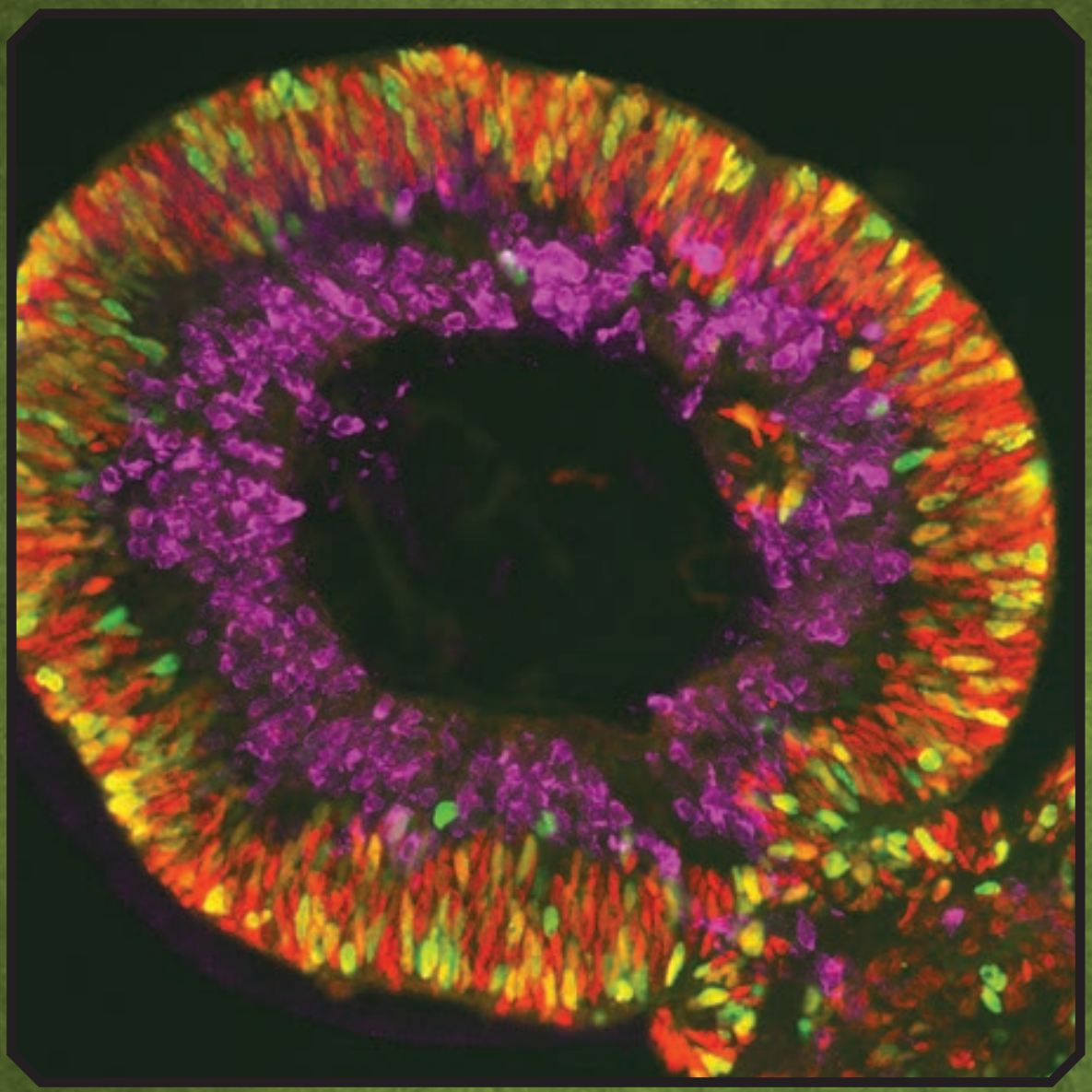


RETINA RESEARCH FOUNDATION

2015 annual report

Retina Research Foundation Board of Directors

Dr. Frank Eggleston and Ames Smith

Barbara Kirsch, Dr. Alice McPherson and Jamie McMahon

Lynn Bernard and Dr. Ben Orman

Henry Gissel and John Dawson

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
2015

Table of Contents

James Winfrey, Dr. Alice McPherson, Malcolm Wooley and Larry Washington

Bettie Lee and Dede Weil

Dr. Petros Carvounis, Dr. Bernie Hicks and Rose Haché

Ron Webster, Henry Gissel and Roger Beck

Bob Thomas and Rich Walton

Keith Humble, Emmett Humble and Deral Humble

President's Message

Dear Friends,

The year 2015 was a year of new experiences for Retina Research Foundation. On March 25, the RRF Board was invited to lunch and a tour of the newly renovated Retina Research Laboratory at the Cullen Eye Institute of Baylor College of Medicine in Houston. Dr. Tim Stout, Chairman of Ophthalmology, arranged the visit along with RRF-funded scientists Dr. Sam Wu and Dr. Ching-Kang Jason Chen. Board members got a first-hand look at demonstration stations of Dr. Wu and Dr. Chen's experiments, including presentation of the methods and purpose of the experiments – all accomplished with cutting-edge research equipment, largely funded by RRF over the years.

The ARVO Annual Meeting is the largest gathering of eye and vision researchers in the world. At this year's meeting in Denver, McPherson ERI hosted a reception honoring RRF's 46 years of excellence in supporting research and the scientists whose work has been funded by RRF. Many of the leaders in ophthalmology attended, and seven distinguished speakers shared their stories of the impact that RRF has had on advancing knowledge into vision preservation.

Dr. Sheila Nirenberg was selected to be the McPherson Lecturer at McPherson ERI, and on May 18, ten RRF Board members traveled to hear her speak about her progress in developing new types of prosthetic devices to correct blindness. While there, the Board participated in a tour of the new McPherson Eye Research Institute offices and some of the laboratories supported by RRF.

In September, Dr. Dan Albert, Dr. David Gamm, and David Walsh of McPherson Eye Research Institute in Madison, WI, came to Houston to give presentations to the Board. This was a valuable opportunity for the Board to hear updates about current and future plans at the McPherson ERI.

