# BrightFocus Glaucoma Fast Track

*Co-organizers & Co-chairs:*

*Abbot F. Clark, PhD*

*John C. Morrison, MD*

*Preeti Subramanian, PhD*

May 24, 2022 • 7:45 am ET

Emory Conference Center, Atlanta, Georgia

www.brightfocus.org/GFT2022

#GlaucomaFastTrack

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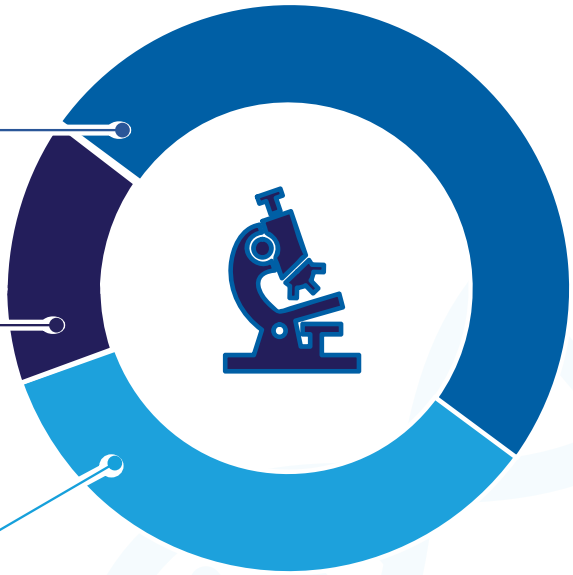

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# WELCOME TO THE BRIGHTFOCUS GLAUCOMA FAST TRACK℠ 2022 WORKSHOP!

As a longtime supporter of early-career scientists, BrightFocus Foundation is proud to organize and sponsor this immersive opportunity for emerging researchers to learn from, and interact with, leaders in this field. We are especially excited to hold the third BrightFocus Glaucoma Fast TrackSM as a pre-symposium to the ISER/BrightFocus 2022 Glaucoma Symposium.

At BrightFocus, our mission is clear: harness the power of science to end the conditions we fear most – loss of sight and loss of mind. Through our support of research on glaucoma, macular degeneration, and Alzheimer's disease and related dementias, we serve as an umbrella for scientific innovation in neurodegenerative disease research, uniquely positioned for experts to share discoveries about one disease to inform another. I encourage you to bring your most creative, most innovative ideas to BrightFocus.

We now offer Postdoctoral Fellowship grants to support early-stage scientists in glaucoma research. We are an independent, non-profit organization, free to support investigator-initiated research across borders and across disciplines. The world-class members of our scientific review committees seek out the untried, the unexpected, and the most promising. Since inception we have funded nearly $275 million in 25 countries.

For more information on our research opportunities please visit science.brightfocus.org or email at researchgrants@brightfocus.org.

Thank you for joining us today – I look forward to meeting every one of you. I hope that your time at Glaucoma Fast Track is meaningful and rewarding, accelerating your path toward scientific discovery. Please remember that your journey doesn't stop at the end of this workshop. As alumni of the BrightFocus Glaucoma Fast Track, please keep in touch with each other and with BrightFocus. We hope this experience sparks collaboration for years to come.

Sincerely

Diane Bovenkamp

Diane Bovenkamp, PhD
Vice President of Scientific Affairs

## Table of Contents



## Workshop Schedule and Program

**Workshop Goals**

The glaucoma research field continues to grow in size and scope. For people entering such a dynamic environment, acquiring an initial understanding of the disease becomes more difficult each year. This workshop offers graduate students, postdocs, and other early career researchers an immersive environment to learn and discuss foundational knowledge and recent discoveries through close interaction with established leaders in the field. By the end of this workshop, participants will have engaged in scientific discussions and networked with preeminent glaucoma experts and fellow early-stage researchers based in the U.S. and around the world. In addition, this program provides lines of communication and a networking opportunity for travel fellows and renowned scientific experts in the field of glaucoma.

## Workshop Organizing Sponsor

**BrightFocus Foundation**

*Stacy Pagos Haller, CEO and President*
*Diane Bovenkamp, PhD, Vice President, Scientific Affairs*
*Preeti Subramanian, PhD, Director of Scientific Programs, Vision Sciences*

https://science.brightfocus.org/event/glaucoma-fast-track-2022

Additional thanks to co-chairs Abbot F. Clark, PhD, and John C. Morrison, MD, for their advice and leadership in the planning of the workshop and speaker invitations.

## BrightFocus Glaucoma Fast Track Session Schedule

**All sessions will be held at the Emory Amphitheater.**

| | | |
|---|---|---|
| 7:45 AM | Introduction of BrightFocus Glaucoma Fast Track | *Preeti Subramanian, PhD, BrightFocus Foundation* |
| | Introduction of Fast Track Speakers | *John Morrison, MD, Oregon Health and Science University* |
| 8:00 AM | Clinical glaucoma | *Leon Herndon, MD, Duke University* |
| 8:25 AM | Epidemiology and public health impact of glaucoma | *Anne Coleman, MD, PhD, university of California, Los Angeles* |
| 8:50 AM | Q and A | |
| 9:00 AM | Human glaucoma genetics | *Michael Hauser, PhD, Duke University* |
| 9:25 AM | Glaucoma therapeutics in the pipeline and the future | *Kate Bollinger, MD, Medical College of Georgia* |
| 9:50 AM | Q and A | |
| 10:00 AM | Break (Amphitheater Break Area) | |
| 10:30 AM | OCT in the diagnosis and management of glaucoma | *Joel Schuman, MD, New York University* |
| 10:55 AM | New OCT developments and application to experimental glaucoma | *Yali Jia, PhD, Oregon Health and Science University* |
| 11:20 AM | Q and A | |
| 11:30 AM | Lunch (Dining Room) | |
| 12:30 PM | Biomechanics of ONH injury in glaucoma | *Vicky Nguyen, PhD, Johns Hopkins University* |
| 12:55 PM | Biomechanics of outflow dysfunction in glaucoma | *Mark Johnson, PhD, Northwestern University* |
| 1:20 PM | Q and A | |
| 1:30 PM | Inducible rodent models of glaucomatous optic nerve damage | *Colleen McDowell, PhD, University of Wisconsin* |
| 1:55 PM | Non-rodent models of glaucomatous optic nerve damage | *Gillian McLellan, PhD, University of Wisconsin* |
| 2:20 PM | Q and A | |
| 2:30 PM | Break (Amphitheater Break Area) | |
| 3:00 PM | Mechanisms of axonal injury in experimental glaucoma | *Denise Inman, PhD, University of North Texas* |
| 3:25 PM | RGC injury in glaucoma | *Richard Libby, PhD, University of Rochester* |
| 3:50 PM | Q and A | |
| 4:00 PM | Experimental models to study TM pathology | *Abe Clark, PhD, University of North Texas* |
| 4:25 PM | Cross-talk between glaucoma pathogenic signaling pathways in the TM | *Weiming Mao, PhD, Indiana University* |
| 4:50 PM | Q and A | |
| 5:00 PM | Adjourn | |

## About the Speakers, Workshop Organization Committee Members

**Kathryn Bollinger, MD, PhD**
Associate Professor, Ophthalmology
Director of Glaucoma Service

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Dr. Bollinger is a glaucoma specialist and Associate Professor of Ophthalmology at the Medical College of Georgia. Her laboratory is directed toward development of novel treatment strategies for glaucoma. The goal is to identify molecular pathways that can be manipulated to protect retinal ganglion cells (RGCs) under conditions of glaucomatous stress. Functional and structural measures are used to evaluate multiple rodent models of ocular hypertension-induced glaucoma. These techniques allow for probing of the effects of neuroprotective candidates in the whole animal as well as at cellular and molecular levels. Current projects include examining the molecular mechanisms of Sigma 1 Receptor (S1R) – mediated RGC neuroprotection. S1R is a unique transmembrane protein that is expressed in neuronal and glial cell types throughout the central and peripheral nervous systems, including the optic nerve head. Its cellular function is not well understood. However, in vivo and in vitro cellular stress studies have shown that activation of S1R provides robust protection of RGCs under glaucomatous conditions. Current work involves systemic administration of S1R agonists to evaluate their neuroprotective effects in rat models of induced glaucoma.

**Abbot (Abe) Clark, PhD**
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Abbot (Abe) Clark, PhD, FARVO is Regents Professor of Pharmacology & Neuroscience and Medical Education and served as the Executive Director of the North Texas Eye Research Institute (NTERI) at the University of North Texas Health Science Center (UNTHSC) in Ft. Worth, Texas. Prior to joining UNTHSC 14 years ago, Abe worked at Alcon Laboratories for 23 years, retiring as Vice President of Discovery Research and Head of Glaucoma Research. The major focus of his research has been on the discovery of molecular pathogenic pathways for glaucomatous damage to the aqueous humor outflow pathway, retinal ganglion cells, the optic nerve head and optic nerve, as well as vision centers in the brain in order to develop novel disease modifying therapies for glaucoma. Abe's laboratory has recently discovered both small molecule, gene therapies, and genome editing that prevent glaucoma-like damage to the eye and vision centers of the brain. Dr. Clark collaborates with a number of other investigators around the world in order to perform interdisciplinary and translational research. Abe's academic lab has been continuously funded by grants from the NEI, Department of Defense, and pharmaceutical/biotechnology companies. Dr. Clark has published more that 250 peer-reviewed scientific articles, 20 book chapters and is the editor of 2 ophthalmic textbooks. He is an inventor of more than 80 patents. Abe has given 140 invited national and international presentations of his research and has organized and/or chaired sessions in 28 national and international scientific meetings. He serves on the editorial boards of 3 ophthalmic journals as well as Molecular Neurodegeneration. Abe serves on study sections for the NEI, BrightFocus Foundation, The Glaucoma Foundation, and Fight for Sight. He has successfully trained 22 PhD students and 6 postdoctoral fellows. Under Abe's leadership, NTERI has grown and is committed to improving vision health, discovering new ophthalmic therapies through interdisciplinary translational research, and training future eye care providers and researchers.

**Anne L. Coleman, MD, PhD**
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Anne L. Coleman, M.D., Ph.D. is the Fran and Ray Stark Professor of Ophthalmology at the Jules Stein Institute, David Geffen School of Medicine, UCLA, and Professor of Epidemiology at the UCLA Fielding School of Public Health. She is the Director for the UCLA Center for Eye Epidemiology, the Mobile Eye Clinic, and the Center for Community Ophthalmologists and Vision Health. She is a member of the U.S. Food and Drug Administration Ophthalmic Devices Panel, the U.S. Cochrane Collaboration Eyes and Vision Steering Group, the Board of Trustees of Helen Keller International and the ARVO Awards Committee. She is the Chair of the NEI's National Eye Health Education Program Planning Committee, Director of the H. Dunbar Hoskins, Jr. M.D. Center for Quality Eye Care, executive editor of glaucoma for the American Journal of Ophthalmology, as well as the Secretary of Quality of Care for the American Academy of Ophthalmology. Her research is directed toward the diagnosis, treatment, and societal impact of visual impairment from uncorrected refractive error, glaucoma, cataracts, and age-related macular degeneration (AMD), including the study of lifestyle limitations imposed on patients with these kinds of eye diseases and disorders. She is a Co-Investigator for an NEI-funded study on immune response gene polymorphisms and AMD and a comparative effectiveness study on the treatment of open-angle glaucoma funded by the Agency for Healthcare Research and Quality (AHRQ). Clinical projects include a population-based study on the incidence of glaucoma and AMD in Thessaloniki, Greece; geographic variation in diagnostic and therapeutic procedures for eye diseases in the Medicare population; and prevention of visual impairment and blindness in school-aged children Dr. Coleman received her medical degree from the Medical College of Virginia where she earned membership in the Alpha Omega Alpha honor society. After a surgical internship at the Medical College of Virginia, she went to the University of Illinois of Chicago for her residency training in ophthalmology. She did a fellowship in Glaucoma at the Wilmer Eye Institute, Johns Hopkins University. She received a doctorate in Epidemiology from UCLA in 1997 and earned membership in the Delta Omega Honor Society.

**Michael Hauser, PhD**
Professor of Medicine and Ophthalmology
Duke Molecular Physiology Institute
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Dr. Michael Hauser has a long-standing interest in the genetics of glaucoma, and has participated in many genetic consortia, including the NEIGHBOR and NEIGHBORHOOD studies. Together with these groups and his longtime collaborator Dr. Rand Allingham, he identified genetic variants in the SIX6 gene that influence RNFL thickness, both in glaucoma cases and controls. Dr. Hauser also has a special interest in the genetics of glaucoma in individuals of African ancestry. To this end has collaborated with Dr. Adeyinka Ashaye at the University of Ibadan to establish the Eyes of Africa consortium, which is building a DNA and plasma resource based primarily in Nigeria. This group has identified variants in the APBB2 gene that increase risk of glaucoma specifically in African ancestry individuals, and are associated with increased levels of beta-amyloid in the retina. Dr. Hauser is now working to identify African ancestry specific polygenic risk scores that allow the identification of high-risk individuals for prioritized monitoring and treatment of glaucoma.

**Leon Walker Herndon, MD**
Professor of Ophthalmology
Chief, Glaucoma Division
Duke University School of Medicine

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I have an interest in exploring better medical and surgical ways to treat patients and will continue to be involved in clinical trials involving novel drug-delivery systems and new surgical procedures. I also have a research interest in the differential burden of glaucoma on African-derived populations. This question is multi-faceted, and involves a comprehensive evaluation of the genetics, economics, accessibility to treatment, and response to therapy of these populations.

