoral Training:* Virginia Polytechnic Institute & State University; Wilmer Eye Institute, Johns Hopkins University School of Medicine

C. Douglas Witherspoon, M.D., FACS
**Professor**
*Medical School:* St. Louis University  
*Residency:* University of Alabama at Birmingham  
*Fellowship:* University of Tennessee

Yuhua Zhang, Ph.D.
**Associate Professor**
*Master’s Degree:* Chinese Sciences Academy, China  
*Doctoral Degree:* Tianjin University, China  
*Postdoctoral Training:* Beijing Institute of Technology; Auckland University, New Zealand