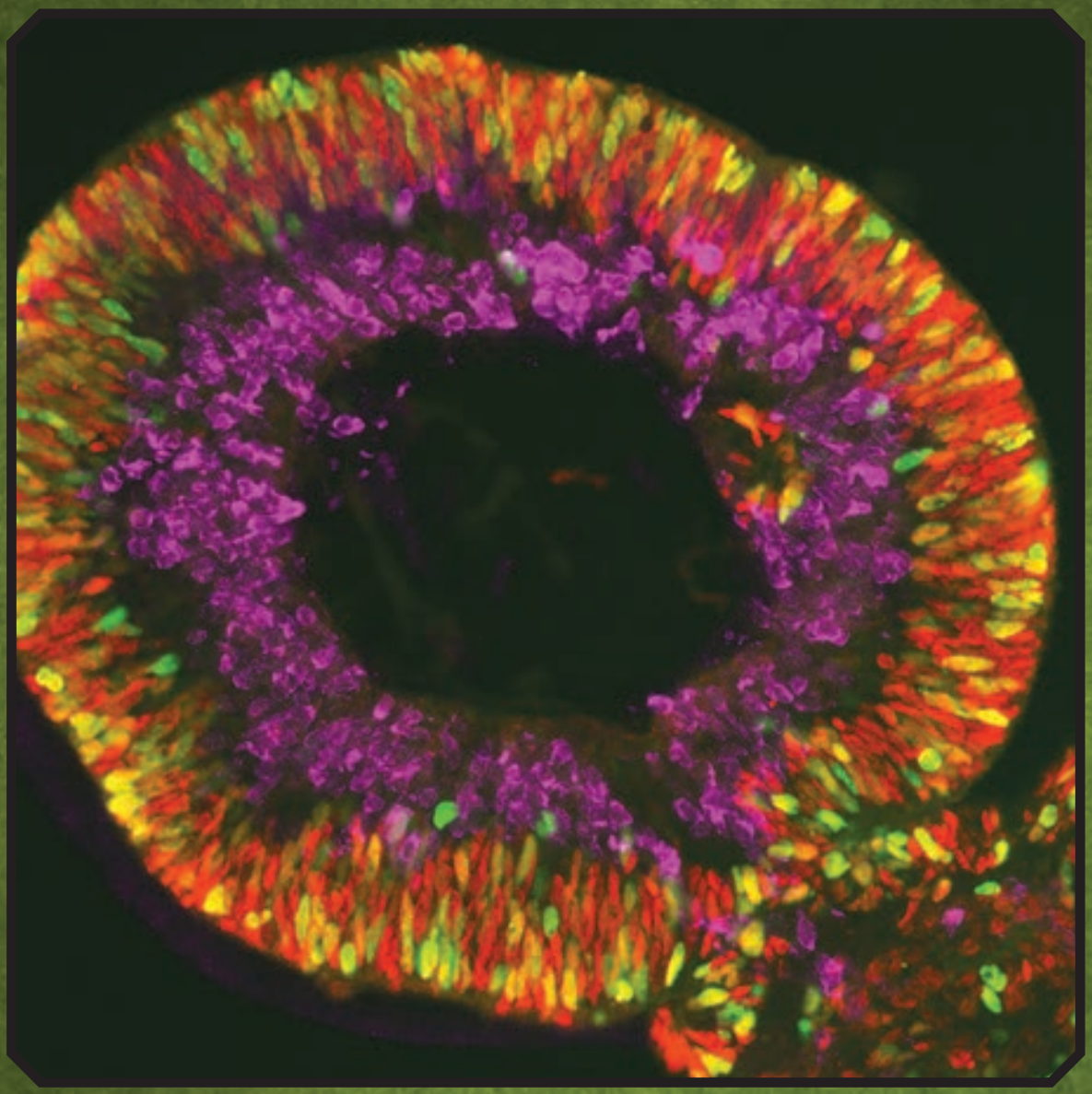

RETINA RESEARCH FOUNDATION

2016 annual report

Retina Research Foundation Board of Directors

Drs. Petros Carvounis, Alice McPherson, and Charles Campbell

Drs. Bernie Hicks and Frank Eggleston

Ames Smith and Pat Singleton

Suzanne Miller, Bettie Lee, and Dede Weil

Cover photo courtesy of David M. Gamm, MD, PhD

RRF Emmett A. Humble Distinguished Director, McPherson Eye Research Institute

Cross section of an early retinal organoid generated from human induced pluripotent stem cells. Dividing retinal progenitor cells are shown in red and green and ganglion cells are shown in purple.

Retina Research Foundation

Annual Report
2016

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Annual Meeting of Board of Directors

Rose Haché, Dean Malouta and Rich Walton

Jacque Royce and Dede Weil

Drs. Charles Campbell and Jim Key

Mike Patrick and Dr. Ben Orman

Linda Lesser and Dede Weil

President's Message

Dear Friends,

We are fast approaching a major milestone in the Foundation's history, and in a few short years we will be celebrating our 50th anniversary. In introducing this year's annual report, let me begin with honoring the founders of RRF for paving the way and establishing the organizational and scientific template that we follow to this day. The building blocks: funding programs in basic science without governmental help, no bricks-and-mortar, and led primarily by lay people dedicated to the mission of eradicating blindness around the globe.

At that time, in 1969, there was no effective treatment for most diseases of the retina although great strides had been made in prevention and cure for non-retinal eye diseases such as cataract and glaucoma. Now, just decades later, new discoveries in the laboratory have resulted in a deeper understanding of retinal development and the disease process. No longer is it a given that one scientist is working alone or with a small team, and collaboration between scientists from various disciplines is more the norm than the exception now. Advances in treatment protocols, surgical technique, instrumentation, and imaging - combined with these basic science discoveries – have resulted in new hope for patients with many retinal diseases.

Retina Research Foundation tirelessly works to make sure that the pace of progress in vision research continues on track. And notably, many of our programs are not just limited to the field of retina now. Retina was the area of greatest need when we began, and remains our primary research focus, but now our programs cover a broad spectrum of fronts. Basic science research, research awards for career achievement by established scientists, research chairs and professorships, educational programs for ophthalmologists, advanced subspecialty training for promising clinicians from developing countries, and travel grants for young scientists to attend scientific meetings – all puzzle pieces in the quest for improved patient care.

What a journey it's been to this point, and how exciting the future before us is shaping up to be. As always, we truly appreciate your decision to join us on this grand adventure of searching for answers to the mysteries of blindness. We are committed to continuing the fight with your help.

With gratitude,

Alice McPherson M.D.

Alice McPherson, MD
President

Overview of Research - 2016

Retina Research Foundation supports an exemplary variety of programs in retina research around the world. The following is a brief recap of RRF research supported in 2016, which illustrates the wide scope of RRF activities.

RRF Pilot Study Grants – Investigation of New Research Topics

Baylor College of Medicine, Houston, TX
- Samuel Wu, PhD – Kayser Research Project
- Milan Jamrich, PhD – Lawrence Research Project
- Rui Chen, PhD – Manning Research Project
- Graeme Mardon, PhD – Miller Research Project
- Richard Hurwitz, MD – Wilson Research Project

University of Texas MD Anderson Cancer Center, Houston, TX
- Louise C. Strong, MD – Humble Research Project

University of Texas Medical Branch-Galveston, Galveston, TX
- Wenbo Zhang, PhD – Bovay Research Project

Texas A&M Health Science Center, Temple, TX
- Lih Kuo, PhD – Gueymard Research Grant

University of Wisconsin, Madison, WI
- Curtis Brandt, PhD – Murfee Macular Degeneration Project

Indiana University, Indianapolis, IN
- Timothy Corson, PhD – Basic Research Grant

The City College of New York, New York, NY
- Mark Emerson, PhD – Basic Research Grant

University of Utah, John Moran Eye Center, Salt Lake City, UT
- Wolfgang Baehr, PhD – Basic Research Project

Case Western Reserve, Cleveland, OH
- Paul Shin-Hyun Park, PhD – Basic Research Project

RRF Cox Macula Society Research Grant – administered by The Macula Society
- Christine A. Curcio, PhD – University of Alabama at Birmingham, Birmingham, AL

Research Chairs – Ongoing Proven Research Projects

Baylor College of Medicine, Houston, TX
- Ching-Kang Jason Chen, PhD – RRF Research Chair

University of Wisconsin, Madison, WI
- Akihiro Ikeda, PhD – Helmerich Chair, Assoc. Director, McPherson Eye Research Institute
- Nader Sheibani, PhD – RRF Research Chair
- David Gamm, MD, PhD – Humble Distinguished Director, McPherson Eye Research Institute
- T. Michael Nork, MD – Murfee Chair, McPherson Eye Research Institute
- Christine Sorenson, PhD – Albert Chair, McPherson Eye Research Institute

Research Professorships – Ongoing Proven Research Projects

University of Wisconsin, Madison, WI
- Jeremy Rogers, PhD – Gamewell Professor, McPherson Eye Research Institute
- Bikash Pattnaik, PhD – Matthews Professor, McPherson Eye Research Institute
- Aparna Lakkaraju, PhD – Brown Professor, McPherson Eye Research Institute