**Denise Inman, PhD**
Associate Professor, Dept. of Pharmaceutical Sciences,
North Texas Eye Research Institute
University of North Texas Health Science Center

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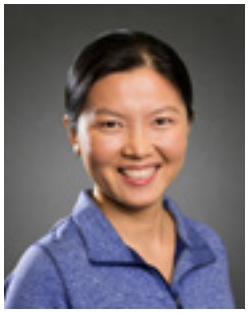
My laboratory investigates the mechanisms of glaucoma, with an emphasis on how neurons and glial cells interact during the process of neurodegeneration. Our research has implicated metabolism in glaucoma pathogenesis, finding that transfer of energy substrate is compromised and mitochondria are dysfunctional prior to axon loss. Restoration of metabolic transporters can protect retinal ganglion cells and their axons from degeneration and sustain mitochondrial function. We have also determined that retinal ganglion cell axons in the optic nerve lose their ability to respond to changing energy demands as a result of glaucoma-associated changes. By investigating the interaction of glial and retinal ganglion cell axon metabolism in the retina and optic nerve head, we hope to identify new targets and strategies for glaucoma treatment.



**Yali Jia, PhD**
Associate Professor of Ophthalmology and Biomedical Engineering
Jennie P. Weeks Professor of Ophthalmology
Casey Eye Institute, Oregon Health & Science University

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My primary interest is the development and evaluation of structural and functional optical coherence tomography (OCT) techniques for ophthalmic care. 1) Clinical OCT angiography (OCTA) is our research focus in the last decade. Our OCTA algorithm was implemented in commercial device for the first time, and then we lead the field on OCTA advances, including wide-field and high-resolution OCTA, artifact-free OCTA, deep learning-aided detection and quantification of retinal pathologies using OCT/OCTA. 2) OCT oximetry is our new direction. Motivated by understanding of the autoregulation of retinal circulation in response to retinal and optic nerve diseases, we pioneered the first fiber-based visible-light OCT to image the retinal oximetry in rodents, and have recently achieved this technique down to capillary level. Overall, my general research interests are (a) development of optical imaging techniques, including hardware and software (laboratory prototypes and technology commercialization); (b) clinical translation of our new technologies; (c) cutting-edge imaging of animal models for understanding ocular pathologies.

**Mark Johnson, PhD**
Professor
Departments of Biomedical Engineering, Mechanical Engineering and Ophthalmology, Northwestern University

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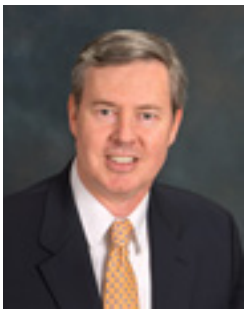
My research interests have been focused on ocular biomechanics, particular with regards to the pathogenesis of glaucoma and age-related macular degeneration. Studies in my group involve a bioengineering approach that utilize perfusion studies, atomic force microscopy and theoretical analysis in combination with use of high-resolution morphometry and finite element modeling. More generally, my work has been involved in the study of a variety of physiological transport and mechanics problems including flow through the aqueous humor outflow pathways as relates to glaucoma, transport and mechanics of the arterial wall, transport through the cornea, transport through macromolecular gels such as hyaluronic acid and Matrigel, and transport through Bruch's membrane. Recently, my group has been studying cell mechanics, particularly the role of the cortex, and novel mechanism of targeted drug delivery for treating glaucoma.



**Richard T. Libby, PhD**
Professor of Ophthalmology
Senior Associate Dean, Graduate Education and Post-Doctoral
University of Rochester Medical Center

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Dr. Libby did his doctoral work on the role of extracellular matrix in retinal development in Dr. William Brunken's laboratory (Boston College). After completion of his doctorate, he studied Usher Syndrome as a postdoctoral fellow in Dr. Karen Steel's Hereditary Deafness Group at the Medical Research Council's Institute for Hearing Research (Nottingham England). He continued his postdoctoral training in Dr. Simon John's laboratory (The Jackson Laboratory) where he began to study glaucomatous neurodegeneration. After he left Dr. John's laboratory, he started his own laboratory at the University of Rochester Medical Center focused on identifying the cell death pathways controlling retinal ganglion cell death in glaucoma. Currently, Dr. Libby is a Professor of Ophthalmology and Biomedical Genetics and Senior Associate Dean for Graduate Education and Postdoctoral Affairs at the University of Rochester Medical Center.

**Weiming Mao, PhD**
Associate Professor
Jay C. and Lucile L. Kahn Scholar in Glaucoma Research and Education
Showalter Scholar
Eugene and Marilyn Glick Eye Institute
Indiana University School of Medicine

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My research focuses on the trabecular meshwork and aqueous humor outflow. We use cell cultures, perfusion cultured human anterior segments, and mouse models to determine the molecular pathology in the glaucomatous trabecular meshwork. Our current projects include the study of the crosstalk between Wnt and TGF beta signaling, glucocorticoid-induced glaucoma, and cytoskeletal reorganization in the trabecular meshwork.

**Colleen McDowell, PhD**
Assistant Professor, University of Wisconsin-Madison

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My laboratory is dedicated to dissecting the molecular mechanisms responsible for glaucomatous trabecular meshwork damage, elevated IOP, as well as damage to the retina and optic nerve. Our approach utilizes in vitro, in vivo, and ex vivo model systems combined with advanced molecular genetics, physiology, and imaging techniques. Recently, work in our lab has focused on the Fibronectin extra domain A (FN-EDA) ligand and its role in glaucomatous conditions through Toll-like receptor 4 signaling.

**Gillian McLellan, BVMS, PhD, DACVO, DECVO, DVOphthal, MRCVS, FARVO**

Associate Professor, Tim and Nancy Speaker Chair in Canine Health

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Dr McLellan is a tenured professor and Chair of Surgical Sciences at the University of Wisconsin-Madison. She is a board-certified clinician-scientist-veterinarian with PhD and post-doctoral training in the fields of ophthalmology, cell biology and comparative ocular pathology, and experience in the conduct of GLP pre-clinical safety and efficacy studies. For over 15 years, her research has focused on the molecular and cellular mechanisms that underlie IOP dysregulation and neurodegeneration in glaucoma, including tissue, cellular and molecular genetic factors that determine susceptibility to loss of vision. She has established many productive inter-disciplinary collaborations, that incorporate electrophysiology, pharmacology, genomics, transcriptomics, advanced imaging, pathology and biomechanical engineering. Her studies of glaucoma span molecular pathology to whole animal pathology and the in vivo characterization of animal and human disease. Work in the McLellan lab also probes complex links between glaucoma and Alzheimer's-like pathology and cognitive dysfunction in mouse models and in companion animals. She has a strong interest in advanced imaging technologies, as Program Director responsible for the Multimodal Imaging for Animal Models of Eye Disease director of UW-Madison's Animal Models Vision Research Core, and as a member of the Wisconsin Advanced Imaging of the Visual System (WAIVS) laboratory steering committee.

**John C. Morrison, MD - Co-Chair, BrightFocus Glaucoma Fast Track Workshop Committee**

Casey Eye Institute, Oregon Health & Science University Portland, OR

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Dr. Morrison received his MD from the Oregon Health and Science University (OHSU), followed by an ophthalmology residency and glaucoma fellowships at OHSU and the Wilmer Eye Institute. He joined OHSU and the Casey Eye Institute in 1988 and is now the Fred P and Joan Thompson Family Professor of Ophthalmology. His research centers on understanding the cellular basis of glaucomatous optic nerve damage using rodent models of elevated intraocular pressure (IOP), a major glaucoma risk factor. Models include: (1) injecting episcleral veins with hypertonic saline to sclerose the trabecular meshwork and produce chronic IOP elevation; (2) short term, controlled elevation of IOP (CEI) under anesthesia in rats and mice; and (3) an awake CEI model in rats that avoids general anesthesia. His group studies early IOP-induced gene expression and protein responses within the optic nerve head (ONH) and retina, as well as the effects of IOP on ocular blood flow using optical coherence tomography angiography. This work will lead to new approaches for protecting the optic nerve in patients with glaucoma. Dr. Morrison has served on the National Eye Advisory Council and is chair of the BrightFocus National Glaucoma Research (NGR) Scientific Review Committee.

**Thao D. (Vicky) Nguyen, PhD**
Professor and Marlin U. Zimmerman, Jr. Faculty Scholar
Department of Mechanical Engineering
Secondary appointments in Materials Science and Engineering, Ophthalmology
Johns Hopkins University

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Dr. Thao (Vicky) Nguyen received her S.B. from MIT in 1998, and M.S. and Ph.D. from Stanford in 2004, all in mechanical engineering. She was a research scientist at Sandia National Laboratories in Livermore from 2004- 2007, before joining Johns Hopkins University, where she is currently Professor and The Marlin U. Zimmerman Faculty Scholar in the Department of Mechanical Engineering, with secondary appointments in the departments of Materials Science and Ophthalmology. Dr. Nguyen's research encompasses the biomechanics of collagenous tissues, ocular biomechanics, and mechanics of active polymers and biomaterials. Dr. Nguyen's research in ocular biomechanics is focused on modeling and characterization of the structure and mechanical behavior of the sclera and optic nerve head. Her work has been supported by NIH/NEI, NSF, the Brightfocus Foundation, and the Vision Research Program of the Army Medical and Materiel Research Command. Dr. Nguyen has received numerous awards for her work in applied mechanics and biomechanics, including the 2008 Presidential Early Career Award for Scientists and Engineers (PECASE) and the 2008 NNSA Office of Defense Programs Early Career Scientists. She received the 2013 NSF CAREER award and 2016 JHU Catalyst Award to study the micromechanisms of growth and remodeling of collagenous tissues. She was also awarded the 2013 Eshelby Mechanics Award for Young Faculty, 2013 ASME Sia Nemat-Nasser Early Career Award, and the 2015 T.J.R. Hughes Young Investigator Award from the Applied Mechanics Division of ASME. She was the President of the Society of Engineering Science in 2020 and was recently appointed Editor-in-Chief of the Journal of Biomechanical Engineering.

**Joel S. Schuman, MD, FACS**
Elaine Langone Professor & Vice Chair for Research,
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Joel S. Schuman, MD is Elaine Langone Professor of Ophthalmology, Vice Chair for Ophthalmology Research, Professor of Neuroscience & Physiology, Neural Science, Biomedical Engineering and Electrical & Computer Engineering at NYU. He was Chairman of Ophthalmology at NYU for the five years 2016-2020 inclusive. Dr. Schuman and his colleagues were first to identify a molecular marker for human glaucoma, published in Nature Medicine in 2001.Continuously funded by the National Eye Institute as a principal investigator since 1995, he is an inventor of optical coherence tomography (OCT), used world-wide for ocular diagnostics. Dr. Schuman has published more than 400 peer-reviewed scientific journal articles, 9 books, and more than 50 book chapters.

**Preeti Subramanian, PhD – Speaker and Director of Scientific Programs, Vision Science**

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Currently, Dr. Subramanian is the Director of Scientific Programs for Vision Science, overseeing the macular degeneration and glaucoma research programs at BrightFocus Foundation. Before joining BrightFocus, Dr. Subramanian was a research scientist at the National Eye Institute (NEI) of the NIH for ten plus years.

Dr. Subramanian received her PhD in Biochemistry from Virginia Commonwealth University in Richmond, Virginia, identifying a novel role for bioactive sphingolipid ceramide 1 phosphate (C1P) in mediating inflammation. She completed her postdoctoral training at the NEI, performing investigations on pigment epithelium-derived factor (PEDF), an ocular protein with neurotrophic activity. She continued her research in vision science at the NEI, identifying and studying potential therapeutic agents for diseases involving RPE oxidative stress (e.g., age-related macular degeneration). Dr. Subramanian has published more than 15 peer-reviewed articles in prestigious archival journals including Journal of Biological Chemistry and Investigative Ophthalmology of Visual Science.

## BrightFocus Leadership

### Stacy Pagos Haller - President and CEO

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BrightFocus President and CEO Stacy Pagos Haller has significantly expanded the foundation's stature as a premier source of private funding and support for research on Alzheimer's, macular degeneration, and glaucoma. Under her tenure, the Maryland-based nonprofit has nearly tripled its financial commitment to innovative, high-risk research that spans scientific disciplines and national borders. Ms. Haller regularly appears on panels for scientific, health care, and philanthropic audiences and represents BrightFocus among public and private sector leaders in efforts to increase and diversify sources of research funding. Her honors and recognitions include Disruptive Women in Health Care naming her to its list of Disruptive Women to Watch and the thought leader Ideagen presenting her with their Global Leadership Award. Prior to assuming the leadership of BrightFocus in 2010, Ms. Haller served as the Executive Director of CureSearch National Childhood Cancer Foundation, the world's largest children's cancer research organization. Additionally, she co-created the first Outcomes Measurement Training in the Mid-Atlantic region to improve nonprofit performance. Ms. Haller, whose board service includes America's Charities, is a graduate of Mount Holyoke College.

### Diane Bovenkamp, PhD - Vice President, Scientific Affairs

BrightFocus Foundation, Clarksburg, MD

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Diane Bovenkamp, PhD, Vice President of Scientific Affairs, oversees the global scientific operations for BrightFocus and serves as the scientific liaison for the organization in local, national, and international forums. Dr. Bovenkamp obtained her PhD in Biochemistry from Queen's University in Kingston, Ontario, Canada, discovering and studying Eph receptors in angiogenesis and neural development in zebrafish and mice. She completed a Postdoctoral Fellowship in the Vascular Biology Program at Boston Children's Hospital/Harvard Medical School, isolating and characterizing zebrafish neuropilins. Dr. Bovenkamp conducted further research at the Johns Hopkins University Bayview Proteomics Center in the Division of Cardiology at Johns Hopkins School of Medicine in Baltimore, Maryland, using proteomic techniques for biomarker detection in human serum. Prior to assuming her current position, Dr. Bovenkamp served as the Scientific Program Officer and Science Communications Specialist at BrightFocus, and as Director of Science Information and Programs at Foundation Fighting Blindness.

