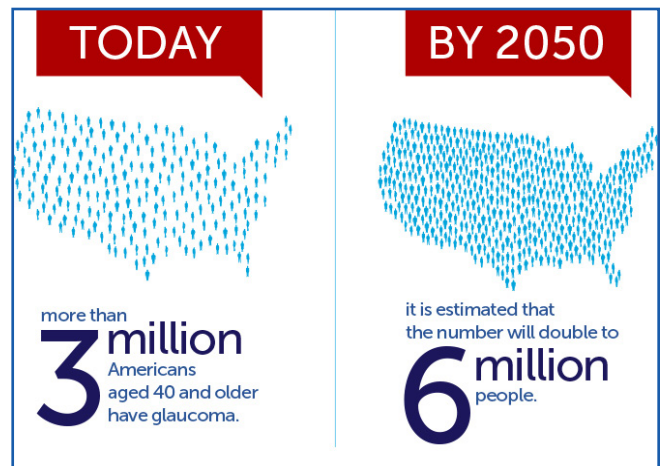


# National Glaucoma Research Current Grantees

Glaucoma is the second leading cause of blindness worldwide, according to the World Health Organization, affecting 60.5 million in 2010. Given the aging of the world's population, this number may increase to almost 80 million by 2020. More than three million Americans are living with glaucoma, 2.7 million of whom—aged 40 and older—are affected by its most common type, open-angle glaucoma. In the United States, glaucoma is a leading cause of blindness among African Americans and Hispanics.

Since National Glaucoma Research (NGR) began in 1978, more than \$28.6 million has been awarded to support research projects on the causes and potential prevention and treatment of this disease. The standard NGR grant is \$150,000 over two years. In the past three years alone, NGR has funded 43 research projects totaling \$5.9 million.

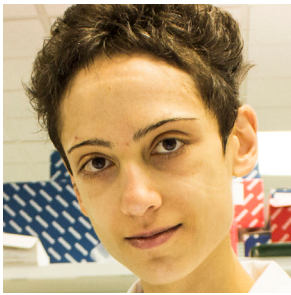


NGR is currently supporting 31 research projects. They are grouped into the following categories:

- Preventing Nerve Cell Death
- Targeting the Outflow Pathway
- Discovering New Ways to Treat Glaucoma
- Imaging and Exploring the Eye-Brain Connection
- Genetic Risk Factors and Prevention Strategies

## Preventing Nerve Cell Death

Glaucoma threatens sight by damaging the optic nerve, which is like a fiber optic cable carrying light signals from the eye to the brain. It is made up of a type of nerve cells called retinal ganglion cells (RGCs), which receive signals from the eye's photoreceptors and transmit those signals to the brain over long connecting fibers, called axons. Our knowledge of how and when glaucoma damages RGC cells remains imprecise. It's widely thought to be due to chronic elevated intraocular pressure (IOP), but there may be other factors involved. BrightFocus-funded research is looking at how inflammation, oxygen deprivation, and other factors threaten nerve health, and developing new ways to study and treat glaucoma at ever earlier stages, before optic nerve damage occurs. Novel therapies that render the optic nerve more resistant to injury are being studied and could transform glaucoma management in humans.



**Vicki Chrysostomou, PhD** (7/1/15 - 6/30/17)

Centre for Eye Research Australia, The University of Melbourne  
*Can Exercise Protect the Optic Nerve Against Glaucoma?*

*"In this project we will investigate how exercise may benefit the optic nerve, the structure joining the eye to the brain, which is primarily affected in the eye disease glaucoma."*

[www.brightfocus.org/grant/G2015125](http://www.brightfocus.org/grant/G2015125)



**Adnan Dibas, PhD** (7/1/15 - 6/30/17)

University of North Texas Health Science Center  
*Protecting Vision by Blocking Protein Channels*

*"The goal of the current study is to test whether the acid-sensing ion channel (ASIC), inhibitors may exert protective effects in the retina."*