Overview of Research - 2016

Established Awards – Awards Recognizing Lifetime Achievement

RRF Award of Merit – presented by The Retina Society – San Diego, CA – September 15

Steve Charles, MD – Charles Retina Institute, Germantown, TN

RRF Kayser International Award – presented by International Society for Eye Research (ISER) – Tokyo, Japan – September 28

King-Wai Yau, PhD – Johns Hopkins University School of Medicine, Baltimore, MD

RRF Pyron Award – presented by American Society of Retina Specialists (ASRS) – San Francisco, CA – August 10

Donald J. D'Amico, MD – Weill Cornell Medicine, New York, NY

CL Schepens MD/AAO Award – presented by American Academy of Ophthalmology (AAO) and Schepens International Society (SIS) – Chicago, IL – October 14

Harry W. Flynn, Jr., MD – Bascom Palmer Eye Institute, Miami, FL

RRF Gonin Lecturer – presented by Club Jules Gonin – Bordeaux, France – July 8

Thomas W. Gardner, MD – Kellogg Eye Center, Ann Arbor, MI

Gonin Medal – presented by International Council of Ophthalmology (ICO); will be presented again in 2018

Paul Kayser/RRF Global Award – presented by Pan-American Association of Ophthalmology (PAAO); will be presented again in 2017.

International Fellowships – Advanced Subspecialty Training

ICO – RRF Helmerich International Fellowships – administered by International Council of Ophthalmology Foundation (ICOF)

Thiago George Cabral, MD - from Brazil to New York, NY

Jose Manuel Guajardo Beroiza, MD - from Chile to London, UK

Waheed Ademola Ibraheem, MD - from Nigeria to Satna, India

Gillingham Pan-American Fellowships – administered by Pan-American Association of Ophthalmology (PAAO)

João Rafael de Oliveira Dias, MD - from Brazil to Bascom Palmer, Miami, FL

Felipe A. Valenzuela, MD - from Chile to Bascom Palmer, Miami, FL

Research Initiatives – Educational and Travel Scholarships

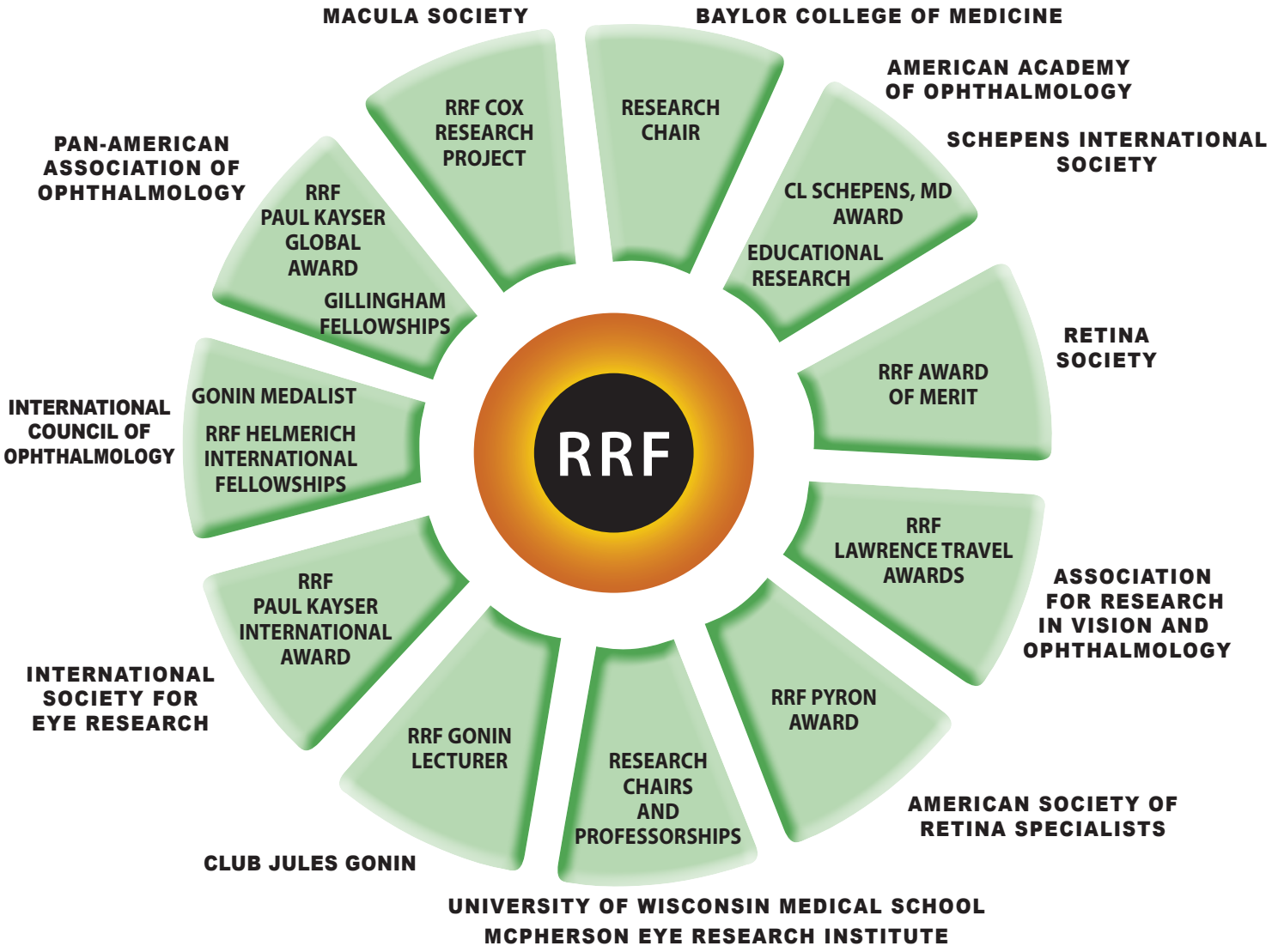
AAO Educational Trust Fund – administered by The Foundation of the American Academy of Ophthalmology (FAAO)

Retina-related educational research programs for clinical and basic science

RRF Lawrence Travel Scholarships – administered by The Association for Research in Vision and Ophthalmology (ARVO)

Twenty-two vitreoretinal scientists representing schools in 15 states traveled to the ARVO Annual Meeting to present their scientific research.

COLLABORATING ORGANIZATIONS



COLLABORATING ORGANIZATIONS	AWARD	DATE OF FIRST COLLABORATION WITH RRF
RETINA SOCIETY	RRF Award of Merit in Retina Research	1978
ARVO Assoc. for Research in Vision and Ophthalmology	RRF Lawrence Travel Awards	1984
ISER International Society for Eye Research	RRF Paul Kayser International Award	1986
ASRS American Society of Retina Specialists	RRF Pyron Award	1988
PAAO Pan-American Association of Ophthalmology	Gillingham Pan-American Fellowships Paul Kayser/RRF Global Award	1992 2012
AAO American Academy of Ophthalmology	Educational Trust Fund	1993
MACULA SOCIETY	RRF Cox Research Project	1993
CLUB JULES GONIN	RRF Gonin Lecturer	1996
ICO International Council of Ophthalmology with University of Lausanne and Swiss Ophthalmological Society	Gonin Medalist	1998
BAYLOR Baylor College of Medicine	Research Chair	1998
UW University of Wisconsin School of Medicine and Public Health	Research Chairs and Professorships	1998
MERI McPherson Eye Research Institute	Research Chairs and Professorships	2007
AAO American Academy of Ophthalmology with SIS Schepens International Society	Charles L. Schepens, MD/AAO Award	2008
ICO/ICOF International Council of Ophthalmology	ICO RRF Helmerich International Fellowships	2009

RETINA RESEARCH SITES

PAST AND PRESENT

TEXAS : 11

Baylor College of Medicine
Center for Technology
Houston Advanced Research Center
UT MD Anderson Cancer Center
Southwest Research Institute
Texas A & M Health Science Center
Texas Children's Hospital
The Methodist Hospital
University of Houston
University of Texas at Galveston
University of Texas at Houston

PAN AMERICAN : 22

Buenos Aires, Argentina
Curitiba, Argentina
La Paz, Bolivia
Belo Horizonte, Brazil
Recife, Brazil
São Paulo, Brazil
Porto Alegre, Brazil
Santiago, Chile
Bogotá, Colombia
Cali, Colombia
San Juan, Costa Rica
Santo Domingo, Dominican Republic
San Salvador, El Salvador
Port-au-Prince, Haiti
San Lorenzo, Honduras
Mexico City, Mexico
Nuevo León, Mexico
Asunción, Paraguay
Lima, Peru
San Juan, Puerto Rico
Montevideo, Uruguay
Caracas, Venezuela