# BrightFocus Travel Fellowship for Underrepresented Minorities

## Fellowship Description

BrightFocus is committed to bringing scientists from diverse backgrounds to foster creativity and innovation in addressing complex scientific challenges. The BrightFocus Travel Fellowship for Underrepresented Minorities is designed to broaden the participation of those pursuing a research career in vision sciences, focusing on glaucoma. The specific intent of this fellowship is to increase active participation in and networking among vision research trainees and early career faculty who are from groups underrepresented in the field.

The fellowship provides travel support to underrepresented diverse groups of undergraduate students, graduate students, postdoctoral fellows, and early career faculty members to attend ISER/ BrightFocus Glaucoma Symposium and the BrightFocus Glaucoma Fast Track.

## INHIBITING THE ALTERNATIVE COMPLEMENT PATHWAY IS NEUROPROTECTIVE IN A MICROBEAD-INDUCED MOUSE MODEL OF GLAUCOMA

**Cindy Hoppe, M.Sc.,** Yinjie Guo, M.D. Maleeka Shrestha, BA, Kip Connor, PhD, Meredith Gregory-Ksander, PhD

*Schepens Eye Research Institute of Mass and Ear/Harvard Medical School, United States*

**Keywords:** complement, inflammation, alternative pathway, complement factor B

**Biosketch:** Graduate Student, Schepens Eye Research Institute of Mass Eye and Ear, Department of Ophthalmology, Harvard Medical School. Cindy Hoppe received her M.Sc. in Cell and Molecular Biology from the Friedrich-Alexander University Erlangen-Nürnberg, Germany in 2020.

Research focus: Cindy Hoppe joined the laboratory of Dr. Meredith Gregory-Ksander in 2020 to investigate the role of the alternative pathway of the complement system in the pathogenesis of glaucoma. Recent studies identify the alternative complement pathway as a major facilitator of neuronal cell death in response to retinal injury. Cindy is using Factor B knock-out mice to determine the extent to which the alternative complement pathway contributes to axon degeneration, death of RGCs, and loss of visual function in a microbead-induced mouse model of glaucoma. Preliminary data suggests that inhibiting the alternative pathway is neuroprotective and could be a novel therapeutic target for the treatment of glaucoma.

*BrightFocus Travel Fellowship for Underrepresented Minorities*

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## SUSTAINED REVERSAL OF GLAUCOMA-INDUCED VISION LOSS BY IN VIVO EPIGENETIC REPROGRAMMING

**Margarete Karg[1]**, PhD, Yuancheng Lu[2], PhD, Emma Hoffmann[1], BA, May Moorefield[1], Maleeka Shrestha[1], BA, Yinjie Guo[1], MD, Meredith Gregory-Ksander[1], PhD, David Sinclair[3], PhD, Bruce Ksander[1], PhD

*[1]Schepens Eye Research Institute, United States, [2]Whitehead Institute, United States, [3]Blavatnik Institute, Paul F. Glenn Center for Aging Research, United States*

**Keywords:** reprogramming, aging, epigenetic, regeneration, gene therapy

**Biosketch:** I was awarded my B.Sc. in Molecular Live Sciences from the Radboud University of Nijmegen, Netherlands in 2009 and my M.Sc. in Biomedical Sciences from the Vrije University of Amsterdam in 2012. I received my Ph.D. in Molecular Biology from Friedrich-Alexander-Universität Erlangen-Nürnberg in 2018 after which I started my postdoctoral research fellowship at Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School in the Ksander Laboratory.

Research Focus:

My graduate research has provided a compelling link between the expression of a midkine, a relatively unknown cytokine and tumor growth factor, and the survival of uveal melanoma patients. Uveal melanoma is a highly aggressive intra-ocular malignancy, and the metastatic disease lacks any effective targeted therapy with dismal patient survival. I showed that midkine significantly correlates with overall-survival and the development of metastasis in uveal melanoma patients. This finding brings forth a prognostic marker in uveal melanoma and a potential druggable target. Based on my graduate work, I was awarded a prestigious Walter-Benjamin post-doctoral fellowship from the German Research Council to continue my research in my current laboratory at the Schepens Eye Research Institute of Mass. Eye and Ear in Boston under the supervision of Prof. Bruce Ksander.

As a postdoctoral fellow, my research focuses on reversing vision decline in glaucoma and age-related macular degeneration (AMD). Previously, we showed that epigenetic reprogramming by Oct4, Sox2 and Klf4 (OSK), the three of the 4 Yamanaka transcription factors that are famously known for their ability to induce pluripotency in differentiated cells, recovered youthful epigenetic information and restored vision in aged mice and in a mouse model of glaucoma. My role in this project was to investigate the safety of long-term expression OSK in retinal ganglion cells. My current research shows that OSK treatment improves vision decline in a mouse model of glaucoma with long-term efficacy. Furthermore, I am investigating the efficacy of an inducible version of the OSK treatment in restoring vision, paving the path towards the translation of the OSK treatment for glaucoma patients in the near future.

*BrightFocus Travel Fellowship for Underrepresented Minorities*

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## STEM CELL SECRETOME AS A POTENTIAL TREATMENT FOR STEROID-INDUCED AND PRIMARY OPEN-ANGLE GLAUCOMA MODELS

**Ajay Kumar[1], PhD,** Enzhi Yang[1], Andrew Price[2], Ting Xie[2], PhD, Yiqin Du[1], MD, PhD

*[1]University of Pittsburgh, United States, [2]Stowers Institute for Medical Research, United States*

**Keywords:** Stem cell, Secretome, Glaucoma, Retinal ganglion cells, Trabecular meshwork, Proteomics

**Biosketch:** Dr. Ajay Kumar is currently working as a Postdoctoral Researcher at the Department of Ophthalmology, School of Medicine, University of Pittsburgh with Dr. Yiqin Du. He did his Ph.D. from PGIMER, India in the field of stem cell biology and secretome. He has been working in the stem cell field for more than a decade. His primary interest is to devise novel stem cell-free therapies for the treatment of glaucoma and other diseases. He is also working on new methods to mimic the development of the human retina in a dish. He is the recipient of "Weigand fellowship in Regenerative medicine" and "Young innovator award in Medicine". He has published 25 peer-reviewed papers in esteemed journals. He wishes to establish regenerative medicine-based therapies for different diseases which can benefit patients.

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## MODELING BLOOD-BRAIN BARRIER PHENOTYPES IN GLAUCOMA WITH HUMAN PLURIPOTENT STEM CELLS

**Sailee Sham Lavekar[1,2], MS,** Jason Hughes[1], Kang-Chieh Huang[1,2], MS, Catia Gomes[1], PhD, Scott Canfield[1], PhD, Jason S Meyer[1], PhD

*[1]Indiana University School of Medicine1, United States, [2]Purdue University, United States*

**Keywords:** human pluripotent stem cells, retinal ganglion cells, blood brain barrier, glaucoma, astrocytes, endothelial cells, TGF_2.

**Biosketch:** Since my formative years, news about diseases and their fatalities left me disheartened but simultaneously intrigued about how the human body works and how regulated mechanisms sometimes go amiss, resulting in different diseases. My passion for science was ignited after being selected for a biology research training camp, the National Initiative on Undergraduate Science, at the Tata Institute of Fundamental Research in India. Because of my love for science, I was fortunate to receive a fellowship in which I learned about medulloblastoma, and genetic modifications made by CRISPR, developed by two women scientists, Dr. Doudna and Dr. Charpentier, which further motivated and inspired me to pursue a career in academic research and follow my dream to become an established scientist. To begin to pursue this goal, I am currently a 5th year PhD student in the lab of Dr. Jason Meyer at the Indiana University School of Medicine, where my research uses

human pluripotent stem cells as an in vitro model of neurodegenerative diseases including glaucoma and Alzheimer's disease.

The focus of my current work is upon how stem cell-based retinal organoids can be used as a model system for studying degenerative features of disease. In one of my primary projects, I have worked to develop a novel in vitro hPSC model to study how the blood brain barrier is compromised in glaucoma through the derivation and assembly of retinal ganglion cells, astrocytes, and microvascular endothelial cells. In parallel, I have also been developing retinal organoids from patient-derived induced pluripotent stem cells (iPSCs) to examine Alzheimer's disease-associated phenotypes in the retina, with a focus upon identifying early features of the disease as possible early biomarkers. My work as a PhD student has provided me with the skills to use hPSCs for the derivation of both retinal organoids as well as cortical organoids, expertise in disease modeling, molecular and imaging techniques and the use of gene editing tools such as CRISPR/Cas9 technology. I have also presented my work at different local and international conferences in a poster format, including the Society for Neuroscience (SfN), The Association for Research in Vision and Ophthalmology (ARVO), the International Society for Stem Cell Research (ISSCR), and the ISER/BrightFocus Glaucoma Symposium to help me hone my scientific communication skills as well as get feedback for my research.

The results of my work have led to numerous achievements and awards, including two expected first authorships, three co-authorship research articles, and two book chapters to date. Additionally, the success and impact of my work has been recognized by numerous organizations, including poster awards at the Stark Neurosciences Summer Research Symposium as well as the IU/Purdue Joint Symposium on Brain and Spinal Cord Injury. Furthermore, I have received a first-place award in the Gill Symposium image award contest, and I was the recipient of the ARVO Foundation travel award for attendance at this year's annual meeting this past spring. More recently, I was awarded the IUPUI 3-minute thesis award along with Sigma Xi Student award 2021, which are both larger and more impactful awards, which I believe helps to support the fact that I am continuing to grow as a scientist. Also, I am thrilled to have received travel grants from ISER/BrightFocus Symposium and the travel grant from IUPUI graduate office for the upcoming ARVO conference. In the future, I hope to continue pursuing neuroscience research with the use of stem cell-based models. My expertise in the field of stem cell research and the use of 2D and 3D in vitro stem cell-based disease models will help increase the understanding of different neurodegenerative disease mechanisms by modeling genetic mutations associated with them which in turn could help in translational applications. I hope to eventually use the knowledge I gain to secure a strong postdoctoral research position, with the eventual goal of obtaining a faculty position at a research university.

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## DISEASE STAGE-DEPENDENT OPTIC NERVE HEAD (ONH) MOLECULAR ALTERATIONS IN A FELINE GLAUCOMA MODEL

**Kazuya Oikawa, BVSc, PhD,** Julie A. Kiland, MS, Odalys Torne Escude, DVM, Shawna Gloe, BS, Virginia Mathu, BS, Brenna Wetherbee, BS, Gillian J. McLellan, BVMS, PhD, DACVO, DECVO, DVOphthal, MRCVS

*University of Wisconsin-Madison, United States*

**Keywords:** Optic nerve head, glia, astrocytes, microglia, oligodendrocyte, animal model

**Biosketch:** Dr. Kazuya Oikawa is a veterinarian/research associate in Dr. Gillian McLellan's lab at the University of Wisconsin-Madison. Kazu earned his veterinary medical degree in 2012, subsequently completed 2-year veterinary clinical internship and practiced in Japan. His clinical experiences with naturally occurring ocular diseases in a wide variety of species have reinforced his strong interest in comparative ophthalmology and vision research. Before moving to the U.S., he also conducted research on the effect of IOP on retinal ischemia in rodent models and genomic analyses in spontaneous ocular tumors in animals. Kazu joined McLellan lab as a graduate student and recently earned PhD from UW-Madison, where he studied the cellular and molecular pathobiology of glaucomatous optic neuropathy utilizing a unique spontaneous feline model. His career goal is to become a veterinary ophthalmologist-vision scientist who contributes to better understanding in glaucoma pathology and developments of novel therapies for humans and animals.

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## FAKE IT UNTIL YOU MAKE IT; CONCEALING ""EAT ME"" SIGNAL ON DONOR RETINAL GANGLION CELLS TO BYPASS NEUROPHAGY

**Monichan H. Phay, Ph.D.,** Petr Baranov, M.D., Ph.D.

*Schepens Eye Research Institute of Mass and Ear/Harvard Medical School, United States*

**Keywords:** Cell therapy, Retinal Ganglion Cell, Neurophagy, Phagocytosis

**Biosketch:** Education and Training: Postdoctoral Fellow, Schepens Eye Research Institute of Mass Eye and Ear/Harvard Medical School, Department of Ophthalmology, Boston, MA; Ph.D. in RNA Biology and Neurobiology, University of Delaware, Newark, DE; B.S. in Biology and B.A. in Chemistry, Roger Williams University, Bristol, RI

Research Interest: Equipped with multi-disciplinary training in chemistry and biology, my early interest in regenerative medicine/neurobiology focused on the molecular mechanism underlying mammalian axon regeneration following mechanical injury. My doctoral work on regulatory small-noncoding RNAs in axons of sensory neurons shed light on the selective targeting mechanism of precursor microRNAs into regenerating axons. I was the first to demonstrate that specific axonal precursor microRNAs undergo rapid local maturation at the injury site to modulate intra-axonal protein expression to support axon regeneration. As I progressed through my research, it became clear that axon regeneration is only possible if the loss of neurons is prevented. In a progressive neurodegenerative disease such as glaucoma, where neuronal loss is already significant, functional recovery is nearly impossible. Inspired to develop treatments for nervous system injury and neurodegenerative diseases, I pursued my postdoctoral training in Dr. Petr Baranov's laboratory at Schepens Eye Research Institute to advance the development of cell replacement therapy. My postdoctoral research focuses on two major areas: 1) using tree shrew (para-primate) model of traumatic optic neuropathy and glaucoma to study stem cell-derived retinal ganglion cell replacement and 2) improving graft outcome by engineering robust donor cells and shielding grafted RGCs from the host immune response.