[www.brightfocus.org/grant/G2015163](http://www.brightfocus.org/grant/G2015163)



**Jeffrey Goldberg, MD PhD** (7/1/15 - 6/30/17)

Stanford University  
*Neurodegenerative Strategies in Glaucoma*

*"Dr. Goldberg is conducting a phase 2 clinical trial where he will implant into the eye a tiny device, called NT-501 encapsulated cell therapy (NT-501 ECT)."*

[www.brightfocus.org/grant/C2015201](http://www.brightfocus.org/grant/C2015201)

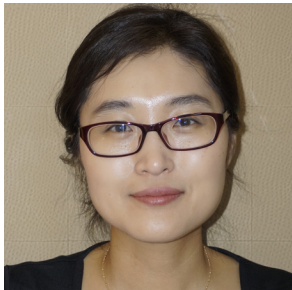


**Meredith Gregory-Ksander, PhD** (7/1/16 - 6/30/18)  
Schepens Eye Research Institute, Harvard, Massachusetts Eye & Ear  
*A New Method to Inhibit Inflammation and Prevent Glaucoma*

*"Our project identifies an important new regulator of inflammation in the optic nerve head and tests whether inhibiting this regulator will stop disease development and vision loss."*

[www.brightfocus.org/grant/G2016081](http://www.brightfocus.org/grant/G2016081)

**Recipient of The Thomas R. Lee Award for Glaucoma Research**



**Yonju Ha, PhD** (7/1/15 - 6/30/17)  
University of Texas Medical Branch at Galveston  
*Chemokine Receptor Signaling in Glaucoma*

*"The goal of the proposed research is to investigate the role of CXCL10/CXCR3 signaling during the pathogenesis of glaucoma related to inflammation, RGC death and optic nerve degeneration."*

[www.brightfocus.org/grant/G2015044](http://www.brightfocus.org/grant/G2015044)

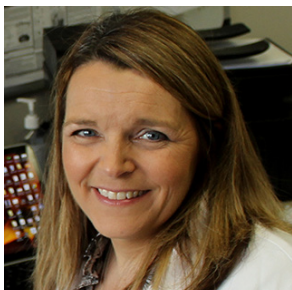
**Recipient of Marguerite Wilke Memorial Award for Glaucoma Research**



**Shahid Husain, PhD** (7/1/16 - 6/30/18)  
Medical University of South Carolina  
*Low Oxygen Mediated Proteins Play Pathological Role in Glaucoma*

*"The studies in this project seek to limit the up-regulation of neurotoxic proteins to slow/halt neuronal death in glaucoma."*

[www.brightfocus.org/grant/G2016157](http://www.brightfocus.org/grant/G2016157)



**Gillian McLellan, PhD** (7/1/16 - 6/30/18)  
University of Wisconsin-Madison  
*A New Treatment to Protect the Optic Nerve in Glaucoma*

*"This research seeks to understand how we might protect the optic nerve from damaging effects of a chemical growth factor, transforming growth factor beta (TGF- $\beta$ ) and will test a promising new treatment strategy for glaucoma patients by repurposing an existing drug to block TGF- $\beta$  and preserve vision."*

[www.brightfocus.org/grant/G2016129](http://www.brightfocus.org/grant/G2016129)



**Xiuqian Mu, MD, PhD** (7/1/16 - 6/30/18)

State University of New York at Buffalo

*Generating Retinal Ganglion Cells in a Dish to Study and Treat Glaucoma*

*"This proposal aims to improve existing procedures and establish new ones to generate retinal ganglion cells, the cells affected in glaucoma, in a petri dish. The cells thus produced will be used to study the reasons causing glaucoma, to screen for drugs to treat it, and to develop new therapeutic strategies."*

[www.brightfocus.org/grant/G2016024](http://www.brightfocus.org/grant/G2016024)