INTERNATIONAL : 41

Asahikawa Medical College	Asahikawa, Japan
Beijing Institute of Ophthalmology	Beijing, China
Bern University Hospital	Bern, Switzerland
Centre for Eye Research	Melbourne, Australia
Eskisehir Osmangazi University	Eskisehir, Turkey
Eye & Laser World Center	Giza, Egypt
Eye Foundation Hospital	Lagos, Nigeria
Hospital Ophthalmique	Lausanne, Switzerland
Institut de la Vision	Paris, France
Jimma University	Jimma, Ethiopia
Kasindo Eye Clinic	E. Sarajevo, Bosnia and Herzegovina
Keio University	Tokyo, Japan
L V Prasad Eye Institute	Hyderabad, India
Lariboisiere Hospital	Paris, France
Lidcombe Hospital	Sydney, Australia
Lund University	Lund, Sweden
Magrabi ICO Cameroon Eye Institute	Yaounde, Cameroon
Mashhad University Medical Services	Mashhad, Iran
Melles Cornea Clinic	Rotterdam, Netherlands
McGill University	Montreal, Canada
Montreal General Hospital	Montreal, Canada
Moorfields Eye Hospital	London, England
Osaka Medical School	Osaka, Japan
Research Institute of Ophthalmology	Cairo, Egypt
Royal College of Ophthalmologists	Edinburgh, Scotland
Sankara Nethralaya Eye Hospital	Chennai, India
Siriraj Hospital	Bangkok, Thailand
Sussex Eye Hospital	Brighton, UK
Tehran University of Medical Sciences	Tehran, Iran
Toronto Western Hospital	Toronto, Canada
University of Bonn	Bonn, Germany
University of Cambridge	Cambridge, England
University of Iceland	Reykjavik, Iceland
University of Osaka	Osaka, Japan
University of Oxford	Oxford, England
University of Paris	Paris, France
University of Erlangen-Nuremberg	Erlangen, Germany
University of Leipzig	Leipzig, Germany
University of Regensburg	Regensburg, Germany
University of Tübingen	Tübingen, Germany
Western General Hospital	Edinburgh, Scotland

NATIONAL : 54

Bascom Palmer Eye Institute	Miami, FL
Beaumont Eye Institute/Hospital	Royal Oak, MI
California Institute of Technology	Pasadena, CA
Case Western Reserve University	Cleveland, OH
Casey Eye Institute	Portland, OR
City College of New York	New York, NY
Cleveland Eye Clinic/Cole Eye Institute	Cleveland, OH
Columbia University	New York, NY
Cornell University Medical College	Ithaca, NY
Dean McGee Eye Institute	Oklahoma City, OK
Duke Eye Center/University Medical School	Durham, NC
Emory University Eye Center	Atlanta, GA
Eye Tech Pharmaceuticals	Worchester, MA
Georgia Regents University	Augusta, GA
Greater Baltimore Medical Center	Baltimore, MD
Harvard Medical School	Boston, MA
Indiana University	Indianapolis, IN
Johns Hopkins University Medical School	Baltimore, MD
Joslin Diabetes Center	Baltimore, MD
Jules Stein Eye Institute	Los Angeles, CA
Kellogg Eye Center	Ann Arbor, MI
Kresge Eye Institute	Detroit, MI
Massachusetts Eye & Ear Infirmary	Boston, MA
Massachusetts Institute of Technology	Boston, MA
McPherson Eye Research Institute	Madison, WI
Medical University of South Carolina	Charleston, SC
National Eye Institute	Bethesda, MD
Northwestern University	Evanston, IL
Rockefeller University	New York, NY
Schepens Eye Research Institute	Boston, MA
Sheie Eye Institute	Philadelphia, PA
Shiley Eye Center, UC San Diego	La Jolla, CA
St. Joseph's Hospital	Baltimore, MD
Stanford University Medical School/ Byers Eye Institute	Palo Alto, CA
Tulane University Medical School	New Orleans, LA
Thomas Jefferson University	Philadelphia, PA
University of California	Berkeley, CA
University of California	Los Angeles, CA
University of California	San Francisco, CA
University of Colorado	Denver, CO
University of Florida	Gainesville, FL
University of Kansas Medical College	Kansas City, KS
University of Miami Medical School	Miami, FL
University of Nebraska HSC	Omaha, NE
University of Pennsylvania	Pittsburgh, PA
University of Rochester	Rochester, NY
University of Southern California	Los Angeles, CA
University of Utah, John A. Moran Eye Center	Salt Lake City, UT
University of Washington	Seattle, WA
University of Wisconsin Medical School	Madison, WI
Vanderbilt University	Nashville, TN
Washington University	St. Louis, MO
Wills Eye Hospital	Philadelphia, PA
Wilmer Eye Institute	Baltimore, MD

Research

RRF provided funding for 13 pilot study research projects conducted at leading research institutions. Nine of the projects were named in recognition of generous support through gifts and years of exceptional service to the Foundation. Pilot studies are experimental studies designed "to test the waters" or break new ground. Findings may lead to larger ongoing studies in the future.

Named Basic Research Projects

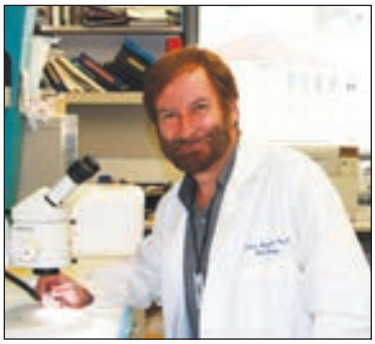
The Kathryn and Latimer Murfee Macular Degeneration Project

Curtis R. Brandt, PhD
Dept. of Ophthalmology and Visual Sciences
McPherson Eye Research Institute
University of Wisconsin, Madison, WI

Gene therapy for retinal degenerative diseases

To date there are few therapies for retinal degenerative diseases such as retinitis pigmentosa (RP) and macular degeneration (MD), but a number of approaches are under investigation including retinal transplantation, stem cells, and gene therapy. Several different viruses have been utilized as gene delivery vectors, including herpes simplex virus (HSV), adenovirus (AdV), adeno-associated virus (AAV), and lentiviruses. Many factors must be considered when designing a vector for ocular gene delivery, including selection of viral vector, delivery route, cellular target, and choice of promoter. Dr. Brandt's work in rodents showed that gene delivery with HSV vectors did not induce inflammation of the eye. In contrast, he found that adenovirus and lentiviral vectors induced a transient inflammatory response in primate eyes. The ultimate goal of this project is to develop a strategy for preventing viral vector induced inflammation in the primate eye in order to improve gene therapy for human ocular diseases.

Joe M. and Eula C. Lawrence Research Project

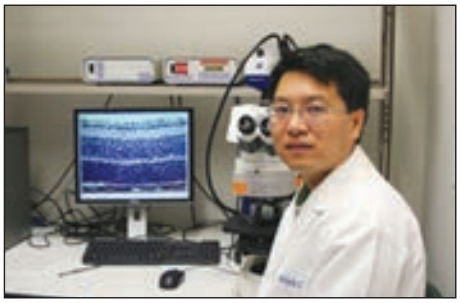


Milan Jamrich, PhD
Dept. of Molecular and Cellular Biology
Baylor College of Medicine, Houston, TX

Function of Rx in the specification, differentiation and survival of vertebrate retinal cells

During eye development the undifferentiated cells of the retina develop into a layered array of cell types with specific capabilities. These include the light-sensitive photoreceptor cells, the bipolar interneuron cells, and the ganglion cells that transmit the information from the eye to the brain. The retinal gene Rx, initially isolated in Dr. Jamrich's laboratory, plays a critical role in the vertebrate eye development and is also expressed in adult retinal cells. There is a possibility that Rx genes might play a role in the survival of photoreceptor cells, and Dr. Jamrich's focus is to investigate the role of Rx in adult retinal cells. Studying the role of mouse Mrx gene in the survival of retinal cells, he found that Mrx has no influence on the survival of the photoreceptors in adult mice.

The W.O. Manning Research Project



Rui Chen, PhD
Dept. of Molecular and Human Genetics
Baylor College of Medicine, Houston, TX

Identification and functional analysis of genes Involved in retina diseases and development

To date, a total of 263 genes have been identified that are associated with heritable human eye diseases (IRD). Therefore, understanding of molecular mechanisms of retina disease is an essential first step for designing personalized treatments of eye diseases. The goal of this project is to identify novel genes involved in human retinal disorders, conduct functional analysis, and develop therapy of these disease genes using model organism. In the past decade, Dr. Chen has identified 15 novel IRD genes, including IFT81, CWC27, and REEP6 in the past year. In addition, animal models have been generated for REEP6 and CWC27, for which functional studies provide new insights of the disease mechanisms. This project provides benefits for the patients in several ways, such as, when positive results are obtained, the molecular mutation screen result provide critical information for diagnosis, prognosis, and potential treatment.