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## NITRIC OXIDE MEDIATES RAPID IOP-DEPENDENT HOMEOSTATIC REGULATION OF AQUEOS HUMOUR OUTFLOW IN MICE

**Ester Reina-Torres[1], PhD,** Jason YH Chang[1], PhD, W Daniel Stamer[2], PhD, Darryl R. Overby[1], PhD

*[1]Imperial College London, United Kingdom, [2]Duke University, United States*

**Keywords:** Nitric oxide, outflow resistance, trabeuclar meshwork

**Biosketch:** Ester Reina-Torres, PhD, is a research associate at Imperial College London, (UK). Ester graduated in Biotechnology from University of Vic (Barcelona, Spain) and attended to University of Bristol (UK) for a MSc in Biomedical Sciences Research, where she studied the role of VEGF delivered by micro-vesicles in Age-related Macular Degeneration. Ester joined the department of Bioengineering at Imperial College London in 2012 to do her PhD at Prof. Overby's lab. Her project consisted in studying how targeting Schlemm's canal endothelium can modulate aqueous humour outflow facility. She mostly focused on the role of VEGF on outflow facility regulation and how tight junction inhibition can reduce outflow resistance. Furthermore, she participated in the development of iPerfusion. After graduating in 2016, Ester spent a year at Trinity College Dublin in Prof. Humphries' lab where she worked on glucocorticoid-induced ocular hypertension models. In 2017, Ester went back to Darryl Overby's lab where she continues investigating physiological aspects that regulate outflow resistance focusing on cell metabolism, nitric oxide, VEGF, and segmental outflow.

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## BRIGHTFOCUS TRAVEL FELLOWSHIP

## IMMUNOMETABOLIC MANIPULATION OF MICROGLIA PREVENTS CONTRALATERAL BUT NOT IPSILATERAL MICROGLIAL REACTIVITY AFTER OPTIC NERVE CRUSH

**Margaret Maes[1], PhD,** Gloria Colombo[1], Felix Locker[2], Elena Pohl[2], PhD, Sandra Siegert[1], PhD

*[1]Institute of Science and Technology, Austria, [2]University of Veterinary Medicine, Vienna, Austria*

**Keywords:** microglia, optic nerve crush, neuroinflammation, immunometabolism

**Biosketch:** I am interested in understanding how mitochondrial dynamics and metabolism contribute to immune cell reactivity. In my postdoctoral work in Professor Sandra Siegert's laboratory, I have focused on the microglial response to retinal ganglion cell death, specifically investigating how altered microglia metabolism via UCP2-deficiency affects their reactivity. I came to the Institute of Science and Technology Austria after completing my doctoral thesis under supervision of Dr. Robert Nickells at the University of Wisconsin-Madison. Here, I studied the role of the pro-apoptotic protein, BAX, in mitochondrial fission during apoptosis, as well as its recruitment kinetics during retinal ganglion cell death.

*BrightFocus Travel Fellowship*

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## NATIONAL EYE INSTITUTE, NIH TRAVEL AWARD

### LONGITUDINAL VISUAL IMPAIRMENT ASSOCIATED WITH AGING AND E50K OPTINEURIN MUTATION IS NOT OBSERVED WITH OPTINEURIN DEFICIENCY

**Vishnu Adi[1], DO, MPH,** Jeffrey R. Sims[1], MD, Crystal Liu[1], BA, Dominick Forlenza[1], Da Ma[2], PhD, Gadi Wollstein[14], Joel S. Schuman[1], MD, Henry C. Tseng[3], MD, PhD, Kevin C. Chan[1], PhD

*New York University Grossman School of Medicine, United States, [2]Simon Fraser University, Canada, [3]Duke University Medical Center, Duke Eye Center, United States, [4]NYU Tandon School of Engineering, United States*

**Keywords:** Glaucoma, Optineurin, E50K, Optokinetics, Visual Function, Genetics, Neuroprotection

**Biosketch:** Vishnu Adi is a recent medical school graduate from NYIT-COM, currently working on glaucoma research at the Neuroimaging and Visual Science Laboratory at NYU Grossman School of Medicine and at USF Morsani College of Medicine as a Glaucoma Research Fellow. His research interests include studying the genetic factors that contribute to glaucoma, in vivo imaging methods to assess the progression of glaucoma, and glaucoma surgical outcomes.

*National Eye Institute, NIH Travel Award*

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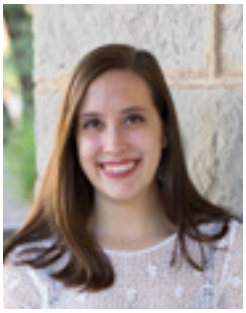
### INTRAVITREAL APPLICATION OF TNF AND IL1A IS SUFFICIENT TO DRIVE RETINAL GANGLION CELL DEATH IN VIVO



**Katherine M. Andersh, MS,** Richard T. Libby, PhD

*University of Rochester, United States*

**Keywords:** retinal ganglion cell death, inflammation, cytokines, extrinsic signaling

**Biosketch:** Kate is a fifth year Neuroscience graduate student at the University of Rochester studying the role of proinflammatory cytokines in retinal ganglion cell death relevant to glaucoma with Dr. Rick Libby. Specifically, Kate is focused on the contributions of interleukin 1, TNF, and complement signaling both after axonal injury and following direct intravitreal application. She was recently a 2020-2021 ARVO Science Communication Training Fellow and aims to improve scientific communication with the public through outreach and advocacy.

*National Eye Institute, NIH Travel Award*

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## IN VIVO LAMINA CRIBROSA MICROSTRUCTURE COMPARING SWEPT-SOURCE AND SPECTRAL-DOMAIN OCT IMAGING

**Cameron A Czerpak,** Brandon K. Zimmerman, Harry A. Quigley, Thao D. Nguyen

*Johns Hopkins University, United States*

**Keywords:** Lamina cribrosa, SS-OCT, SD-OCT, microstructure

**Biosketch:** Cameron Czerpak is a fourth year PhD student in Professor Vicky Nguyen's lab in the Johns Hopkins Mechanical Engineering department. His research examines the structure biomechanics relationship in the human lamina cribrosa (LC). His current project uses optical coherence tomography (OCT) imaging to study the LC beam microstructure in glaucoma patients. Future work will use digital volume correlation on the OCT images to determine LC displacements and strain with changes in intraocular pressure.

*National Eye Institute, NIH Travel Award*

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## TOLL-LIKE RECEPTOR 4 SIGNALING IN GLAUCOMATOUS OPTIC NERVE HEAD

**Emma K. Geiduschek,** Timur Mavlyutov, PhD, Justin Myrah, Colleen M. McDowell, PhD

*University of Wisconsin, United States*

**Keywords:** Optic Nerve Head, TLR4, TGFb, Astrocytes, Microglia

**Biosketch:** Originally from Seattle, WA, I completed my B.S. in Neuroscience at the University of Wisconsin – Madison, and currently am a PhD student in the Neuroscience Training Program also at the UW – Madison. My graduate research in Dr. Colleen McDowell's lab attempts to understand the molecular pathology within the optic nerve head; the first site of damage during the progression of glaucoma. My goal is to better understand the molecular mechanisms behind this disease to further the development of neuroprotective therapies for glaucoma patients.

*National Eye Institute, NIH Travel Award*

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## OCULAR BIOMECHANICS DURING IMPROVISED EXPLOSIVE DEVICE BLAST

**Alireza Karimi[1],** Reza Razaghi[2], Christopher A. Girkin[1], J. Crawford Downs[1]

*[1]University of Alabama at Birmingham, United States, [2]Heel of Scene Lt, Japan*

**Keywords:** Improvised Explosive Devices; Ground Reinforcement; Intraocular Pressure; Finite Element Method

**Biosketch:** I am a postdoc research fellow in the lab of Dr. J. Crawford Downs, at the Department of Ophthalmology and Visual Sciences, the University of Alabama at Birmingham (UAB). I work on ocular biomechanics with a focus on the microstructural biomechanics of the lamina cribrosa in the human optic nerve head using a complex anisotropic heterogeneous material model. The aim of my research is to understand of the biomechanics of the optic nerve head in healthy and glaucoma eyes.

*National Eye Institute, NIH Travel Award*

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## MECHANICAL RESPONSE OF THE MOUSE ASTROCYTIC LAMINA IS ALTERED AFTER TREATMENT WITH TRYPLE ENZYME

**Arina Korneva, PhD,** Elizabeth Cone Kimball, Vicky (Thao) Nguyen, Harry Quigley, MD

*Johns Hopkins University School of Medicine, United States*

**Keywords:** astrocytic lamina, mouse, ONH, digital image correlation, biomechanics

**Biosketch:** Arina Korneva is a postdoctoral fellow at the Wilmer Eye Institute at the Johns Hopkins University. Dr. Korneva is studying the biomechanics of the optic nerve head in glaucoma in the laboratories of Dr. Harry Quigley and Dr. Vicky (Thao) Nguyen. She is interested in understanding the remodeling of the sclera and optic nerve head. The research aims to identify novel targets for glaucoma therapies. Dr. Korneva received a PhD in Biomedical Engineering from Yale University in 2018.

*National Eye Institute, NIH Travel Award*

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## PROLIFERATION IS GREATER AND PEAKS EARLIER IN THE ANTERIOR OPTIC NERVE HEAD (ONH) FOLLOWING CONTROLLED ELEVATION OF IOP (CEI)

**Diana C. Lozano,** Virginia O'Callahan, Hailey Pausz, William Cepurna, Elaine C. Johnson, John C. Morrison

*Oregon Health & Science University, United States*

**Keywords:** Glaucoma, Optic Nerve Head, Glia, Animal Model

**Biosketch:** Diana C. Lozano is a Research Assistant Professor at the Casey Eye Institute, Oregon Health & Science University. She received her Bachelor's degree in Electrical Engineering from San Diego State University and her PhD in Physiological Optics and Vision Science from the University of Houston, College of Optometry. Her research focus is to understand the cellular mechanisms of glaucomatous optic nerve damage from elevated intraocular pressure. She also has an interest in investigating the molecular mechanisms that regulate humor outflow and IOP by the trabecular meshwork and in utilizing in-vivo OCT imaging techniques for quantitative injury assessment.

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## DEVELOPMENT OF RECOMBINANT ANTIBODIES FOR DETECTING MULTIPLE CONFORMATIONAL STATES OF GLAUCOMA-ASSOCIATED MYOCILIN

**Minh Thu Ma[1],** Athéna Patterson-Orazem[1], PhD, Laura Azouz[2], Ahlam Qerqez[2], Jennifer A. Maynard[2], PhD, Raquel L. Lieberman[1], PhD

*[1]Georgia Institute of Technology, United States, [2]The University of Texas at Austin, United States*

**Keywords:** Myocilin, antibody, misfolding, conformational

**Biosketch:** My thesis project seeks to: (i) determine the biological function of myocilin and its role in glaucoma using novel conformational antibodies, and (ii) better understand the molecular and structural details of wild-type (WT) and olfactomedin (mOLF) variants in the context of aggregation and disease. Mutations in mOLF domain of the protein myocilin are linked to the autosomal dominant inherited form of glaucoma. These destabilizing mutants aggregate and accumulate within trabecular meshwork cells, causing cell death and increased intraocular pressure, hastening glaucoma-related vision loss. Wild-type myocilin is also susceptible to misfolding and aggregation, but the consequence of such dysfunctions as well as the physiological function of wild-type myocilin remain unknown. Antibodies currently used in biomedical research to detect myocilin are unable to differentiate among disease-related myocilin conformations, greatly limiting our understanding of its function and misfolding in a biological context. Thus, the first goal of my thesis is to develop novel recombinant antibodies that differentially target folded and misfolded mOLF using antibody engineering methods. The second goal is to characterize WT and glaucoma-causing mOLF variants using hydrogen/deuterium exchange - mass spectrometry (HDX-MS) to elucidate sec-hour timescale dynamics and better understand the role of structural dynamics in pathogenesis. Together, our findings provide insight into the complex relationship among myocilin structure, function, and aggregation in promoting eye health and disease.

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## MKK4 AND MKK7 CONTROL RETINAL GANGLION CELL SOMA LOSS, AXONAL DEGENERATION, AND DENDRITIC REMODELING AFTER GLAUCOMA-RELEVANT INJURY

**Olivia J. Marola, MS,** Stephanie B. Syc-Mazurek, MD, PhD, Richard T. Libby

*University of Rochester, United States*

**Keywords:** MKK4, MKK7, JUN, DDIT3, ocular hypertension, DBA/2J, optic nerve crush, axon degeneration, dendritic retraction, pattern electroretinography

**Biosketch:** Olivia is a sixth year graduate student at the University of Rochester studying the mechanisms of retinal ganglion cell death relevant to glaucoma with Dr. Rick Libby. Specifically, Olivia has investigated retinal ganglion cell intrinsic mechanisms (e.g. activation of MAPKKs, JUN, and DDIT3) and extrinsic mechanisms (e.g. activation of the endothelin system, vascular pathology, neuroinflammation) in driving neurodegeneration. After graduating from the University of Rochester, Olivia will work with Dr. Gareth Howell at the Jackson Laboratory as a postdoctoral associate.

*National Eye Institute, NIH Travel Award*

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## DIVERGING DEGENERATION PROFILES OF RGC SUBTYPES: OCULAR HYPERTENSION VS OPTIC NERVE CRUSH

**Nolan R. McGrady, PhD,** Staff Scientist, Marcio Ribeiro, PhD, Joe M. Holden, Michael L. Risner, PhD, David J. Calkins

*Vanderbilt University Medical Center, United States*

**Keywords:** Glaucoma, Optic Nerve Crush, TRPV1, Retinal Ganglion Cell

**Biosketch:** My research interest has been on glaucomatous optic degeneration. My primary interest in glaucoma is the transient receptor potential vanilloid (TRPV1) cation channel. My goal is to determine the role TRPV1 channels play during injury and stress. To do this I am using the microbead occlusion model to elevate IOP, an important hallmark of glaucoma. Previously, our lab demonstrated the absence of TRPV1 accelerated degeneration in a mouse model of glaucoma. In addition to the ocular hypertension model, a chronic model of degeneration, I am also using the optic nerve crush model, an acute model of degeneration. Currently, I am using genetically modified mice that lack functional TRPV1 channels to perform directed physiological and morphological analysis to determine the differences and similarities of early pathological mechanisms between the two models as well as TRPV1's involvement.