**Yvonne Ou, MD** (7/1/16 - 6/30/18)

University of California, San Francisco

*Understanding the Earliest Steps of Optic Nerve Cell Death in Glaucoma*

*"Our goal is to understand the earliest steps of injury to the optic nerve cell, or retinal ganglion cell (RGC), in glaucoma."*

[www.brightfocus.org/grant/G2016084](http://www.brightfocus.org/grant/G2016084)

**Recipient of The Douglas H. Johnson Award for Glaucoma Research**



**Daniel Sun, PhD** (7/1/16 - 6/30/18)

Schepens Eye Research Institute, Harvard, Massachusetts Eye & Ear

*Astrocyte Reactivity in the Glaucomatous Optic Nerve Head: Beneficial or Harmful for Vision?*

*"My research focuses on better understanding the role that a type of supporting cell, called astrocytes, plays in the biological process of glaucoma, primarily whether they help to slow down the vision loss in glaucoma or make it worse."*

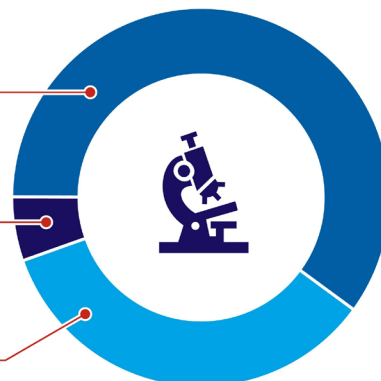
[www.brightfocus.org/grant/G2016137](http://www.brightfocus.org/grant/G2016137)

**2016  
BrightFocus  
Grants  
at a Glance**

**55%**  
BASIC RESEARCH GRANTS

**10%**  
CLINICAL RESEARCH GRANTS

**35%**  
TRANSLATIONAL RESEARCH GRANTS





## Targeting the Outflow Pathway

Elevated intraocular pressure (IOP) is present in most forms of glaucoma. This can happen when the fluid that constantly bathes the front of the eye, called aqueous humor, gets backed up. Normally it drains through a spongy tissue known as the trabecular meshwork (TM), which serves as the eye's main drainage channel. IOP can be affected by such factors as outflow volume and TM's stiffness, which is reported to be 20 times higher in individuals with glaucoma than in normal eyes. Unfortunately, most our knowledge of the outflow pathway is limited to fixed measurements representing a "snapshot" in time. New methods are being developed to assess the outflow pathway in "real time," lending insight into dynamic factors such as how tissues respond to changes in IOP. Several BrightFocus researchers are studying what goes wrong with the TM and other parts of the eye's drainage system, and looking for ways to help it work better.



**John W. Crabb, PhD** (7/1/15 - 6/30/17)

The Cleveland Clinic Foundation  
*Biomarkers for Glaucoma*

*"The proposed research will identify glaucoma-altered proteins in aqueous humor, the clear fluid at the front of the eye, in order to clarify disease mechanisms and help identify of biomarkers that will assist in caring for glaucoma patients."*

[www.brightfocus.org/grant/G2015039](http://www.brightfocus.org/grant/G2015039)



**Rudolf Fuchshofer, PhD** (7/1/16 - 6/30/18)

University of Regensburg (Germany)  
*Identifying Underlying Pressure-Control Mechanisms in Glaucoma*

*"The understanding of the functional role of miRNAs will be an important step toward restoring the homeostatic balance of the outflow regulation in the glaucomatous tissues and will lead to new therapies."*

[www.brightfocus.org/grant/G2016076](http://www.brightfocus.org/grant/G2016076)



**Haiyan Gong, MD, PhD** (7/1/16 - 6/30/18)

Boston University School of Medicine

*Mechanism of Decreased Giant Vacuole and Pore Formation in Glaucoma Using a Novel Method*

*"We propose to study two types of cellular interactions in the cells that line Schlemm's canal using a newly developed, advanced 3D electron microscopy technology.*