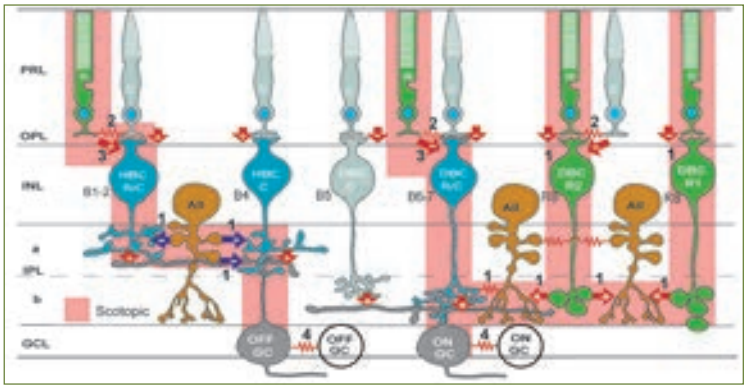
The Paul Kayser Research Project

Dr. Wu examined retinal tissues with a two-photon microscope

Samuel Wu, PhD
Cullen Eye Institute, Neurosensory Center
Baylor College of Medicine, Houston, TX

Pharmacological and genetic mechanisms underlying retinal cell death in glaucoma and age-related macular degeneration (AMD)

Dr. Wu's research project is to study cellular, synaptic and genetic mechanisms underlying retinal cell dysfunction and degeneration in glaucoma and age-related macular degeneration (AMD). By using the multi-electrode array system and reverse correlation methods, his lab has developed new recording and analytic tools for studying spatiotemporal receptive field properties of retinal ganglion cells (RGCs). They also study the effects of elevated intraocular pressure (IOP) on receptive fields of RGCs. Since elevated IOP is known to be associated with glaucoma, these studies will provide crucial information on how RGC receptive fields are altered in glaucoma patients. Moreover, techniques and analytical tools developed in his lab can be used to investigate how receptive fields are altered in other retinal diseases.



Rod synaptic pathways in the mammalian retina

Bertha and I.L. Miller Research Project

Graeme Mardon, PhD
Depts. of Pathology, Molecular and Human Genetics
Baylor College of Medicine, Houston, TX

Genetic and molecular analysis of retinal development

The long-term goal of this project is to improve both the diagnoses and treatments of Leber congenital amaurosis (LCA), a disease characterized by severe blindness at birth or within the first year of life. Dr. Mardon's laboratory recently identified a new gene associated with LCA (Kcjn13), which encodes inwardly rectifying potassium channel but for which no animal models have been established. They have created a new mouse model for LCA by knocking out the mouse Kcnj13 gene using CRISPR technology. These mouse models will serve as an important basis for understanding the mechanism of disease in human and developing gene therapy approaches. Dr. Mardon has demonstrated that loss of Kcnj13 in the RPE causes strong loss of photoreceptors by 3-5 months of age. These data show that his conditional allele is functioning efficiently, and he is now poised for a full developmental study of Kcnj13 function.

Emmett A. Humble Research Project

Louise C. Strong, MD
Dept. of Genetics
University of Texas MD Anderson Cancer Center
Houston, TX

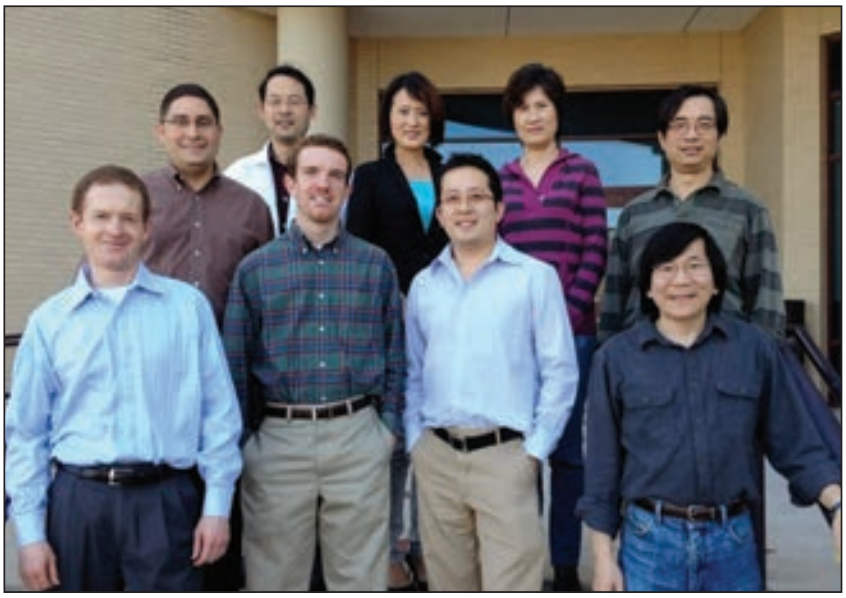
Genetic etiology of retinoblastoma

Dr. Strong's goal is to provide a unique early cancer detection program for individuals with a hereditary cancer predisposition, specifically retinoblastoma and Li Fraumeni syndrome individuals. These tumors are a significant health problem as the most frequent cause of death in hereditary retinoblastoma patients is a second malignant neoplasm; it is also an important biologic question, as the retinoblastoma "pathway" is considered to be critical to the development of most if not all cancers. The purpose of this project is to pilot a new program in education and screening for individuals at genetic high risk of multiple different cancer types that can occur due to the presence of a germline mutation in the Rb1 tumor suppressor gene.

Adolphe G. and Josephine Roberts Gueymard Research Project

Lih Kuo, PhD
Depts. of Medical Physiology, Surgery,
and Ophthalmology
Texas A&M Health Science Center, Temple, TX

Activation of endothelin-dependent RhoA/ROCK pathway elicits retinal arteriolar dysfunction in diabetic retinopathy



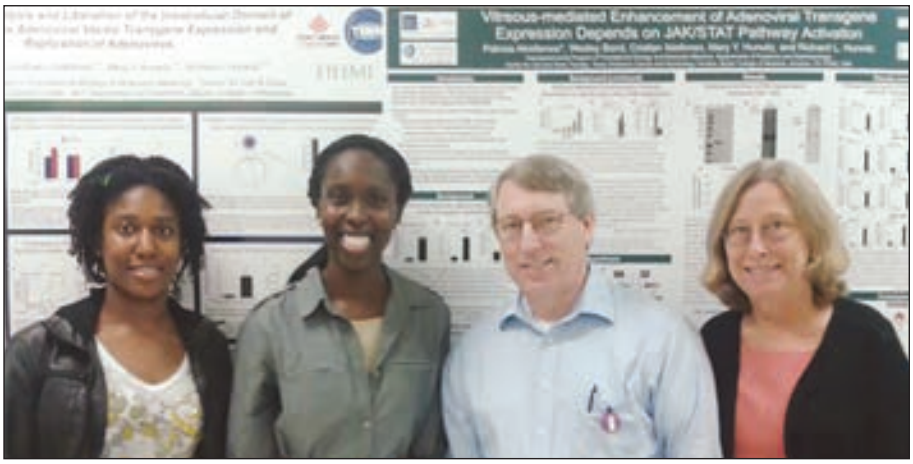
Kuo's retinal research team (Dr. Kuo, front row, far right)

In diabetes, the reduced ocular blood flow regulation is known to be a major culprit for the development of diabetic retinopathy. Dr. Kuo's data are the first to demonstrate the adverse effect of diabetes on retinal vasomotor regulation in the pig model relevant to human physiology and pathophysiology. Recent studies supported by RRF showed that hyperglycemia compromises endothelium-dependent nitric oxide (NO)-mediated vasodilator function in retinal arterioles via activation of endothelin-dependent Rho kinase signaling. In the pig model, he subsequently demonstrated that simvastatin elicits mainly an endothelium-dependent, NO-mediated dilation of retinal arterioles by inhibiting Rho kinase pathway and oxidative stress, and consequently protects the microvasculature from hyperglycemic insults. These results suggest that statins may improve retinal vasomotor function in diabetic retinopathy.

Mary Ellen Wilson Research Project

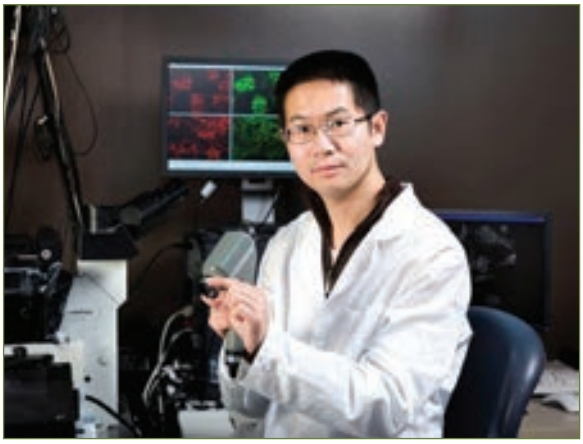
Richard L. Hurwitz, MD
Dept. of Pediatrics, Ophthalmology,
Molecular and Cellular Biology
Co-Director, Retinoblastoma Center
Texas Children's Cancer Center
Center for Cell and Gene Therapy
Baylor College of Medicine, Houston, TX

Immune consequences of gene therapy for ocular disorders



Dr. Richard Hurwitz and Dr. Mary Hurwitz Lab Group

Dr. Hurwitz has completed the first clinical trial using suicide gene therapy to treat children with advanced retinoblastoma (Rb), an ocular cancer that affects young children. The successful reduction of vitreous seeds has encouraged him to continue his laboratory initiatives to improve this innovative therapy. Dr. Hurwitz is also interested in developing gene therapy options for retinal degenerative disorders such as Stargardt Disease. His strategy for either application of gene therapy uses a special nonpathogenic virus to deliver the correct genetic material to selected cells in the eye. Dr. Hurwitz is exploring novel, non-invasive microwafers that can deliver nanoparticles containing drugs or gene-expressing plasmids to the eye to treat retinal diseases including Stargardt Disease and retinoblastoma.