Utilizing whole-cell patch clamping of retinal ganglion cells (RGCs) and compound action potential of the optic nerve in combination with pharmacological inhibition I can delineate where TRPV1 has the most impact on RGCs and degeneration of the visual system. I have found that RGC subtypes (most notably _ON-sustained RGCs) are differentially affected by genetic disruption of TRPV1. My results have also shown that the effect of TRPV1 is most likely axogenic and not dendritic. Meaning that disrupting TRPV1 affects how signals are initiated from the RGCs. In addition to the retina, my experiments examining optic nerve compound action potential that TRPV1 also affects how signals are transmitted from the retina to the visual systems of the brain.

Future experiments will aim to investigate biochemical interactions of TRPV1. This will include determining how the TRPV1 cation channel interacts with other synaptic receptors such as the glutamate receptors (AMPAR and NMDAR) as well as other TRPV channel isoforms. Furthermore, I will be isolating the downstream pathways involved in TRPV1 signaling and regulation. By understanding where and how TRPV1 is integrated in visual system pathologies, therapies can be specifically targeted to provide new strategies for treatment.

*National Eye Institute, NIH Travel Award*

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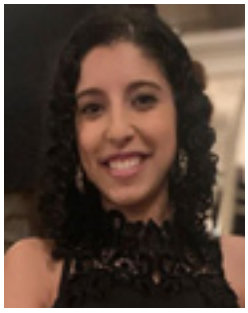
## NRF2 IN THE RGCS MODULATES GLAUCOMA PATHOGENESIS ONSET AND SEVERITY



**Sarah Naguib,** Jon R. Backstrom, PhD, Elisabeth Artis, Purnima Ghose, PhD, David J. Calkns, PhD, Tonia S. Rex, PhD

*Vanderbilt University Medical Center, United States*

**Keywords:** Nrf2, oxidative stress, RGC, glaucoma, microbead occlusion model, neuroprotection, neurodegeneration

**Biosketch:** Sarah Naguib is a 5th year graduate student at Vanderbilt University in the Neuroscience Graduate Program in the lab of Dr. Tonia Rex. Her research focuses on the cell-type specific activation of the transcription factor Nrf2 in the microbead occlusion model of glaucoma. She will be defending her PhD this upcoming spring.

*National Eye Institute, NIH Travel Award*

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## IOP VARIABILITY IN CONSCIOUS RATS

**Christina Nicou,** Christopher Passaglia, PhD

*University of South Florida, United States*

**Keywords:** IOP variability, Telemetry, Tonometry, Circadian

**Biosketch:** Christina Nicou received her BS in Biomedical Sciences from the University of South Florida, where she is currently pursuing her PhD in Biomedical Engineering. Her research in Dr. Chris Passaglia's Ocular Neuroscience and Neuroengineering Lab involves characterizing intraocular pressure (IOP) dynamics in rats using a custom-built telemetry system. Her thesis projects include studying the effects of various physiological factors on IOP and developing a wearable device for continuous collection of body temperature, heart rate, and animal activity alongside IOP. She plans to continue working with medical devices and applications of engineering in medicine following graduation.

*National Eye Institute, NIH Travel Award*

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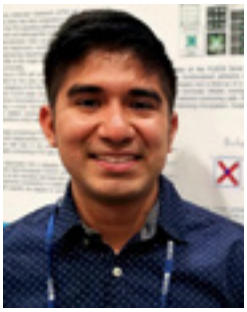
## TIME-COURSE ANALYSIS OF HUMAN TRABECULAR MESHWORK SINGLE CELL CONTRACTION AFTER A 5-DAY DEXAMETHASONE TREATMENT



**Luis Sanchez, B.S.,** Jie J. Zheng

*University of California Los Angeles, United States*

**Keywords:** Trabecular Meshwork

**Biosketch:** Luis Sanchez is a PhD candidate at UCLA studying under Professor Jie J. Zheng. He completed his Bachelor of Science at San Francisco State University in the field of cellular and molecular biology. As an undergraduate student, he was a member of the distinguished NIH-Minority Access to Research Careers (MARC) training program where he conducted research under the mentorship of Professor Laura W. Burrus focusing on Wnt morphogen gradient formation. Prior to his graduate studies, Luis joined Eureka Therapeutics, a bay area biotechnology start-up focused on the development of T-cell immunotherapies for the treatment of solid tumors. He is now focused on the isolation, culture, and mechanical property characterization of cells residing within the trabecular meshwork, an ocular tissue responsible for intraocular pressure homeostasis. In the future, Luis wishes to leverage his research background to contribute to the development of glaucoma therapeutics.

*National Eye Institute, NIH Travel Award*

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## STRAIN-DEPENDENT OCULAR PHENOTYPES IN LOXL1-KNOCKOUT MOUSE

**Heather Schmitt, PhD,** TeddiJo Watkins, Kristyn Hake,Megan Kuhn, Guorong Li, MD, W. Daniel Stamer, PhD, Michael A. Hauser, PhD"

*Duke University, United States*

**Keywords:** extracellular matrix, LOXL1, genetics

**Biosketch:** I received my PhD from UW-Madison, where I worked with Rob Nickells' group to investigate the epigenetic role of histone deacetylase-3 in retinal ganglion cell nuclear atrophy and apoptosis as they occur in glaucoma. As a postdoctoral associate, I work with Dan Stamer's group to investigate the role of LOXL1 and it's antisense lncRNA LOXL1-AS1 in regulating cellular mechanisms in tissues of the aqueous outflow pathway that contribute to the pathology of pseudoexfoliation glaucoma.

*National Eye Institute, NIH Travel Award*

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## PRIMARY CILIUM IS A MECHANOSENSOR FOR MECHANICAL STRESS-INDUCED AUTOPHAGY IN THE CONVENTIONAL OUTFLOW PATHWAY

**Myoungsup Sim,** April Nettesheim, Angela Dixon, Paloma B. Liton

*Duke eye center, Duke University, United States*

**Keywords:** Primary cilia, Autophagy, mechanical stress, Trabecular meshwork, Schlemm's canal

**Biosketch:** Dr. Sim received his Ph.D. in Molecular biology and Genetics from Seoul National University, Korea. He is a Research Associate Senior in the Department of Ophthalmology at Duke University and has worked with Dr. Paloma B. Liton for 4 years to understand the biological basis of glaucoma, particularly focusing on the roles of autophagy and mechanotransduction in the outflow physiology and pathophysiology. His goal of current research is to elucidate physiological roles of autophagy to maintain outflow pathway tissue homeostasis. Currently, his projects are focusing on identifying mechanosensor and downstream signaling pathways that are responsible for mechanical stress-induced autophagy, especially by using molecular biological and realtime-live cell imaging techniques in the trabecular meshwork and Schlemm's canal cells.

*National Eye Institute, NIH Travel Award*

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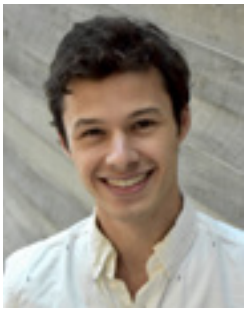
# HUMAN RETINAL GANGLION CELL INTEGRATION IS ENHANCED THROUGH SDF1 AND NETRIN1 - GUIDED MIGRATION IN A MOUSE XENOTRANSPLANTATION MODEL



**Jonathan Soucy, PhD,** Monichan Phay, PhD, Julia Oswald, PhD, Petr Baranov, MD, PhD

*Schepens Eye Research Institute of Mass. Eye & Ear, Harvard Medical School, United States*

**Keywords:** Retinal Organoid, Cell Replacement, Glaucoma, Transplantation, Retinal Ganglion Cells, Stem Cells

**Biosketch:** My fascination with the retina stems from my own vision problems caused by the late treatment of a congenital cataract in my left eye. When cataract surgery is performed in newborns and adults, vision is often completely restored; however, my delay in treatment led to uncorrectable vision loss in that eye. Despite current advancements in understanding the neural retina, there remains no effective strategies to repair damaged visual neurocircuitry. With a vested interest in visual neurodevelopment and a strong cross-disciplinary background in chemical and biomedical engineering, I aim to advance therapies for treating vision loss. As a postdoctoral fellow in Dr. Petr Baranov's lab at Massachusetts Eye and Ear, the same hospital I received eye surgery 25 years ago, I am studying retinal ganglion cell (RGC) migration and synaptogenesis for improving cell replacement therapies.

Before discovering my passion for understanding visual neural sensory perception, I immersed into translational sciences as an undergraduate. Through academic research and industry internships at Rensselaer Polytechnic Institute and Genentech, I developed drug delivery vehicles, designed affinity peptides, and engineered antibody therapeutics. Inspired to begin research in neural tissue engineering, I pursued a doctoral degree at Northeastern University in Dr. Ryan Koppes' lab, where I developed novel biomaterials for nerve regeneration and engineered microphysiological systems for investigating the neurocardiac axis. After completing my PhD, I got a chance to pursue my long-term dream of working in visual neuroscience and regenerative ophthalmology. As a part of my ongoing postdoctoral training, I am focused on improving the integration of stem cell-derived RGCs through guided migration and by modulating their interactions with the retinal microenvironment. In the future, as a Principal Investigator, I aim to combine all my knowledge and skills to engineer ex vivo models to study fundamentals of neurocircuit formation and neuroplasticity in the retina.

*National Eye Institute, NIH Travel Award*

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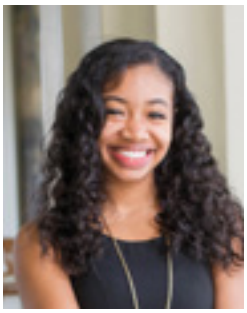
## COMPARISON OF AUTOMATED DEEP LEARNING METHODS FOR ASSESSING OPTIC NERVE AXONS



**Cydney A. Wong[1],** Adam Hedberg-Buenz, PhD[2], Vidisha Goyal[1], Mona K. Garvin, PhD[2], Michael G. Anderson, PhD[2], C. Ross Ethier[1], PhD

*[1]Georgia Institute of Technology, United States, [2]University of Iowa, United States*

**Keywords:** axon segmentation, optic nerve, deep learning, imaging

**Biosketch:** Cydney Wong graduated from Massachusetts Institute of Technology with a BS in Biological Engineering in Spring 2020. She is currently a second year PhD student at the Wallace H. Coulter Department of Biomedical Engineering at Georgia Institute of Technology and Emory University in the lab of Dr. C. Ross Ethier. In her research, she aims to use her engineering background to better understand the pathophysiology of glaucoma through biomechanics and bioinformatics approaches.

*National Eye Institute, NIH Travel Award*

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## OCULAR PULSE WAVEFORM IN THE ONH DIFFERS BETWEEN GLAUCOMATOUS (GL) AND GLAUCOMA SUSPECT (GLS) EYES IN INDIVIDUALS WITH SIMILAR SYSTEMIC PULSE WAVEFORMS

**Hongli Yang**, Grant Gull, Cindy Albert, Xiue Jiang, Lin Wang, Stuart K Gardner

*Legacy Health Research, United States*

**Keywords:** blood flow,Ocular pulse,systemic pulse, hemodynamics,glaucoma

*National Eye Institute, NIH Travel Award*

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## ESTROGEN SIGNALING IN INTRAOCULAR PRESSURE REGULATION

**Hannah Youngblood[1],** Patricia V. Schoenlein[1], PhD, Kristin Perkumas[2], Sylvia B. Smith[1], PhD, Janey L. Wiggs[3], MD, PhD, Louis R. Pasquale[4], MD, Michael A. Hauser[2], PhD, W. Daniel Stamer, PhD[2], Yutao Liu[1], MD, PhD

*[1]Augusta University, United States, [2]Duke University, United States, [3]Massachusetts Eye and Ear Infirmary, Harvard Medical School, United States, [4]Icahn School of Medicine at Mt. Sinai, United States*

**Keywords:** POAG, Intraocular pressure, Trabecular meshwork, Estrogen signaling

**Biosketch:** Hannah Youngblood is currently a doctoral candidate in her fourth year of study at Augusta University (formerly the Medical College of Georgia) in the Department of Cellular Biology and Anatomy. She holds an NIH/NEI F31 predoctoral fellowship that supports her study of the role of estrogen signaling in intraocular pressure regulation.

*National Eye Institute, NIH Travel Award*

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## MEASURING CUMULATIVE LOSS OF GANGLION CELL LAYER SOMAS IN NORMAL AND GLAUCOMATOUS SUBJECTS

**Kazuhiro Kurokawa**, James A Crowell, Yan Liu, Marcel T. Bernucci, HaeWon Jung, Donald T. Miller

*Indiana University, United States*

**Keywords:** ganglion cell, adaptive optics, optical coherence tomography, glaucoma

**Biosketch:** Dr. Kazuhiro Kurokawa received his Ph.D. in engineering from the University of Tsukuba, Japan, in 2013, and then did his postdoctoral work in the laboratory of Dr. Donald T. Miller at Indiana University School of Optometry, Bloomington, IN. Currently, he is an assistant scientist at Discoveries in Sight Research Laboratories of the Devers Eye Institute, Portland, OR. His research primarily focuses on improving the capability of high-resolution retinal imaging systems, specifically adaptive optics optical coherence tomography, for visualizing and quantifying the structure and function of individual retinal cells in the living eye. His long-term goal is to improve eye-imaging technology, which in turn will lead to better clinical outcomes in treating eye disease.