Last, but not least, over 200 Board members, Trustees, scientists, and guests attended the 2015 Luncheon. The speaker, Dr. Paul Klotman, President of Baylor College of Medicine, spoke about the four missions of Baylor: clinical, research, education, and community.

RRF puts great value on keeping you informed on our progress in working towards a world free of blindness - through our website, our newsletters, and our annual reports. I invite you now to delve further into our programs, featured in the pages of this year's annual report, and hope you will enjoy reading about the progress being made through our combined efforts. All of this would not be possible without your support.

With gratitude,

Alice McPherson, M.D.

Alice McPherson, MD
President

Overview of Research - 2015

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 2015, 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 – Basic 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

University of Rochester, Rochester, NY
- Ruchira Singh, PhD – Basic Research Project

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

Georgia Regents University, Augusta, GA
- Ming Zhang, MD, 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
- Robyn Guymer, MD – Centre for Eye Research, University of Melbourne, Australia

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
- Arthur S. Polans, PhD – Murfee Chair, McPherson Eye Research Institute
- Christine Sorenson, PhD – Albert Chair, McPherson Eye Research Institute

Overview of Research - 2015

Research Professorships – Ongoing Proven Research Projects

University of Wisconsin, Madison, WI

Jeremy Rogers, PhD – Gamewell Professor, McPherson Eye Research Institute

Nansi Jo Colley, PhD – Matthews Professor, McPherson Eye Research Institute

Aparna Lakkaraju, PhD – Brown Professor, McPherson Eye Research Institute

Established Awards – Awards Recognizing Lifetime Achievement

RRF Award of Merit – presented by The Retina Society – Paris, France – October 9

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

RRF Kayser International Award – presented by International Society for Eye Research (ISER); will be presented again in 2016