Harry E. Bovay, Jr. Research Project

Wenbo Zhang, PhD
Department of Ophthalmology & Visual Sciences
University of Texas Medical Branch at Galveston
Galveston, TX

Novel therapy for retinal neovascularization

Ischemic retinopathies (IRs) are caused by impaired retinal blood supply in diseases such as diabetic retinopathy, retinopathy of prematurity, and retinal vascular occlusion. These conditions often result in irreversible vision loss due to the development of abnormal new blood vessels, a process referred to as retinal neovascularization. The goal of this project is to develop a novel approach to selectively kill abnormal blood vessels in the retina without affecting normal blood vessels. Dr. Zhang will take advantage of his new discovery of cellular and molecular changes that accompany retinopathies to speed up the development of innovative therapeutic approaches to treat neovascularization in IRs. He has developed and synthesized 12 novel Epac inhibitors based on the structure of ESI-09. In a mouse model of ischemic retinopathy, Dr. Zhang showed that nanoparticle-formulated ESI-09 effectively eliminated abnormal vessels while promoting the physiological vascular repair.

Basic Research Projects

Timothy W. Corson, PhD
Eugene & Marilyn Glick Eye Institute
Indiana University School of Medicine
Indianapolis, IN

Soluble epoxide hydrolase: a therapeutic target in choroidal neovascularization?

The overall goal of this project is to develop novel therapeutic approaches for ocular neovascularization. Homoisoflavonoids are a small class of natural products that Dr. Corson has pursued as antiangiogenic leads. An intriguing target for drug discovery is the lipid metabolism enzyme sEH, which, with prior RRF funding, Dr. Corson identified as a target of his novel antiangiogenic compound SH-11037. He hypothesized that sEH is required for choroidal neovascularization and has completed the assessment of sEH expression in murine and human choroidal neovascularization. It will be important to determine what aspects of sEH function are important for blood vessel growth, and how this enzyme is linked to signaling in the cell. This work will lay the groundwork for future efforts to target sEH for the treatment of wet AMD and related retinal diseases of abnormal blood vessel growth.

Dr. Corson (third from right) with his lab group

Mark Emerson, PhD
Department of Biology
The City College of New York
New York, NY

A mouse model to improve the generation of stem cell therapies for the treatment of human blindness

Several retinal diseases lead to a debilitating loss of vision upon the death of a particular cell type, the cone photoreceptor. One of the most promising therapies for retinitis pigmentosa and macular degeneration involves introducing new cone photoreceptors into the eyes of patients that have lost them. To accomplish this, scientists need to be able to generate a large number of these cells in the lab. Furthermore, these cells will need to be at the correct developmental stage to integrate into the remaining cellular architecture. Dr. Emerson's goal is to engineer a modified line of embryonic stem cells that will glow green when they are on their way to making cone photoreceptors. In 2016, he began establishing lines and testing for reporter activity in the transgenic founders at his animal facility.

Wolfgang B. Baehr, PhD
Department of Ophthalmology and Visual Sciences
University of Utah Health Science Center
Salt Lake City, UT

Therapy for a mouse model of Senior-Løken Syndrome

Dr. Baehr's lab is interested in understanding mechanisms leading to retina disease and developing gene-based therapies for non-syndromic and syndromic ciliopathies, focusing mainly on the retina. Recently, the lab probed the function of Arf-like protein 3 (ARL3) by generating rod photoreceptor and retina-specific Arl3 deletions. In a follow-up project, they focused on ARL13b, a human disease gene associated with Joubert Syndrome affecting the retina, brain, liver and kidneys. They generated a retina-specific knockout that shows a Leber congenital amaurosis phenotype: rod and cone outer segments are non-functional. Experiments are on the way to show that an AAV2/8 vector can alleviate the disease in mouse.

Dr. Baehr (center) with his lab group

Research

Paul Shin-Hyun Park, PhD
Department of Ophthalmology and Visual Sciences
Case Western Reserve University, Cleveland, OH

A potential neuroprotective role for GPR75 in the retina

The retina is exposed to a variety of stresses during normal function, which can lead to retinal degeneration in the absence of neuroprotective mechanisms. In diseased states, these neuroprotective mechanisms may become overwhelmed. In this proposal, the possibility that GPR75 can serve as a neuroprotective target in the retina is explored. Defects in this protein may contribute to retinal degeneration occurring in diseases such as age-related macular degeneration. In 2016, Dr. Park continued his examination of the retina of GPR75 knockout (GPR75-/-) mice. These studies suggest that in the absence of GPR75, the retina is more susceptible to environmental stresses with age, possibly due to light damage over time. Characterization of GPR75 mutants detected in patients with age-related macular degeneration suggest that some of the mutants exhibit a structural deficit, which is consistent with the notion that defects in GPR75 can contribute to the pathogenesis of AMD.

Grant Recipient from The Macula Society

The RRF Margaret and Mills Cox Macula Society Research Project

Christine A. Curcio, PhD
University of Alabama at Birmingham School of Medicine
Birmingham, AL

Visualizing organelles in human retinal pigment epithelium by 3-dimensional electron microscopy

Dr. Curcio focuses on aging and age-related macular degeneration (AMD), the third largest cause of vision loss worldwide. Interests include cell biology, lipoprotein biology, clinical image validation, neurodegeneration, epidemiology, and transcriptomics. Recently her lab, with clinical collaborators, validated optical coherence tomography and quantitative fundus autofluorescence, two imaging technologies essential to AMD diagnosis and management. Dr. Curcio created an open access web-based digital microscope of AMD histopathology, www.projectmacula.

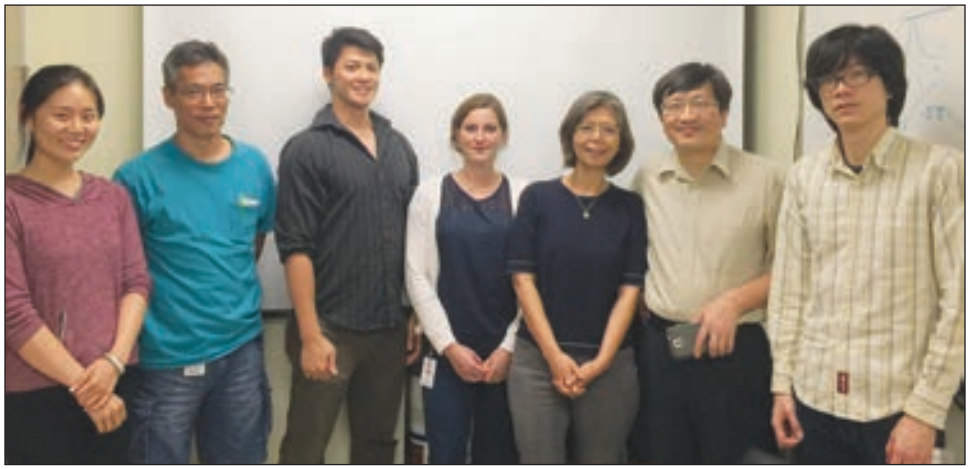
Research Chairs and Professorships

RRF now supports a total of six chairs and three professorships in retina research, which provide funds to vision scientists engaged in original excellent research that has the potential to increase understanding of the retina or retinal diseases.

RRF Research Chair

Ching-Kang Jason Chen, PhD
Depts. of Ophthalmology, Biochemistry and Molecular Biology, Neuroscience
Baylor College of Medicine
Houston, TX

A novel retinal oscillation mechanism in an autosomal dominant mouse model of retinitis pigmentosa



Dr. Chen (second from right) with his research group

Dr. Chen studies the consequences and mechanisms of photoreceptor degeneration. One consequence of photoreceptor loss in retina is the oscillation of many remaining retinal neurons. Dr. Chen's lab has discovered a novel oscillation mechanism in 2016 in one mouse model of autosomal dominant photoreceptor degeneration and several recessive mouse models of stationary night blindness. The current research effort in his laboratory has been focused on elucidating cellular basis of this novel retinal oscillation mechanism, while leveraging this robust biological phenomenon as a means to classify and probe intricate synaptic connections among many different retinal neurons. In 2016 Dr. Chen served as the chair of one NIH Special Emphasis Panel and served as a reviewer in another.