*Allergan Travel Award*

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## LIVE TWO-PHOTON CALCIUM IMAGING IN RETINAL GANGLION CELLS: CHARACTERIZATION OF EARLY CHANGES IN A MOUSE GLAUCOMA MODEL

**Yukihiro Shiga, MD, PhD,** Luis Alarcon-Martinez, PhD, Nicolas Belforte, PhD, Heberto Quintero, PhD, Villafranca-Baughman Deborah, Florence Dotigny, B.Sc, Adriana Di Polo, PhD

*Montreal University Hospital Research Centre (CRHUM), Canada*

**Keywords:** Live calcium imaging, Retinal ganglion cell, Glaucoma, Neurodegeneration

**Biosketch:** Dr. Shiga received his MD from the Yamagata University Faculty of Medicine followed by a Glaucoma fellowship in the Department of Ophthalmology at the Tohoku University Graduate School of Medicine (Japan). He obtained his PhD from Tohoku University where he studied genetics and ocular blood alterations in primary open-angle glaucoma patients as well as molecular basis of retinal ganglion cell degeneration. Dr. Shiga is currently a postdoctoral fellow in the Department of Neuroscience at the University of Montreal (Quebec, Canada) under the supervision of Prof. Adriana Di Polo. He holds a Canadian Institutes of Health Research (CIHR) Postdoctoral Fellowship Award. His research project focuses on the study of cellular and molecular mechanisms underlying calcium dysregulation in retinal ganglion cells in glaucoma. The ultimate goal of his research is to develop biomarkers to facilitate early detection of glaucoma and new therapeutic avenues for retinal ganglion cell neuroprotection and regeneration. His recent accomplishments include the 2019 Fonds de recherche du Québec - Santé (FRQS) Postdoctoral Fellowship Award (top-ranked) and the Uehara Postdoctoral Fellowship Prize awarded in 2020.

*Clearside Biomedical Travel Award*

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## CLUSTERIN ATTENUATES PROFIBROTIC RESPONSES IN TRABECULAR MESHWORK TO MODULATE INTRAOCULAR PRESSURE

**Dr. Avinash Soundararajan,** Dr. Pattabiraman, Padmanabhan P

*Indiana university, Purdue University Indianapolis, United States*

**Keywords:** Clusterin, Intraocular pressure, Trabecular meshwork, ECM, Fibrosis

**Biosketch:** I am a Postdoctoral fellow working in a NIH grant that focuses on regulatory role of a secretory chaperone protein named clusterin in the ocular pressure. My current work serves my research interest which is to contribute in the field of disease biology. Previous work experience in molecular biology and my current knowledge and day to day experience in the field of glaucoma is helping me to drive my project successfully. During my current tenure, I have worked with many collaborators, and core facility personals, which helps me to build a network of knowledge and it also serves me to gain more widespread knowledge in my field of research. As a measure of scientific communication, I have obtained a grant of $5000 from CTSI, Indiana University. My first author and co-authored publications are under submission process. In summary, I have expertise, training and motivation to carry out the proposed research project.

*Duke Eye Center Travel Award*

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## BAX ACTIVATION IN DAMAGED RETINAL GANGLION CELLS IN VIVO OCCURS IN TWO DISTINCT AND DELAYED STAGES

**Ryan J. Donahue[1]**, PhD, Margaret E. Maes[2], PhD, Robert W. Nickells3, PhD

[1]**Boston** Children's Hospital, United States, [2]Institute for Science and Technology Austria, [3]University of Wisconsin, United States

**Keywords:** Retinal ganglion cell, apoptosis, optic nerve crush

**Biosketch:** My research interests are the mechanisms that determine retinal ganglion cell (RGC) degeneration and regeneration. During graduate school, I studied the activation process of the pro-apoptotic protein, BAX, in damaged RGCs. As a post-doc, I am studying the pathways that determine RGC apoptotic fate and regenerative ability. Frustratingly, most current approaches to coax damaged RGCs to regenerate involve deletion of tumor suppressor genes. These results do not represent a pragmatic clinical approach to curing neurodegenerative diseases. My research goal now is to investigate the beneficial mechanisms of tumor suppressor deletion to design more targeted and practical therapeutic strategies.

*Experimentica Travel Award*

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## NOVEL PEPTAIN FOR NEUROPROTECTION IN GLAUCOMA

**Bindu Kodati[1], Ph.D.**, Vignesh R. Krishnamoorthy[2], Rooban B. Nahomi[3], Ph.D, Mi-hyun Nam[3], Ph.D., Ram H. Nagaraj[3], Ph.D., Raghu R. Krishnamoorthy[1], Ph.D., Dorota L. Stankowska[1], Ph.D.

*[1]University of North Texas Health Science Center, United States, [2]Loyola University, United States, [3]University of Colorado School of Medicine, United States*

**Keywords:** Peptain, Crystallin, RGCs, pattern ERG, Neuroprotection, Axoprotection, Glaucoma

**Biosketch:** My research interest is to understand the molecular pathways, gene expression mechanisms and signaling pathways underlying glaucomatous neurodegeneration in rodent and ex vivo models of glaucoma. I have more than three years of experience in glaucoma research area and I am actively involved in various projects aimed at elucidating mechanisms underlying glaucomatous neurodegeneration and developing strategies for neuroprotection in animal models of glaucoma. My current research is aimed at understanding the early pathological mechanisms associated with GC- induced glaucomatous neurodegeneration in mouse and human ex vivo models (perfusion cultured anterior segments). Using a genomic approach, I study molecular pathways contributing to trabecular meshwork damage/dysfunction that occurs in glaucoma. I am involved in genome editing studies using viral vectors that transduce the trabecular meshwork with the long term goal of developing ocular gene therapies. I am also involved in another major project to assess mechanisms involved in endothelin mediated neurodegeneration in a rodent model of glaucoma with a goal to develop neuroprotective approaches using endothelin receptor antagonists.

*OHSU - Casey Eye Institute Travel Award*

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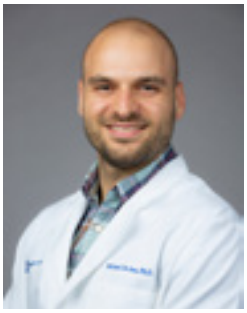
## CAVEOLIN-1 REGULATES TRABECULAR MESHWORK CONTRACTILE TONE VIA PKC AND RHO/ROCK SIGNALING



**Michael L. De Ieso[1], PhD,** Megan Kuhn[1], Michael H. Elliott[2], PhD, W. Daniel Stamer[1], PhD

*[1]Duke University, United States, [2]Dean McGee Eye Institute USA*

**Keywords:** caveolin-1, caveolae, PKC, Rho, ROCK, trabecular meshwork, cavtratin, contractility, outflow.

**Biosketch:** Dr. De Ieso has a PhD from University of Adelaide, Australia and is currently apostdoctoral fellow at Duke.

*University of Wisconsin - Department of Ophthalmology and Visual Sciences Travel Award*

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## GLIA-MEDIATED MODULATION OF PERICYTE AND CAPILLARY FUNCTION IN GLAUCOMATOUS OPTIC NEUROPATHY

**Deborah Villafranca Baughman, MSc,** Luis Alarcon Martinez, Ph.D., Nicolas Belforte, Ph.D., Florence Dogtiny, Adriana Di Polo, Ph.D.

*University of Montreal, Research Centre University of Montreal Health Centre, Canada*

**Keywords:** Retinal live imaging, Neurovascular coupling, Pericytes, Glial cells

**Biosketch:** Deborah Villafranca-Baughman is a third-year Ph.D. candidate in the neuroscience program at the University of Montreal (UdeM) with Prof. Adriana Di Polo. She studies vascular dysfunction related to retinal pathologies. Particularly, she is interested in pericytes, cells located around capillaries with contractile capability, and in new compounds to modulate the pericyte response, improving blood flow regulation. Deborah has recently established a unique two-photon laser scanning microscopy setup that allows us to obtain intravital high-resolution images of the retina of transgenic animals. She has published impactful scientific papers, including Nature, Acta Neuropathologica Communication and Molecular Neurodegeneration. Before starting her Ph.D., Deborah obtained her master's degree in Neuroscience at UdeM, got a bachelor's in Molecular Biotechnology at the University of Barcelona and completed her undergraduate thesis at the Lady Davis Institute for Medical Research in the Jewish General Hospital and McGill University in Montréal. Moreover, she took part in the JGH Alzheimer Risk Assessment Clinic to investigate Alzheimer-related proteins' expression in humans. She is the co-president of the student committee of the Research vision network of Quebec. She has been involved in organizing the new first international summer school, the vision restoration summer school held in Quebec (2022). Finally, Deborah is a student advisor and teaching assistant of UdeM and a volunteer in elementary schools supported by Brain Reach North (McGill University).

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## MECHANOBIOLOGY OF STRETCH INDUCED PORE FORMATION IN SCHLEMM'S CANAL ENDOTHELIAL CELLS

**Jacques A. Bertrand[1], MRes,** W. Daniel Stamer[2], PhD, Darryl R. Overby[1], PhD

*[1]Imperial College London, United Kingdom, [2]Duke University, United States of America*

**Keywords:** aqueous humor outflow, mechanobiology, Schlemm's canal, pores

**Biosketch:** Jacques Alexander Bertrand, MSc, is a PhD student and research technician at Imperial College London (UK). Jacques graduated from Imperial College London with an MSc in Bioengineering, studying the effects of novel prostanoid receptor agonists on outflow facility and intraocular pressure regulation in mice. Jacques joined the Bioengineering Department at Imperial College London in 2011 as a research technician working with Prof. Darryl Overby. In his technician role, Jacques developed a mouse model of glucocorticoid-induced ocular hypertension using subcutaneous mini-pumps and steroid-loaded polymeric microparticles. Jacques aided in the development of the iPerfusion system and published works investigating the role of ion channels in outflow facility regulation. In 2019, Jacques began a PhD in Prof. Darryl Overbys laboratory to investigate the molecular mechanisms of pore formation in Schlemm's canal cells exposed to stretch. This on-going work will shed light on a poorly understood yet critical process that likely governs outflow facility regulation and intraocular pressure, helping to further our understanding of glaucoma and aid development of novel, targeted therapeutics.

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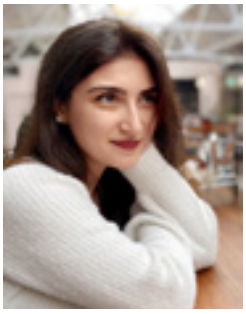
## INFLUENCE OF TM CELL-DERIVED ECM ON THE DIFFERENTIATION OF IPSCS INTO TM CELLS



**Emine Kubra Bilir, Ph.D,** Olivia Kingston, Xiaochen Fan, Rachel Oldershaw, Carl Sheridan

*University of Liverpool, United Kingdom*

**Keywords:** iPCS, TM cells, Glaucoma, ECM

**Biosketch:** Emine Kubra Bilir is a final year Ph.D. student in the Department of Eye and Vision Sciences, Institute of Life Course and Medical Sciences, University of Liverpool, UK. Emine is funded through a governmental scholarship awarded by the Ministry of National Education, Republic of Turkey and her Ph.D. focuses on the influence of extracellular matrix on induced pluripotent stem cell differentiation into trabecular meshwork cells. Prior to this, Emine graduated in 2020 at the University of Ankara with a Ph.D. degree in Veterinary Pharmacology and Toxicology. In 2015, she achieved a first-class honours degree in Veterinary Medicine at the University of Ankara. Whilst studying Veterinary Medicine, Emine attended to the Erasmus Student Exchange programme to study at the University of Ljubljana in 2013.

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## ASTROCYTE GAP JUNCTION PROTEIN CX43 MODULATES THE SIGNALING PROPERTIES OF MOUSE RETINAL GANGLION CELLS

**Andrew M. Boal,** Nolan R. McGrady, PhD, Joseph M. Holden, Michael L. Risner, PhD, David J. Calkins, PhD

Vanderbilt *University Medical Center, United States*

**Keywords:** Astrocytes, Connexin-43, Retinal Ganglion Cells, Electrophysiology.

**Biosketch:** Dr. Boal is MD/PhD Candidate, G3 Vanderbilt Medical Scientist Training Program in Calkins Lab at the Vanderbilt Neuroscience Graduate Program. His research interests are astrocytes, neurodegeneration, glaucoma, retinal ganglion cell physiology, connexin-43

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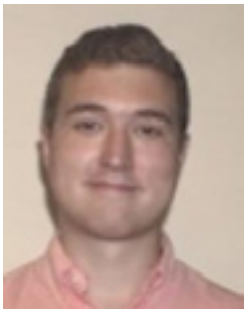
## LONG-TERM PROTECTION OF RETINA AND VISUAL FUNCTION USING MEK INHIBITOR PD0325901 IN A SMALL-EYE PAX6 MOUSE MODEL OF ANIRIDIA



**James D. Cole, BS,** Kara McHaney, Carlos Rodriguez

*University of Virginia, United States*

**Keywords:** aniridia, glaucoma, pax6, development, MEK, retinal ganglion cells

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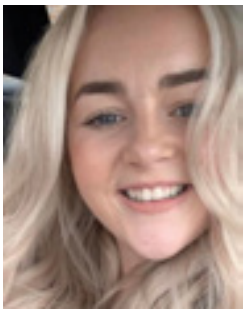
## TARGETING THE NLRP3 INFLAMMASOME IN GLAUCOMA



**Sophie Coyle[1], BSc,** Dr. Victoria McGilligan[1], Dr. Meredith Greogory-Ksander[2] , Dr. Najam Sharif[3], Dr. Melody Chemaly[2], Dr. Carl Sheridan[4,] Prof. Colin E. Willoughby[1], Xiaochen Fan[4], Dr Rebecca Coll[5]

*[1]Ulster University, United Kingdom, [2]Schepens Eye Research Institute, Massachusetts Eye & Ear Infirmary and Harvard Medical School, United States, [3]Global Alliances and External Research, Ophthalmology Innovation Center, Santen Inc, United States, [4]University of Liverpool, United Kingdom, [5] Queens University, Belfast, United Kingdom*

**Keywords:** NLRP3, Inflammasome, RGC, Retina, Optic nerve, Inflammation

**Biosketch:** After graduating with a First-Class Honours in stratified medicine in 2020 I was accepted onto the PhD program at ulster university to investigate the role of the NLRP3 inflammasome in glaucoma. My research interests are investigating the role inhibitors of the NLRP3 inflammasome and a novel biological therapeutic targeting the inflammasome can play in slowing disease progression in glaucoma.