RRF Pyron Award – presented by American Society of Retina Specialists (ASRS) – Vienna, Austria – July 12

Gary W. Abrams, MD – Kresge Eye Institute, Detroit, MI

CL Schepens MD/AAO Award – presented by American Academy of Ophthalmology (AAO) and Schepens International Society (SIS) – Las Vegas, NV – November 13

Mark S. Blumenkranz, MD – Byers Eye Institute at Stanford, Palo Alto, CA

RRF Gonin Lecturer – presented by Club Jules Gonin; will be presented again in 2016

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) – Bogotá, Colombia – August 7

William Harbour, MD – Bascom Palmer Eye Institute, Miami, FL

International Fellowships – Advanced Subspecialty Training

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

Yeshigeti Gelaw Birhanu, MD - from Ethiopia to Eye and Laser World Center, Cairo, Egypt

Nopasak Phasukkijwatana, MD, PhD - from Thailand to Jules Stein Eye Institute at UCLA, Los Angeles, CA

Qisheng You, MD, PhD - from China to Shiley Eye Center at UCSD, San Diego, CA

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

Sergio Groman Lupa, MD - from Mexico to University of Colorado, Aurora, CO

Claudia Inés Osorio Moreno, MD - from Venezuela to Wilmer Eye Institute, Baltimore, MD

Research Initiatives – Educational and Travel Scholarships

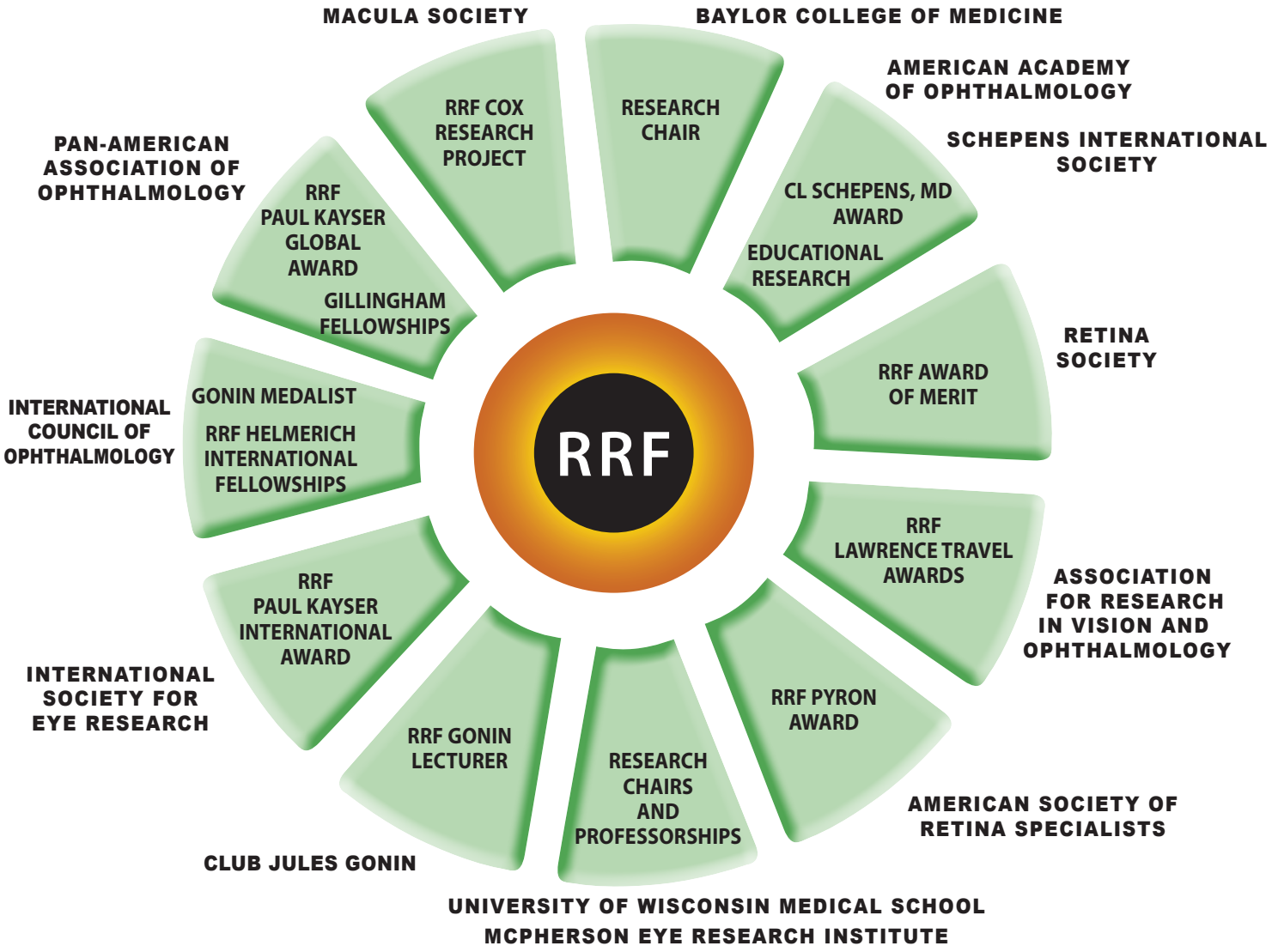
AAO Educational Trust Fund – administered by The Foundation of the American Academy of Ophthalmology (FAAO)