Walter H. Helmerich Chair

Akihiro Ikeda, DVM, PhD
Associate Director, McPherson Eye Research Institute
Department of Medical Genetics
University of Wisconsin, Madison, WI

Identification of genetic factors affecting aging of the retina

Dr. Ikeda uses mouse models to study the genetic and molecular mechanisms of aging. His laboratory studies a mouse mutant showing similar symptoms as observed in age-related macular degeneration (AMD) patients. He has identified the mutation in the gene (Tmem135) associated with mitochondria functions and confirmed that the mutation is indeed causing the AMD-like symptoms. Another major project is to identify genes that determine the severity of aging symptoms in the retina including neurodegeneration, synaptic abnormality, and inflammation using two mouse strains, one of which shows retinal aging symptoms earlier than the other. He has found that a mutation in the bloom syndrome gene (Blm) involved in DNA damage repair is responsible for the early onset of aging symptoms and that Blm may have a role in the mitochondrial function.

Research Chairs and Professorships

RRF Research Chair

Nader Sheibani, PhD
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Regulation of ocular vascular development and neovascularization

Dr. Sheibani's work focus on the mechanisms that regulate ocular vascular function. Using this knowledge, he is developing novel treatments. In collaboration with Dr. Murphy, he recently showed that by using VEGF binding microspheres one can differentially regulate angiogenesis. In collaboration with Dr. Ranji he has developed a multi-parameter image analysis for quantitative assessment of retinopathy. He also showed high glucose conditions promote migratory activity of retinal pigment epithelial cells through increased oxidative stress and PEDF expression. In collaboration with Dr. Subauste he showed an important role for CD40 signaling in Muller cells and activation of microglia and development of diabetic retinopathy. (Reported in: Biomaterials (July 2016), J Med Signal Sens (April-June 2016), AJP Cell Physiol (Sept 2016), and Diabetes (July 2016).

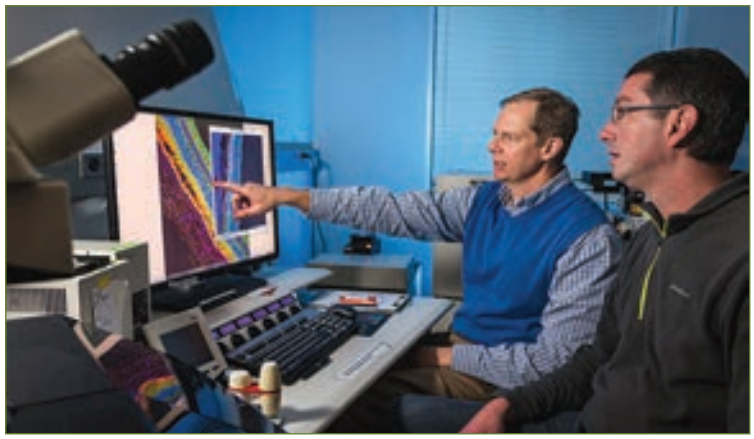
Dr. Sheibani (standing, left) with his research team

Emmett A. Humble Distinguished Directorship

David M. Gamm, MD, PhD
Director, McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Modeling and treating retinal disease with human induced pluripotent stem cells (hiPSCs)

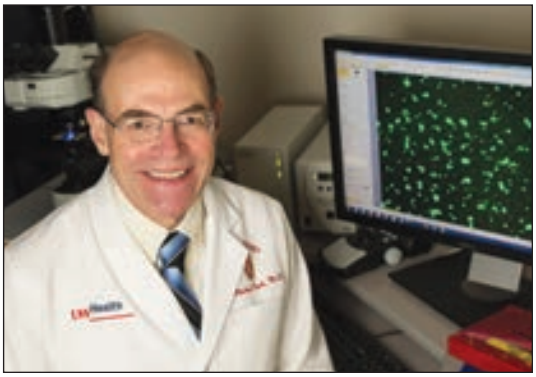
Dr. Gamm is advancing his pioneering technology that grows retinal tissues from blood samples using human induced pluripotent stem cells (hiPSCs). He uses this versatile system to model human retinal diseases in a laboratory dish in order to screen for drugs and other therapeutics. He is also actively engaged in stem cell-based photoreceptor replacement efforts to treat retinal degenerative diseases. Recently, he partnered with FUJIFILM-Cellular Dynamics International to create Opsis Therapeutics, which utilizes his patented approaches to produce clinical-grade cells for the treatment of blind and low vision patients. Together with collaborators at the UW-Madison, Dr. Gamm's team is paving the way for hiPSC therapies for retinal disease.



Dr. Gamm and scientist Dr. Joe Phillips discuss results from a human photoreceptor transplant experiment

Research Chairs and Professorships

Kathryn and Latimer Murfee Chair



T. Michael Nork, MD, MS
McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Functional and Cellular Mechanisms of Ischemic Retinal Injury

Dr. Nork is a clinician-scientist whose clinical subspecialty is diseases and surgery of the retina. He is also fellowship trained in ophthalmic pathology. The object of his basic laboratory research has been to understand how an inadequate blood supply (ischemia) to the retina affects its health. Much of his initial and ongoing studies have looked at the ischemic changes that he and others found in the outer retina (rods and cones) in glaucoma and what this might mean for the health of the cells that are most damaged in glaucoma—the retinal ganglion cells. Other retinal diseases, such as retina vascular occlusion, are unquestionably the result of reduced retinal circulation. Working with animal models of branch retinal artery occlusion and glaucoma and applying advanced electrophysiologic and histopathologic examination, his lab hopes to better understand the underlying mechanisms of retina cellular damage with the long-term goal of developing pharmaceutical and other interventions that might mitigate such injury.

Daniel M. Albert Chair

Photo by Andy Manis

Christine M. Sorenson, PhD
University of Wisconsin Dept. of Pediatrics
McPherson Eye Research Institute
Madison, WI

Apoptosis in retinal vascular development and disease

Dr. Sorenson's research focus is delineating the role Bim and Bcl-2 proteins play in modulating apoptosis during normal and aberrant retinal vascularization. She is interested in understanding how these proteins are regulated during eye diseases with a neovascular component such as exudative age-related macular and retinopathy of prematurity. Her studies have established key roles for the Bcl-2 and Bim proteins in retinal vascular development and neovascularization, and she is delineating their impact in specific retinal and choroidal vascular cells. The knowledge gained from these studies will aid in development of new therapies that lack global systemic effects as now seen in anti-VEGF therapies.

Research Chairs and Professorships

Edwin and Dorothy Gamewell Professor

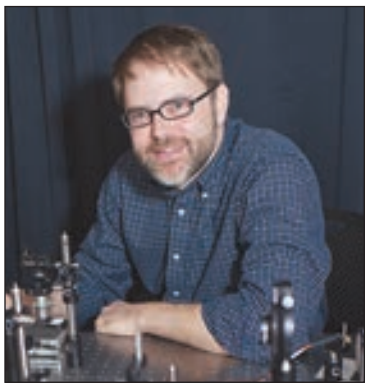
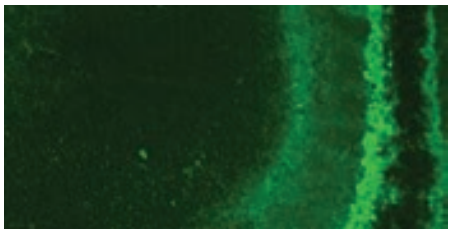


Photo by Todd Brown/Media Solutions

Jeremy Rogers, PhD
McPherson Eye Research Institute
Department of Biomedical Engineering
University of Wisconsin, Madison, WI

Optical instrumentation and technology platforms for the study and screening of retinal disease



Dark-field microscopy of unstained mouse retina highlights the variation of light scattering from different retinal layers

Dr. Rogers develops new imaging tools to aid in the treatment, prevention, and basic research of retinal disease. The ability to image and quantify structure and function of retinal cells in a clinical setting is crucial to advancing treatment and prevention options. Dr. Rogers is developing new imaging technologies that exploit the intrinsic light scattering properties of cells to provide contrast, making these methods suitable for clinical imaging. By developing optical contrast methods powered by computational light scattering simulations, he will be able to improve contrast of current instruments, and explore new contrast methods for early disease screening or tracking of disease progression and treatment.

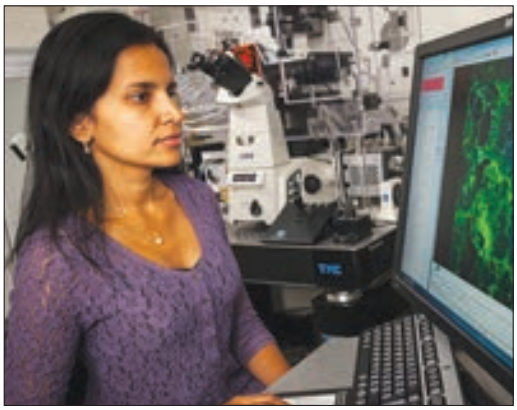
M.D. Matthews Research Professor

Bikash Pattnaik, PhD
McPherson Eye Research Institute
Department of Pediatrics, Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Vision Loss Due to Ion-Channelopathy

Dr. Pattnaik's research focus is on the inherited blindness due to a defective inwardly rectifying potassium (Kir7.1) channel. This Kir7.1 ion-channel is present in the retinal pigment epithelium (RPE) cells within the retina, and he has shown that mutations alters Kir7.1 membrane localization or function. Dr. Pattnaik's lab has developed patient-specific induced pluripotent stem cells (iPSC) derived RPE cells and uses it to model blindness due to the genetic alteration for Kir7.1. They are currently using these cells to test gene or drug-based therapies. The iPSC-RPE cells have potential use in gene manipulation and transplantation studies. The overall goal is to accurately predict prevention or treatment for pediatric blindness.