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## USING MICRO-COMPUTED TOMOGRAPHY TO VISUALISE DECELLULARISED HUMAN TRABECULAR MESHWORK IN 3D

**Devon Crouch,** Lucy Bosworth, Carl Sheridan

*University of Liverpool, United Kingdom*

**Keywords:** Trabecular meshwork; Decellularisation

**Biosketch:** My name is Devon Crouch and I am currently a 3rd year PhD student at the University of Liverpool, based in the Department of Eye and Vision Science. Here, I am looking to design and develop a biomimetic electrospun fibre membrane for the prevention of glaucoma. I graduated with Masters of Chemistry (MChem) in Medicinal Chemistry w/ Pharmacology at the University of Liverpool.

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## DECIPHERING THE ROLE OF MICROGLIA IN GLAUCOMATOUS NEURODEGENERATION

**Cory Diemler, MS**

*Jackson Laboratory, United States*

**Keywords:** Microglia

**Biosketch:** After receiving his Master's from the University of South Florida, Cory began studying, under the mentorship of Dr. Gareth Howell, as a first-year graduate student at the University of Maine Cory is investigating microglial responses during pathogenesis of glaucomatous neurodegeneration. In particular, the long-term goal is to decipher the neuroprotective mechanisms of specific microglia states play in neurodegenerative diseases.

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## TRABECULAR MESHWORK CELLS IDENTIFIES MIR-18A AS A POTENTIAL THERAPEUTIC AGENT MIR-17-92 CLUSTER INDUCTION BY TGF_2 IN HUMAN

**Chelsey Doyle[1], BSc,** John Knox[2], BSc, Dr. Breedge Callaghan[1], PhD, Dr Declan McKenna[1], PhD, Dr Kevin J. Hamill[2], PhD, Dr Carl Sheridan[2], PhD, Prof Colin E. Willoughby[1], MD FRCOphth

*[1]Ulster University, United Kingdom, [2]University of Liverpool, United Kingdom*

**Keywords:** POAG, TGF_2, trabecular meshwork, miR-17-92, miR18a, CTGF

**Biosketch:** Currently I am in the final year of my PhD program at Ulster University, researching the role of the TGF_ microRNAome in glaucoma. Research interests include glaucoma, specifically bioinformatics, fibrosis, oxidative stress and miRNAs. I have skills in bioinformatics and molecular/cell biology and work with trabecular meshwork cells and Tenon's fibroblasts. I can perform miRNA and RNA-Seq analysis and pathway analysis in Bioconductor/R. From these sequencing datasets I can perform downstream molecular experiments including RT-qPCR, WB, miRNA transfections and cell-based assays. I enjoy using a combination of bioinformatics and wet-lab experiments to study disease processes in glaucoma.

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## A REFERENCE OPTIC NERVE (ON) ATLAS FOR RETINAL GANGLION CELL (RGC) AXON MORPHOLOGY IN RATS

**Vidisha Goyal[1],** Luke A. Brawer[1], Kaitlyn M. Bateh[1], Bailey G. Hannon[2], Andrew J. Feola[3], A. Thomas Read[1], C. Ross Ethier[1]

*[1]Georgia Institute of Technology, United States, [2]Genentech, United States, [3]The Atlanta VAMC, United States*

**Keywords:** Axonal Atlas, Glaucoma, Deep-learning, RGC Axon Segmentation

**Biosketch:** Transitioning to the Bioengineering (BioE) Ph.D. program in 2021, my professional career goal is to create novel health sensing wearables and corresponding predictive models. During my Master's from 2019-2021, I worked with Dr. Ross Ethier to analyze optic nerve axonal morphology using deep learning. During my undergraduate at Delhi Technological University from 2015-2019, I have been involved in various other research projects such as quantifying human emotions by measuring subjects' electroencephalography (EEG) irregularity, creating a spinal posture evaluation and feedback wearable, creating a deep learning-based algorithm to study cellular gene expression changes in Irritable Bowel Syndrome patients etc. I am aware of the unrealized potential of employing the vast healthcare data made available through electronic records, genomic data, and wearable devices. I aim to take the computational challenge of using this data to create early-detection and intervention healthcare models, and in turn develop expertise in this area.

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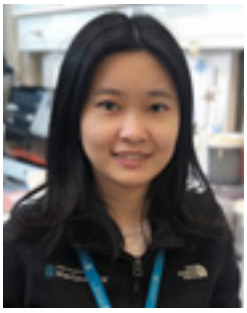
## CASPASE-8-MEDIATED INFLAMMATION TRIGGERS BOTH AXON DEGENERATION AND RGC APOPTOSIS IN A MOUSE MODEL OF GLAUCOMA



**Yinjie Guo[1], M.D.,** Maleeka Shrestha[1], BA, Ann Marshak-Rothstein[2], PhD, Meredith Gregory-Ksander[1], PhD

*[1]Schepens Eye Research Institute, United States, [2]University of Massachusetts Medical School, United States*

**Keywords:** inflammation, apoptosis, caspase-8

**Biosketch:** Yinjie Guo received her M.D. from Xiangya Medical School, Central South University, PRC in 2015 and she finished her 3-year national standard training residency in China and registered as a medical practitioner of Ophthalmology. In 2019, Yinjie Guo joined the laboratory of Dr. Meredith Gregory-Ksander at Schepens Eye Research Institute of Massachusetts Eye and Ear, Department of Ophthalmology, Harvard Medical School as a joint PhD student. Research Focus: As a PhD student in Dr. Gregory-Ksander's laboratory, Yinjie Guo's research has focused on elucidating the role of Caspase-8-mediated inflammation and Caspase-8-mediated apoptosis in the pathogenesis of glaucoma. Yinjie is using a caspase-8 mutant mouse in which a point mutation in the auto-cleavage site blocks caspase-8-mediated apoptosis but does not block caspase-8-mediated inflammation allowed Yinjie to uncouple the two pathways. Using these Caspase-8 mutant mice in conjunction with a microbead-induced mouse model of glaucoma, Yinjie has demonstrated that Caspase-8-mediated apoptosis is not required for the development of glaucoma, indicating that caspase-8-mediated inflammation, but not caspase-8 mediated apoptosis is the driving force in glaucoma.

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## MOLECULAR PATHWAYS INVOLVED IN INSULIN-MEDIATED RETINAL GANGLION CELL DENDRITE REGENERATION IN GLAUCOMA

**Sana El Hajji,** Nicolas Belforte, Ph.D, Heberto Quintero, Ph.D, Florence Dotigny, Adriana Di Polo, Ph.D

*University of Montreal, Canada*

**Keywords:** Glaucoma, dendrites, insulin, retinal ganglion cells, regeneration

**Biosketch:** I'm a Ph.D. student in the neuroscience program at the University of Montreal. I do my research at Dr. Adriana Di Polo's laboratory at the University of Montreal Hospital Research Center (CrCHUM). I'm interested in the mechanisms of neuronal regeneration. The main objective of my Ph.D. research project is to uncover new mechanisms of regeneration of the retinal ganglion cell dendrites during glaucoma.

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## COLLAGEN TYPE I DEFICIENCY IN MUTANT MICE IS ASSOCIATED WITH LOSS OF OPTIC NERVE AXONS

**Johanna Heimbucher, M.Sc.,** Magdalena Schneider, Ernst R. Tamm, Matthias Mack

*University of Regensburg, Germany*

**Keywords:** Collagen Type I, glaucoma, optic nerve axons, retinal ganglion cells, peripapillary sclera

**Biosketch:** Johanna Heimbucher studied Biology at the University of Regensburg, Germany and received her master's degree there. Since 2020 she is working on her PhD thesis at the Department of Human Anatomy and Embryology of the University of Regensburg in the laboratory of Prof. Dr. Ernst R. Tamm. Her PhD project is focused on the impact of extracellular matrix and cellular mechanical properties of optic nerve head and peripapillary sclera on glaucomatous damage. She analyses a mouse model with reduced amounts of collagen type 1 regarding its susceptibility to axonal damage.

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## AUTOPHAGY DISRUPTION IN HUMAN PLURIPOTENT STEM CELL-DERIVED RETINAL GANGLION CELLS DOWNREGULATES MTOR SIGNALING LEADING TO NEURODEGENERATION

**Kang-Chieh Huang[1,2],** Catia Gomes[1], PhD, Kirstin B. VanderWall[1,2], Sailee S. Lavekar[1,2], Clarisse M. Fligor[1,2], Jason S. Meyer, PhD[1]

*Indiana University[1], United States, Purdue University[2], United States*

**Keywords:** Pluripotent stem cell, retinal ganglion cells, autophagy, mTOR signaling, Optineurin

**Biosketch:** Kang-Chieh Huang obtained his bachelor's degree from Kaohsiung Medical University and pursued his master's degree from National Yang-Ming University in Taiwan, where he studied inherited photoreceptor degeneration in retinal organoid models derived from human induced pluripotent stem cells. Since 2018, Kang-Chieh has been a Ph.D. candidate in the lab of Dr. Jason Meyer at Indiana University School of Medicine. His research focused upon mechanisms underlying the neurodegeneration of retinal ganglion cells (RGCs) in glaucoma using in vitro human pluripotent stem cell (hPSC) models. He established this in vitro model using CRISPR/Cas9 genome editing to create paired OPTN-E50K and isogenic control cell lines from both unaffected and patient-derived sources, with the ultimate goal to look for targets that can rescue RGCs from neurodegeneration and promote cell survival. As a result of his work, Kang-Chieh has received numerous fellowships, including the IUPUI First Year Fellowship, the Taiwan Government Scholarship to Study Abroad, and the Eli Lilly/Stark Neurosciences Predoctoral Fellowship in Neurodegeneration, a research grant from Sigma Xi to support his work, as well as travel awards including the Retina Research Foundation/Joseph M. and Eula C. Lawrence Travel Grant for the ARVO conferences as well as a travel award to attend the ISER/BrightFocus Glaucoma Symposium.

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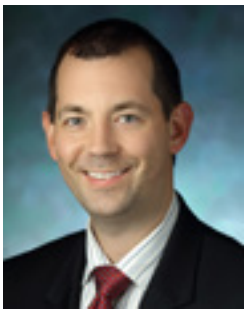
## STRUCTURAL ENGRAFTMENT OF TRANSPLANTED HUMAN STEM CELL DERIVED RETINAL GANGLION CELLS IN VIVO



**Thomas V Johnson, MD, PhD**, Kevin Y Zhang, BA, Arumugam Nagalingam, PhD, Erika A Aguzzi, PhD, Harry A Quigley, MD, Donald J Zack, MD, PhD

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**Keywords:** retinal ganglion cell, transplantation, regeneration, optic nerve, stem cell

**Biosketch:** Tom Johnson is a clinician-scientist at the Wilmer Eye Institute at Johns Hopkins. He grew up in the suburbs of Chicago and studied biology and chemistry at Northwestern University as an undergraduate. He then spent one year at the University of Nebraska studying aqueous humor dynamics before completing his PhD in neuroscience as a Gates Scholar at the University of Cambridge (UK). His doctoral research involved directing a collaborative project between a stem cell laboratory at Cambridge and a molecular biology laboratory in the National Eye Institute's NIH intramural research program, studying stem cell transplantation as a potential neuroprotective treatment for glaucoma. He has been at Johns Hopkins since 2010 where he completed medical school, ophthalmology residency, glaucoma fellowship, and served as the Wilmer Eye Institute's Assistant Chief of Service (ACS). Dr. Johnson is a glaucoma specialist and treats patients in the clinic and OR for 1-2 days per week. The remainder of his time is spent in his translational neuroscience laboratory where is he investigating retinal ganglion cell replacement therapies for vision restoration in glaucoma and other optic neuropathies. His research has been funded by the ARVO David L Epstein Award, a National Eye Institute K08 Clinician Scientist Development Award, a Research to Prevent Blindness Career Development Award, and the American Glaucoma Society Young Clinician Scientist Award. He also has a clinical interest in understanding the relationship between intraocular pressure and glaucoma progression, especially through remote and 24-hour tonometry.

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## EXTRACELLULAR MATRIX AND TGF_2 REGULATE YAP/TAZ ACTIVITY IN HUMAN SCHLEMM'S CANAL CELLS

**Haiyan Li[1],** Ana N. Strat[1], Alexander Kirschner[1], W. Daniel Stamer[2], Preethi S. Ganapathy[1], Samuel Herberg[1]

*[1]SUNY Upstate Medical University, United States, [2]Duke University, United States*

**Keywords:** Glaucoma, POAG, Schlemm's canal, ECM, mechanotransduction, TGF_2, YAP, TAZ

**Biosketch:** Haiyan Li is currently a PhD candidate working with Dr. Samuel Herberg in the Department of Ophthalmology and Visual Sciences at SUNY Upstate Medical University. Prior to focusing on vision research, she earned a MS degree in Biomedical Engineering from Syracuse University. Haiyan's research centers around understanding cellular and biomechanical aspects of outflow tissue dysfunction in glaucoma. In particular, she is interested in determining the role of YAP/TAZ mechanotransduction in human trabecular meshwork and Schlemm's canal cells under glaucomatous conditions using bioengineered extracellular matrix polymer hydrogels inspired by the composition of the native tissue. Haiyan has recently published a paper "A tissue-engineered human trabecular meshwork hydrogel for advanced glaucoma disease modeling" in Experimental Eye Research, and has several bioRxiv preprints that are currently undergoing peer-review. Haiyan will present a poster "Extracellular Matrix and TGF_2 Regulate YAP/TAZ Activity in Human Schlemm's Canal Cells" at the ISER/BrightFocus Glaucoma Symposium.