*[www.brightfocus.org/grant/G2016099](http://www.brightfocus.org/grant/G2016099)*



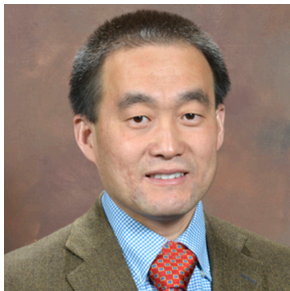
**Guorong Li, MD** (7/1/15 - 6/30/17)

Duke University Eye Center

*A Novel Non-Contact Method for Early Glaucoma Diagnosis and Monitoring*

*"The aim of this study is to understand the vibrant response of conventional outflow tissues to changes in IOP and to a conventional outflow drug, in real-time."*

*[www.brightfocus.org/grant/G2015100](http://www.brightfocus.org/grant/G2015100)*



**Yutao Liu, MD, PhD** (7/1/16 - 6/30/18)

Augusta University Research Institute, Inc.

*Identify New Drug Targets to Lower Eye Pressure Via Outflow*

*"The purpose of this project is to study how a short RNA molecule known as miR-182 may affect the outflow of aqueous humor, which is the clear liquid circulating in the front part of human eyes to bathe its lens and other delicate tissue."*

*[www.brightfocus.org/grant/G2016023](http://www.brightfocus.org/grant/G2016023)*



**Thao Nguyen, PhD** (7/1/15 - 6/30/17)

Johns Hopkins University

*Measuring the Effects of Structure on the Deformation of the Optic Nerve*

*"This project investigates the biomechanical environment of the human optic nerve head as it is affected by Intraocular pressure (IOP) with the goal of understanding the connection between IOP and glaucoma."*

*[www.brightfocus.org/grant/G2015132](http://www.brightfocus.org/grant/G2015132)*



**Darryl Overby, PhD** (7/1/15 - 6/30/17)  
Imperial College London  
*Mechanisms of Pressure Regulation in the Eye*

*"This project will determine whether mice mimic the regulatory mechanisms of eye pressure as occur in humans, so as to establish whether studies in mice are valid for identifying new drugs to lower eye pressure in humans."*  
[www.brightfocus.org/grant/G2015145](http://www.brightfocus.org/grant/G2015145)



**Chris Passaglia, PhD** (7/1/14 - 6/30/17)  
University of South Florida  
*A System for Measuring and Controlling Eye Pressure*

*"The aim of this project is to develop a wireless implantable device for continuous measurement of eye pressure."*  
[www.brightfocus.org/grant/G2014105](http://www.brightfocus.org/grant/G2014105)



**Lyne Racette, PhD** (7/1/14 - 12/31/16)  
Indiana University School of Medicine  
*A New Way to Predict and Monitor Progression in Glaucoma*

*"We propose a new model to detect glaucoma changes over time. This model will be tailored for each patient and tested in a different group of patients."*  
[www.brightfocus.org/grant/G2014096](http://www.brightfocus.org/grant/G2014096)



**Vijay Krishna Raghunathan, PhD** (7/1/15 - 6/30/17)  
University of Houston  
*Effects of Glucocorticoids on Trabecular Meshwork Mechanics and Composition*

*"In the proposed study, we will determine whether treatment with steroids alters cellular and matrix structure, composition, biomechanical attributes, and function."*  
[www.brightfocus.org/grant/G2015078](http://www.brightfocus.org/grant/G2015078)

## Discovering New Ways to Treat Glaucoma

In addition to whether the drainage system's working, biochemical changes in the fluid that travels through that pathway, and other factors, can affect pressure build-up. For example, in certain hereditary forms of glaucoma, mutated forms of an amyloid protein called myocilin are prevalent, creating large circular shapes that clump together and are difficult for the eye to dispose of, eventually becoming toxic to cells. Mutations in myocilin will be studied for clues to novel anti-glaucoma therapies. In another type of glaucoma known as exfoliation syndrome (XFS), the eye starts accumulating "white fluff" protein deposits that block fluid from exiting the eye. BrightFocus-funded projects are exploring new therapies to help the eye dispose of these forms of "cellular waste."