Rebecca Meyer Brown Professor



Aparna Lakkaraju, PhD
McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Insight into the cellular basis of retinal degenerative diseases

Research in Dr. Lakkaraju's laboratory builds on insights from retinal cell biology to develop effective therapies for sight-threatening diseases such as age-related macular degeneration (AMD). Recent work from Dr. Lakkaraju's team has elucidated novel mechanisms that regulate critical pathways in the retina such as cellular clearance, inflammation, and ocular immune privilege. These studies also helped identify FDA-approved drugs that can help preserve retinal health and function over a lifetime. Studies are currently underway to establish the efficacy of these drugs in preserving vision in models of macular degeneration.

Established Research Awards

These awards were presented to renowned scientists in recognition of their lifetime achievement.

The Award of Merit in Retina Research

Steve Charles, MD
Charles Retina Institute
Germantown, TN

Evolution of Vitreoretinal Techniques and Technologies

In being chosen for the Award of Merit, Dr. Charles gave the Charles L. Schepens Lecture at the 49th Annual Scientific Meeting of The Retina Society in San Diego, CA, which was held in September.

Dr. Charles is one of the world's leading vitreoretinal surgeons and has developed many of the techniques and devices used by vitreoretinal surgeons worldwide. He has performed over 36,000 vitreoretinal surgeries, lectured in 50 countries and operated in 25. He authored a leading textbook in the field, over 174 articles in the medical literature and over 50 book chapters. Dr. Charles is a mechanical and electrical engineer and has well over 100 issued or pending patents.

Dr. Charles with Retina Society President Dr. Mark Johnson

RRF Pyron Award for Outstanding Achievement in Retina Research

Donald J. D'Amico, MD
Weill Cornell Medicine, Ophthalmology
New York, NY

Permanent Keratoprosthesis and Complex Ocular Reconstruction: New Opportunities and Challenges for the Vitreoretinal Surgeon

Dr. D'Amico presented the RRF Pyron Award lecture at the 34th Annual Meeting of the American Society of Retina Specialists (ASRS), which was held in San Francisco, CA, in August.

Dr. D'Amico is an internationally recognized leader in the field of vitreoretinal surgery and has participated as a principal investigator or co-investigator in many clinical trials and laboratory investigations. His major interests include vitreoretinal surgery, diabetic retinopathy, experimental lasers and other technologies for the surgical treatment of vitreoretinal disorders, macular degeneration, and endophthalmitis and intravitreal drug therapy. Dr. D'Amico has published over 200 articles on vitreoretinal diseases and has co-edited two books covering comprehensive retinal themes.

Dr. D'Amico with ASRS President Dr. Tarek Hassan

Established Research Awards

Charles L. Schepens, MD/AAO Award

Harry W. Flynn, Jr, MD
Bascom Palmer Eye Institute
Miami, FL

Management options for vitreomacular traction: Use an Individualized Approach

In being selected for the Charles L. Schepens, MD/AAO Award, Dr. Flynn gave the Charles L. Schepens, MD/AAO Lecture at the Retina Subspecialty Day of the American Academy of Ophthalmologists (AAO) Annual Meeting in Chicago, IL, on October 14.

Dr. Flynn specializes in medical and surgical treatment of diseases of the retina and vitreous, and is the J. Donald M. Gass, MD Distinguished Chair in Ophthalmology at the University of Miami School of Medicine. Dr. Flynn has been author or co-author of more than 500 publications as well as 88 book chapters, and has edited or co-edited four books. Dr. Flynn had held numerous administrative positions including President of The Vitreous Society (now ASRS, The American Society of Retina Specialists) in 1992-1993 and President of The Retina Society in 2002 - 2003.

Dr. Flynn with Dr. McPherson

Schepens Medalists Dr. Larry Yannuzzi (2013), Dr. Harry Flynn (2016), Dr. Mark Blumenkranz (2015), and Dr. Stanley Chang (2011) with Dr. Alice McPherson

Established Research Awards

Paul Kayser / RRF Global Award

King-Wai Yau, PhD
Johns Hopkins University School of Medicine
Baltimore, MD

Melanopsin Signaling in the Eye

The XXII Biennial Meeting of the International Society for Eye Research (ISER), held in September in Tokyo, Japan, was the setting for Dr. Yau's Plenary Lecture as recipient of the Kayser International Award.

Dr. Yau's research focus is rod/cone phototransductions, molecular biology, olfactory transduction, ion-channel molecular physiology, mouse genetics, intrinsically photosensitive retinal ganglion cells, as well as retinal diseases and some translational work. His work has transformed the study of retinal rods and cones.

Club Jules Gonin Lecturer

Thomas W. Gardner, MD
Kellogg Eye Center
Ann Arbor, MI

The Neurovascular Unit: A New Dimension in Diabetic Retinopathy

Dr. Gardner gave the Jules Gonin Lecture at the XXXth Meeting of the Club Jules Gonin in Bordeaux, France, in July.

Dr. Gardner has advanced the concept that diabetic retinopathy is a neurovascular disease. His research includes collaborative studies that revealed a molecular basis for retinal vascular permeability and diabetic macular edema, as well as mechanisms for the accelerated death of retinal neurons. He has extended the role of neurosensory retinal damage in diabetes to quantify visual function impairment in persons with diabetes, and to adopt these techniques as dynamic endpoints for therapeutic clinical trials.

Dr. Gardner with Dr. Thomas Wolfensberger, Secretariat, Club Jules Gonin

International Fellowships

RRF funds two programs of international fellowships, one a twelve-month fellowship and the other a six-month fellowship.

ICO - RRF Helmerich International Fellowships

The International Council of Ophthalmology (ICO), in cooperation with the International Council of Ophthalmology Foundation (ICOF), and Retina Research Foundation, has established two international fellowships with income from an endowment created by Walter H. Helmerich, III. This year three, 12 month fellowships provide advanced subspecialty training for young ophthalmologists from developing countries who are recommended by the head of a teaching or public service institution and are committed to returning to a position at a teaching institution or public service hospital in their home country following the fellowship.

Thiago George Cabral, MD, from Brazil, for training in retina at the Edward S. Harkness Eye Institute, Columbia University, New York, NY, with Dr. Stephen Tsang. Following fellowship, Dr. Cabral will return to Federal University of São Paulo, Brazil, as a faculty member and teach medical students, ophthalmology residents, and fellows.

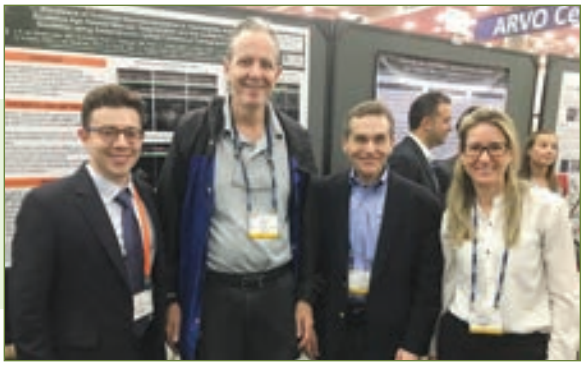
Jose Manuel Guajardo Beroiza, MD, from Chile, for training in glaucoma at St. Thomas Hospital, Dept. of Ophthalmology, London, UK, with Dr. Kim Sheng Lim. After fellowship, Dr. Guajardo Beroiza will return to Hospital del Salvador, Santiago de Chile, Chile, to serve as consultant in the Department of Glaucoma.

Waheed Ademola Ibraheem, MD, from Nigeria, for training in vitreoretinal at Sadguru Netra Chikitsalaya (Eye Hospital) in Satna, India, with Dr. B. K. Jain. Following fellowship, Dr. Ibraheem will return to the Lautech Teaching Hospital in Ibadan, Nigeria, to serve as a consultant.

Gillingham Pan-American Fellowships/PAAO

This program is administered for RRF by the Pan-American Association of Ophthalmology (PAAO). Two, six-month fellowships were awarded this year to Latin American ophthalmologists for training at leading institutions in the United States.

João Rafael de Oliveira Dias, MD, from Brazil, to Bascom Palmer Eye Institute (J-1 Research Scholar), Miami, FL, for training in retina with Dr. Philip Rosenfeld.



Dr. Dias, left, with William Feuer, Dr. Phil Rosenfeld, and Dr. Mariana Thorell

Felipe A. Valenzuela, MD, from Chile, to Bascom Palmer Eye Institute, Miami, FL, for training in cornea with Dr. Victor L. Perez.

Research Initiatives

RRF has endowed gifts with earnings applied to translational research and education to bring laboratory knowledge to the clinical level.