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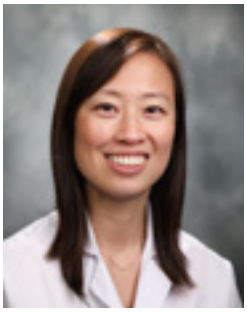
## MACROPHAGE ONTOGENY DIFFERS BY REGION WITHIN THE CONVENTIONAL OUTFLOW TRACT



**Katy C. Liu, MD, PhD,** Darren M. Schuman, Aleksander Grimsrud, Michael L. De Ieso, PhD, W. Daniel Stamer, PhD,
Daniel R. Saban, PhD,

*Duke University, United States*

**Keywords:** macrophages, immunology, outflow tract

**Biosketch:** I am a glaucoma clinician-scientist at Duke University. My research interests include roles of the immune system in the outflow tract of the eye, intraocular pressure regulation, and glaucoma.

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## A20 ATTENUATES THE FIBROTIC RESPONSE WITHIN THE TRABECULAR MESHWORK

**Philip Mzyk, PhD,** Colleen McDowell, PhD

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**Keywords:** trabecular meshwork, A20, TNFAIP3, fibrosis,

**Biosketch:** Philip attended North Carolina State University where he studied polarized protein trafficking within the retinal pigmented epithelium. He received his PhD in Comparative Biomedical Sciences under the direction of Dr. Chris McGahan in 2018. He then worked with Dr. Vasanth Rao as a postdoctoral researcher studying junctional protein dynamics in the trabecular meshwork. Philip is currently a postdoctoral fellow with Dr. Colleen McDowell studying the crosstalk between the TGFB-2 and TLR-4 pathways as they relate to fibrosis within the trabecular meshwork and glaucoma.

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## NITRIC OXIDE - A REGULATOR OF BIOMECHANICAL PROPERTIES AND MOLECULAR PATHWAYS IN THE OUTFLOW TISSUES

**Ramona Pawlak[1]**, Franziska Froemel[1], Amir Vahabikashi[2], W. Daniel Stamer[3], Mark C. Johnson[2], Rudolf Fuchshofer[1]

*[1]Universtity of Regensburg, Germany, [2]Northwestern University, United States, [3]Duke University, United*

**Keywords:** Nitric Oxide, Trabecular Meshwork, Schlemm´s Canal, Growth factors, Cell stiffness

**Biosketch:** Ramona Pawlak studied Biology at the University of Regensburg, Germany and received her master´s degree 2019. In her thesis, she analysed regulatory mechanisms of nitric oxide in Schlemm´s canal endothelial cells and the distribution of endothelial nitric oxide synthase in an animal model for primary open-angle glaucoma (POAG). She started as a PhD student in the laboratory of Prof. Dr. Rudolf Fuchshofer at the Department of Human Anatomy and Embryology at the University of Regensburg. Her focus lies on the analysis of the functional role of factors like NO, Decorin and CTGF in cell culture models and in a mouse model for POAG (Decorin knockout mice). She investigates the consequences of Decorin depletion not only in the outflow tissues, but also the optic nerve head and the retina. She is experienced in expression analysis (mRNA and protein), immunohistochemistry, light and electron microscopy.

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## INCREASED EXPRESSION OF DISC1 RESTORES MITOCHONDRIAL AXONAL TRANSPORT AND RESCUES RGC FUNCTION IN GLAUCOMA

**Heberto Quintero, PhD**, Nicolas Belforte, PhD, Luis Alarcon-Martinez, PhD, Deborah Villafranca, Sana El Hajji, Florence Dotigny, Adriana Di Polo, PhD

*University of Montreal Hospital Research Center (CRCHUM), Canada*

**Keywords:** Mitochondria, axons, neuroprotection, retina

**Biosketch:** Heberto Quintero Ph.D., MSc., is a postdoctoral fellow in Dr. Adriana Di Polo's laboratory at the University of Montreal Hospital Research Center (CRCHUM). He obtained his Ph.D. and MSc in Neuropharmacology and Experimental Therapeutics at the Center for Research and Advanced Studies of the National Polytechnic Institute (CINVESTAV, Mexico City)

His long-term research interests involve finding new molecular mechanisms triggering neuronal death and vision loss, along with the development of novel therapeutic strategies for neuroprotection and regeneration in glaucoma and other optic neuropathies.

The central focus of his current projects is to elucidate the mechanisms underlying impaired axonal transport in glaucoma, one of the earliest pathological features in retinal ganglion cells. More specifically, he investigates the role of traffic proteins in mitochondrial transport inside RGCs' axons using in-vivo two-photon imaging in preclinical models of glaucoma.

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## DEEP LEARNING-BASED SEGMENTATION OF OCT IMAGES FOLLOWING RETINAL GANGLION CELL (RGC) INJURY

**Gabriela Sanchez Rodriguez[1],** Laura García Elcano[1], MSc, Vidisha Goyal[2], Javier Pascau1 González Garzón[1], PhD, C. Ross Ethier[2], PhD, Andrew Feola[2], PhD

*[1]Universidad Carlos III de Madrid, Spain, [2]Georgia Institute of Technology, United States*

**Keywords:** Deep Learning, Retinal nerve fiber, glaucoma, OCT

**Biosketch:** Gabriela received her BS in Biomedical Engineering at Universidad Carlos III de Madrid with a focus on Medical Imaging in 2021. During the 2019-2020 academic year, Gabriela was an exchange student at Georgia Institute of Technology, where she started researching about glaucoma in the lab of Dr. C. Ross Ethier. She then did an undergraduate thesis focused on developing Machine Learning algorithms to assess changes of the retina in experimental glaucoma. Currently, Gabriela is a graduate student in the Bioengineering PhD program at Georgia Institute of Technology where she joined Dr. Andrew Feola's laboratory in researching how age and menopause affect risk factors related to developing glaucoma.

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## ABLATION OF SCLERAL TGF-_ SIGNALING INCREASES SUSCEPTIBILITY TO IOP-INDUCED OPTIC NERVE DAMAGE

**Magdalena Schneider,** Andrea E. Dillinger, Ernst R. Tamm

*University of Regensburg, Germany*

**Keywords:** ocular hypertension, glaucoma, optic nerve damage, TGF beta signaling, optic nerve axons, Collagen Type I

**Biosketch:** Magdalena Schneider received her PhD at the University of Regensburg, Germany. Since 2019 she is part of the laboratory of Prof. Dr. E.R. Tamm at the Department of Human Anatomy and Embryology at the University of Regensburg. In addition, she has been trained in the laboratories of P. Russell (University of California, Davis) and B. Chauhan (Dalhousie University, Halifax). Her research is focused on the interplay between scleral composition, TGF-_ signaling and astrocyte reactivity in the context of ocular hypertension and glaucoma. In her recent project she investigates the role of scleral TGF-_ signaling in optic nerve axon survival after ocular hypertension.

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## YAP/TAZ INACTIVATION WITH SIMVASTATIN ATTENUATES STEROID-INDUCED CONTRACTION AND STIFFENING IN A BIOMIMETIC 3D TRABECULAR MESHWORK HYDROGEL

**Ayushi Singh[1], MS,** Haiyan Li[1], MS, Hannah Yoo[1], BA, Ana N. Strat[1], MS, Tyler Bagué[1], BS, W. Daniel Stamer[2], PhD, Preethi S. Ganapathy[1], MD, PhD, Samuel Herberg[1], PhD

*[1]SUNY Upstate Medical University, United States, [2]Duke University, United States*

**Keywords:** Mechanotransduction, Simvastatin, hyaluronic acid, collagen, elastin, hydrogel, dex, glaucoma

**Biosketch:** Ayushi Singh is currently a PhD student working with Dr. Samuel Herberg in the Department of Ophthalmology and Visual Sciences at SUNY Upstate Medical University in Syracuse, New York. Her research focuses on primary open-angle glaucoma, using human cell-containing biomimetic ECM hydrogels as a model together with microfluidics. Specifically, Ayushi is interested in understanding cell-cell interactions between trabecular meshwork cells and Schlemm's canal endothelial cells that are critical for maintaining intraocular pressure homeostasis. Cellular dysfunction contributes to tissue stiffening and impaired outflow that correlates with ocular hypertension. Prior to joining SUNY Upstate, Ayushi earned a MS degree at the University of Central Florida in the field of Immunology. She is very eager to apply this expertise to studying the immunomodulatory roles of macrophages in outflow tissue dysfunction centered around biomechanics. As a rotation student in Dr. Herberg's laboratory, Ayushi co-lead a project focused on the use of statins for targeting trabecular meshwork stiffening. She will present a poster "YAP/TAZ inactivation with simvastatin attenuates steroid-induced contraction and stiffening in a biomimetic 3D trabecular meshwork hydrogel" at the ISER/BrightFocus Glaucoma Symposium.

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## TRANSIENT INTRAOCULAR PRESSURE FLUCTUATIONS DRIVE NEUROINFLAMMATION AND RETINAL GANGLION CELL DYSFUNCTION

**Markus Spurlok**

*University of Miami Miller School of Medicine, United States*

**Keywords:** glaucoma, intraocular pressure spikes, neuroinflammation, PERG

**Biosketch:** As an undergraduate student I quantified neuronal loss following acute subdural hematoma (ASDH) in a rodent model treated with craniotomy either with or without hypothermia. This showed that hypothermia improved neuronal survival following ASDH when induced prior to or following craniotomy and indicated that acute hypothermia could alleviate the reperfusional secondary injury associated with craniotomy and removal of the hematoma. This data helped to inform the development of a new clinical hypothermia trial for ASDH.

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## THE MECHANISM OF TGF_2-WNT SIGNALING CROSS-INHIBITION IN THE TRABECULAR MESHWORK

**Chenna Kesavulu Sugali**, Naga Pradeep Rayana, Jiannong Dai, Weiming Mao

*Eugene & Marilyn Glick Eye Institute, Indiana University School of Medicine, United States*

**Keywords:** Glaucoma, Wnt Signaling, GSK3b inhibitors, Smad4-_-catenin complex,Extra cellular matrix proteins, Trabecular Meshwork

**Biosketch:** My long-term research interests involve utilizing the knowledge for the betterment of glaucoma treatment. My academic training and research experience have provided me with excellent background in addressing the research questions. During my doctoral training at University of Hyderabad, India, I worked on miRNA and their role in the regulation of TGF_2 signaling pathway in the trabecular meshwork cells. Currently, as a postdoctoral fellow at Indiana University School of Medicine, I am working on multiple projects which aim at addressing the questions in understanding the pathobiology of glaucoma. ISER/BrightFocus Symposium helps me interacting with eminent scientists in the field of glaucoma and helps me to find out my future friends and collaborators.

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## OUTFLOW PATHWAY ASSESSMENT IN A FELINE MODEL OF GLAUCOMA DUE TO LTBP2 MUTATION

**Odalys Torne, DVM,** Kazuya Oikawa, DVM, PhD, Julie A. Kiland, MS, Gillian McLellan, BVMS, DACVO, DECVO, PhD

*Univeristy of Wisconsin – Madison, United States*

**Keywords:** Congenital, Feline, Trabecular Meshwork, Aqueous Angiography

**Biosketch:** Odalys Torne graduated in Veterinary Medicine in 2016 and is currently a PhD candidate in Dr. Gillian McLellan's lab at the University of Wisconsin-Madison. Early on her professional career, Odalys developed an interest in comparative ophthalmology that made her attend several international ophthalmology-related meetings like ECVO, ACVO and ARVO. In 2019 she completed a one-year small animal rotating internship at the Autonomous University of Barcelona, during which she did a project related to funduscopy teaching models that was presented at the ECVO conference in 2019. She is now working on multiple projects related to glaucoma, including imaging the aqueous humor outflow pathway both in vivo (aqueous angiography) and ex-vivo (via immunolabelling and tissue clearing), applying advanced imaging techniques. Her goal is to pursue a career in comparative ophthalmology as a clinician-scientist.

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## LOXL1 PROTEIN AGGREGATION IN EXFOLIATION GLAUCOMA

**Arunkumar Venkatesan[1],** Nileyma Castro[1], J Mario Wolosin[2], Audrey M Bernstein[1]

*[1]SUNY Upstate Medical University, Syracuse VA Medical Center, United States, [2]Icahn School of Medicine at Mount Sinai, United States*

**Keywords:** LOXL1, Exfoliation Glaucoma, Protein aggregation, ER stress

**Biosketch:** Dr. Arunkumar Venkatesan received his Ph.D. in 2017 from Madras University, India. He developed an interest in the research of protein folding diseases and joined the Raghavan lab as a Postdoctoral fellow at the University of Michigan, USA from 2017 to 2021. Currently, he is in Dr. Bernstein's lab, as a Postdoctoral fellow at Upstate Medical University, Syracuse, NY. His research focuses on understanding the cellular and molecular basis of Exfoliation Glaucoma. Dr. Venkatesan has authored many peer-reviewed articles and book chapters. He has been the recipient of several meeting travel awards and most recently, a microscopy award to perform TEM on human exfoliation tenon fibroblasts at Cornell University. He is also on 3 editorial review boards and a reviewer for several cell biological and ophthalmology journals.

**Research** Interest: Protein folding and aggregation, ER quality control, Protein interactions, Protein degradation.

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# Index

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