**Audrey Bernstein, PhD** (7/1/16 - 6/30/18)

Icahn Mount Sinai School of Medicine

*Use of Patient-Derived Cells to Test Compounds that Will Reverse Exfoliation Glaucoma*

*"Our goal is to reverse the effects of exfoliation syndrome (XFS), the leading identifiable cause of open-angle glaucoma."*

[www.brightfocus.org/grant/G2016151](http://www.brightfocus.org/grant/G2016151)



**Yiqin Du, MD, PhD** (7/1/14 - 6/30/16)

University of Pittsburgh

*Cell Therapy in a Mouse Model with Increased Eye Pressure*

*"This study will direct the development of cell-based therapies for glaucoma, which will lead to a revolutionary advance in treatment for glaucoma."*

[www.brightfocus.org/grant/G2014086](http://www.brightfocus.org/grant/G2014086)



**Raquel Lieberman, PhD** (7/1/16 - 6/30/17)

Georgia Institute of Technology

*Function and Dysfunction of Myocilin in Glaucoma: New Insight from Proteomics*

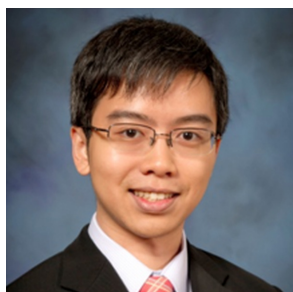
*"The aim of this research is to comprehend molecular changes in myocilin under experimental conditions in the lab that mimic glaucoma. Myocilin is closely associated with several forms of glaucoma."*

[www.brightfocus.org/grant/G2016027](http://www.brightfocus.org/grant/G2016027)



## Imaging and Exploring the Eye-Brain Connection

Glaucoma as a disease, stretches from the eye to the brain—and scientists are no longer focused solely on the eye when exploring its origins and impact. On this next frontier, new technology is making it possible to explore disease-related changes in real time. For example, elevated intraocular pressure (IOP) has long been thought to play a dominant role, but recent work suggests that fluid pressure surrounding the optic nerve when it enters the brain also may contribute, and are designing ways to measure the pressure in this territory. Evidence further suggests that glaucoma may impair the brain in ways that go beyond the visual pathway. Projects will use novel imaging techniques to visualize those changes and determine whether they can be stopped as an early strategy against glaucoma.



**Kevin Chan, PhD** (7/1/16 - 6/30/18)

University of Pittsburgh

*Early Brain Changes and Visual and Motor Functions in Glaucoma*

*“The goal of the project is to understand how glaucoma may impair the brain structurally and functionally within and beyond the visual pathway, and whether the brain changes in glaucoma are associated with early vision loss or balance and mobility impairments.”*

[www.brightfocus.org/grant/G2016030](http://www.brightfocus.org/grant/G2016030)



**J. Crawford Downs, PhD** (7/1/16 - 6/30/18)

University of Alabama at Birmingham

*A Wireless System to Measure and Control Fluid Pressure Around the Optic Nerve*

*“We have developed a new system to wirelessly measure and record the IOP continuously in research subjects, and we now want to extend that system to measure the pressure around the nerve exiting the eye.”*

[www.brightfocus.org/grant/G2016165](http://www.brightfocus.org/grant/G2016165)

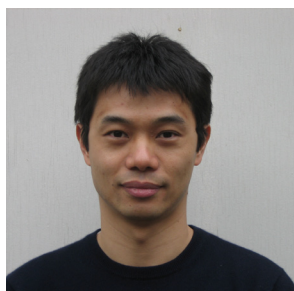


**Rafael Grytz, PhD** (7/1/15 - 6/30/17)  
University of Alabama at Birmingham  
*A New Methodology to Quantify Collagen Remodeling in Glaucoma*