American Academy of Ophthalmology Educational Trust Fund

This educational program is administered for RRF by the American Academy of Ophthalmology, and upgrades clinical research skills in the field of retina. The 2016 funding for this program was over $44,000.

RRF Lawrence Travel Scholarships

This program is administered by the Association for Research in Vision and Ophthalmology (ARVO) and is made possible by a gift to RRF from Joe M. and Eula C. Lawrence. A total of $20,000 was funded to provide travel expenses for young vitreoretinal scientists to attend the ARVO Annual Meeting to present their papers or posters. This year the meeting was held in May in Seattle, WA.

In 2016, twenty-two ophthalmology students were selected from these schools:

University of Nebraska Medical Center, Omaha, NE

Mass. Eye and Ear Infirmary, Harvard Medical School, Boston, MA

The University of Tennessee Health Science Center, Memphis, TN

Miller School of Medicine, University of Miami, Miami, FL

University of North Texas Health Science Center, Fort Worth, TX

Columbia University, New York, NY

University of Pittsburgh School of Medicine, Pittsburgh, PA

IUPUI, Indianapolis, IN

Vanderbilt University Medical Center, Nashville, TN

Wyle Science, Technology, & Engineering Group, Houston, TX

University of Wisconsin-Madison, Madison, WI

University of Iowa, Iowa City, IA

University of Illinois at Chicago, Chicago, IL

University of Utah School of Medicine, Salt Lake City, UT

OU Health Science Center, Oklahoma City, OK

Univ. of Missouri Kansas City School of Medicine, Kansas City, MO

Jules Stein Eye Institute, UCLA, Los Angeles CA

University of Nebraska Medical Center, Omaha, NE

RRF Board Attends the 10th Anniversary of McPherson Eye Research Institute

Five RRF Board members traveled to Madison, WI, in April to participate in activities honoring the 10th anniversary of McPherson Eye Research Institute and to attend the Fourth McPherson Endowed Lecture.

Pawan Sinha, PhD, Professor of Vision and Computational Neuroscience, MIT, Cambridge, MA, was this year's McPherson Lecturer. RRF Board members joined faculty, staff, and students to hear Dr. Sinha speak on the topic of "Learning to See Late in Childhood" about his research related to behavioral and brain-imaging studies. Founded by Dr. Sinha, Project Prakash provides sight-restoring surgeries to blind children in India and addresses scientific questions regarding brain plasticity and learning.

Dr. David Gamm introducing Dr. Pawan Sinha

McPherson ERI hosted a 10th anniversary dinner that was attended by RRF Board members, and distinguished speakers were:

David M. Gamm, MD, PhD, RRF Emmett A. Humble Distinguished Director, McPherson ERI;
Daniel M. Albert, MD, MS, Founding Director, McPherson ERI;
Rebecca M. Blank, Chancellor, University of Wisconsin–Madison;
Robert N. Golden, MD, Dean, UW School of Medicine and Public Health.

In 2005, the concept of a multi-disciplinary, cross-campus vision research institute was unique – not confined to a single building or department, but rather tapping into the full breadth of talent available at UW-Madison and surrounding institutions to create a broad, collaborative vision research community advancing efforts to understand, preserve, and restore vision. With focus from multiple research perspectives, progress in understanding the causes and mechanisms of blinding diseases, as well as in devising innovative strategies for the prevention and treatment of visual loss, advances significantly.

UW Chancellor Rebecca Blank speaking at the McPherson ERI 10th Anniversary Dinner
Photo credit Andy Manis

McPherson Eye Research Institute Renaming Ceremony in 2012

In July 2012, when Institute leadership passed from Dr. Daniel Albert to Dr. David Gamm, the ERI was formally renamed in honor of Dr. Alice McPherson.

Her integral involvement with the ERI dates back to 1992, when Dr. Albert served as Chair of the UW Department of Ophthalmology & Visual Sciences. The idea for the Eye Research Institute evolved in conversations and events held over the 10 years that Dan Albert was Chair. The Institute became operational in 2005, linking vision and visual sciences researchers from across the entire campus.

Ten years after the founding of the Institute, there are now over 180 members from 33 departments representing eight schools and colleges. Among them are biomedical engineering, computer sciences, electrical engineering, genetics, medical physics, psychology, neuroscience, and zoology—as well as ophthalmology and visual sciences.

Interim Chancellor David Ward and Judith Ward congratulating Dr. McPherson
Photo credit Jeff Miller

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RETINA RESEARCH FOUNDATION
COMBINED STATEMENT OF FINANCIAL POSITION

December 31, 2016
(with summarized financial information as of December 31, 2015)

	General Funds			Endowment Funds					2015 Total All Funds
	Unrestricted	Temporarily Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	**2016 Total All Funds**	(Memorandum Only)
Assets									
Cash and cash equivalents	$ 745,804	$ 41,000	$ 786,804	$ -	$ 5,522,979	$ -	$ 5,522,979	**$ 6,309,783**	$ 9,347,314
Contributions receivable	17,000	5,000	22,000	-	-	9,000	9,000	**31,000**	42,327
Investments	1,331,948	-	1,331,948	3,277,502	21,571,553	19,480,409	44,329,464	**45,661,412**	40,153,817
Furniture and equipment, net of accumulated depreciation of $6,129	13,495	-	13,495	-	-	-	-	**13,495**	14,342
Charitable remainder trust	-	-	-	-	-	-	-	**-**	349,065
Intangible assets	12	-	12	-	-	-	-	**12**	12
Total assets	$ 2,108,259	$ 46,000	$ 2,154,259	$ 3,277,502	$ 27,094,532	$ 19,489,409	$ 49,861,443	**$ 52,015,702**	$ 49,906,877
Liabilities and net assets									
Accounts payable	$ -	$ -	$ -	$ -	$ 50,031	$ -	$ 50,031	**$ 50,031**	$ 26,405
Commitments and contingencies									
Net assets	2,108,259	46,000	2,154,259	3,277,502	27,044,501	19,489,409	49,811,412	**51,965,671**	49,880,472
Total liabilities and net assets	$ 2,108,259	$ 46,000	$ 2,154,259	$ 3,277,502	$ 27,094,532	$ 19,489,409	$ 49,861,443	**$ 52,015,702**	$ 49,906,877

RETINA RESEARCH FOUNDATION
COMBINED STATEMENT OF ACTIVITIES AND CHANGES IN NET ASSETS

For the year ended December 31, 2016
(with summarized financial information for the year ended December 31, 2015)

	General Funds			Endowment Funds				2016	2015 Total All
	Unrestricted	Temporarily Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	**Total All Funds**	Funds (Memorandum Only)
Revenues									
Contributions	$ 219,827	$ 67,000	$ 286,827	$ -	$ -	$ 300,738	$ 300,738	**$ 587,565**	$ 374,815
Interest, dividend and distribution income	37,827	-	37,827	88,310	1,245,587	-	1,333,897	**1,371,724**	1,258,870
Realized and unrealized gains (losses) on investments, net	44,411	-	44,411	109,281	1,543,863	-	1,653,144	**1,697,555**	(2,974,496)
Mineral interest income and other income	19,447	-	19,447	-	-	-	-	**19,447**	29,502
Change in value of split-interest agreement	-	-	-	-	-	7,963	7,963	**7,963**	26,911
Income transferred from Endowment Fund investments	1,240,605	90,775	1,331,380	(88,266)	(1,243,114)	-	(1,331,380)	**-**	-
Net assets released from restrictions - satisfaction of program restrictions	207,166	(207,166)	-	-	-	-	-	**-**	-
Total revenues	1,769,283	(49,391)	1,719,892	109,325	1,546,336	308,701	1,964,362	**3,684,254**	(1,284,398)
Expenses									
Program services									
Research projects and grants	1,173,677	-	1,173,677	-	-	-	-	**1,173,677**	1,187,465
Public education	36,222	-	36,222	-	-	-	-	**36,222**	33,665
Career development and awards	80,241	-	80,241	-	-	-	-	**80,241**	80,208
Total program services	1,290,140	-	1,290,140	-	-	-	-	**1,290,140**	1,301,338
Supporting services									
Management and general	113,000	-	113,000	10,541	173,155	-	183,696	**296,696**	429,990
Fundraising	12,219	-	12,219	-	-	-	-	**12,219**	28,829
Total supporting services	125,219	-	125,219	10,541	173,155	-	183,696	**308,915**	458,819
Total expenses	1,415,359	-	1,415,359	10,541	173,155	-	183,696	**1,599,055**	1,760,157
Changes in net assets	353,924	(49,391)	304,533	98,784	1,373,181	308,701	1,780,666	**2,085,199**	(3,044,555)
Net assets, beginning of year	1,754,335	95,391	1,849,726	3,178,718	25,671,320	19,180,708	48,030,746	**49,880,472**	52,925,027
Net assets, end of year	$ 2,108,259	$ 46,000	$ 2,154,259	$ 3,277,502	$ 27,044,501	$ 19,489,409	$ 49,811,412	**$ 51,965,671**	$ 49,880,472

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