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

PAN AMERICAN : 22

Buenos Aires, Argentina	Santo Domingo, Dominican Republic
Curitiba, Argentina	San Salvador, El Salvador
La Paz, Bolivia	Port-au-Prince, Haiti
Belo Horizonte, Brazil	San Lorenzo, Honduras
Recife, Brazil	Mexico City, Mexico
São Paulo, Brazil	Nuevo León, Mexico
Porto Alegre, Brazil	Asunción, Paraguay
Santiago, Chile	Lima, Peru
Bogotá, Colombia	San Juan, Puerto Rico
Cali, Colombia	Montevideo, Uruguay
San Juan, Costa Rica	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	Laos, 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 15 pilot study research projects conducted at leading research institutions. Eight 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

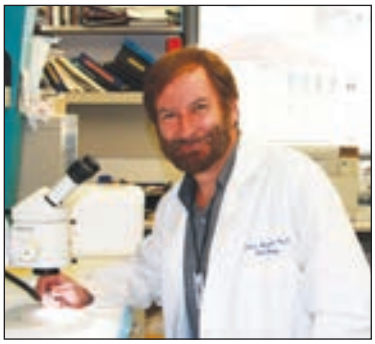
The Kathryn and Latimer Murfee Macular Degeneration Project

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

The goal of Dr. Brandt's project is to continue to study innate immune responses to viral vectors and identify the mechanisms involved in triggering transient uveitis in the retina. 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. This year Dr. Brandt compared gene expression profiles between non-human primate retina tissue before and after viral vector challenge, and evaluated the inflammatory response of neural retina cells following exposure to viral gene delivery vectors. We have found that the retina responds by increasing expression of proteins that promote or inhibit inflammation, suggesting a balancing act is occurring in the retina to decide if uveitis will be triggered.

Joe M. and Eula C. Lawrence Research Project

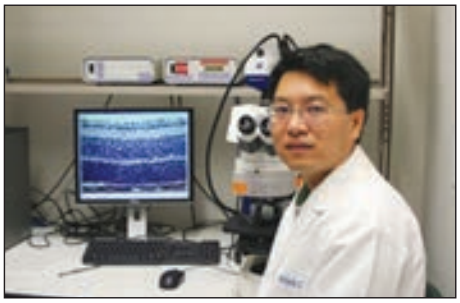


Milan Jamrich, PhD
Dept. of Molecular and Cellular Biology
Baylor College of Medicine, Houston, TX