*"The goal of this project is to develop a novel imaging and quantification methodology, and to use this methodology together with a new animal model to gain insight into the growth and remodeling mechanisms that underlie glaucoma."*

[www.brightfocus.org/grant/G2015115](http://www.brightfocus.org/grant/G2015115)

**Recipient of The Thomas R. Lee Award for Glaucoma Research**



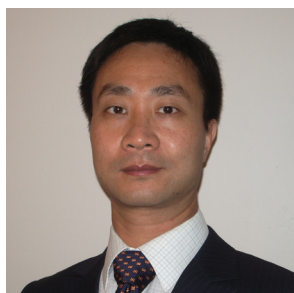
**Hyungsik Lim, PhD** (7/1/13 – 12/31/16)  
Hunter College (City University of New York)  
*A New Imaging Technique to Sensitive Detect Abnormal Changes in the Retinal Nerves*

*"The project goal of Drs. Lim and Danias is to detect glaucoma at an earlier stage than currently possible by means of a novel imaging technology."*

[www.brightfocus.org/grant/G2013143](http://www.brightfocus.org/grant/G2013143)

## Genetic Risk Factors and Prevention Strategies

There are dozens of genetic variants associated with glaucoma. While most genetic studies have been performed in persons of European descent, persons with African ethnicity have about a five-fold increased risk of developing primary open angle glaucoma (POAG), and have a more severe course of disease with a higher risk of blindness. Finding the genetic causes for glaucoma in African populations is critical. Other genetic studies aim to shed light on genetic factors contributing to forms of angle closure glaucoma, and whether some of the risk can be modified or prevented.



**Baojian Fan, MD, PhD** (7/1/14 – 6/30/17)  
Massachusetts Eye and Ear  
*Finding Genes that Cause Pigment Dispersion Syndrome and Pigmentary Glaucoma*

*"In our proposed research, we will use whole exome sequencing, a new and powerful technology, to find genes that can cause this common form of glaucoma."*

[www.brightfocus.org/grant/G2014107](http://www.brightfocus.org/grant/G2014107)



**Caroline Klaver, MD, PhD** (7/1/15 - 6/30/17)

Erasmus Medical Center (Netherlands)

*In Search of Genetic Causes for Glaucoma in African Populations*

*"With this project, we aim to find the genetic causes for glaucoma in African populations. This will help us understand why glaucoma is so common in Africa, provide us with knowledge on the causes of glaucoma, and help create means to cure and prevent this disease."*

[www.brightfocus.org/grant/G2015084](http://www.brightfocus.org/grant/G2015084)



**Julia Richards, PhD** (7/1/15 - 6/30/17)

University of Michigan

*Validating a New Angle-Closure Glaucoma Gene*

*"We will study a new angle closure glaucoma gene, MTRR, which we found by studying a large family with iris cysts. We will study the biochemical and functional changes to this protein that have been caused by the mutation."*

[www.brightfocus.org/grant/G2015202](http://www.brightfocus.org/grant/G2015202)

**Recipient of The Douglas H. Johnson Award for Glaucoma Research**



**Judith West-Mays, PhD** (7/1/15 - 6/30/17)

McMaster University

*Genes Involved in Closed Angle Glaucoma*

*"The goals of this proposal are to determine the genes involved in a group of developmental disorders known as anterior segment dysgenesis (ASD), which can lead to glaucoma, as well as create animal models of glaucoma to further understand the pathophysiology of the disease and how we may cure it."*

[www.brightfocus.org/grant/G2015052](http://www.brightfocus.org/grant/G2015052)

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*\*Note: These are the active National Glaucoma Research grants as of 7/1/2016.*



National Glaucoma Research, a BrightFocus Foundation program