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

The goal of this project is to identify genes and developmental processes that are responsible for development and survival of vertebrate retinal cells. In 2015, Dr. Jamrich made a mouse line in which the Rx protein is tagged with FLAG tags. Using antibodies against the FLAG tag, he demonstrated expression of the tagged Rx protein in sections of embryonic eyes. Furthermore, he was able to purify the tagged Rx protein from embryonic extracts using the anti-FLAG antibodies. As a next step he used the anti-FLAG antibodies to identify the direct target genes of Rx (targetome) by large-scale chromatic immunoprecipitation (ChIP) combined with sequencing. This was successful and he has identified several novel Rx target genes.

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

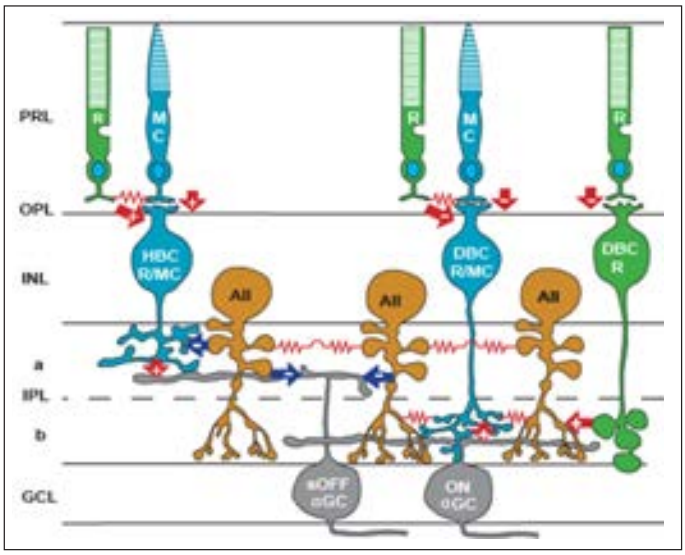
Dr. Chen's research focuses on identification of additional genes whose mutations cause LCA, the most common hereditary cause of visual impairment in infants and children. Dr. Chen has completed the sequencing for all Saudi patient cohort as well as the 600 LCA patients from other collaborators. Initial analysis has been done for these patients, and he has identified several novel disease genes, such as ATF6 and CLAUP1, along with several candidate disease genes. He has performed functional studies of these novel disease genes using both cell and animal model. Dr. Chen's lab has generated mouse models for these disease genes, which will allow for additional mechanistic studies and developing a therapeutic method of the disease.

The Paul Kayser Research Project

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 molecular, cellular and genetic mechanisms underlying retinal cell dysfunction and degeneration in age-related macular degeneration (AMD) and glaucoma. His lab has developed a simultaneous single-cell voltage clamp system for studying synaptic connectivity and a multi-electrode array (MEA) recording system for characterizing spatiotemporal receptive field properties of retinal bipolar cells and ganglion cells. They also study neural circuit function and dysfunction in normal and disease retinas, and changes in receptive fields of retinal ganglion cells in diseased states. Moreover, they investigate how defects in photoreceptor-RGC synaptic pathways cause vision impairment in AMD and glaucoma. Dr. Wu's lab has published over 155 articles and received a number of vision research awards during the years.



Schematic diagram of major synaptic connections in the ON and OFF alpha ganglion 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 and disease

The long-term goal of this project is to improve both the diagnoses and treatments of Leber congenital amaurosis (LCA), which accounts for more than 5% of all retinal diseases. To create a new mouse model for LCA, Dr. Mardon knocked out the mouse Kcnj13 gene by gene targeting, and is analyzing the phenotype of Kcnj13 mutants by histology, immunohistochemistry, electrophysiology, and transmission electron microscopy. In 2015, Dr. Mardon found that conditional loss of Kcnj13 function in his mouse model causes strong loss of photoreceptors. These mouse models will serve as an important basis for understanding the mechanism of disease in human and developing gene therapy approaches.

Emmett A. Humble Research Project

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

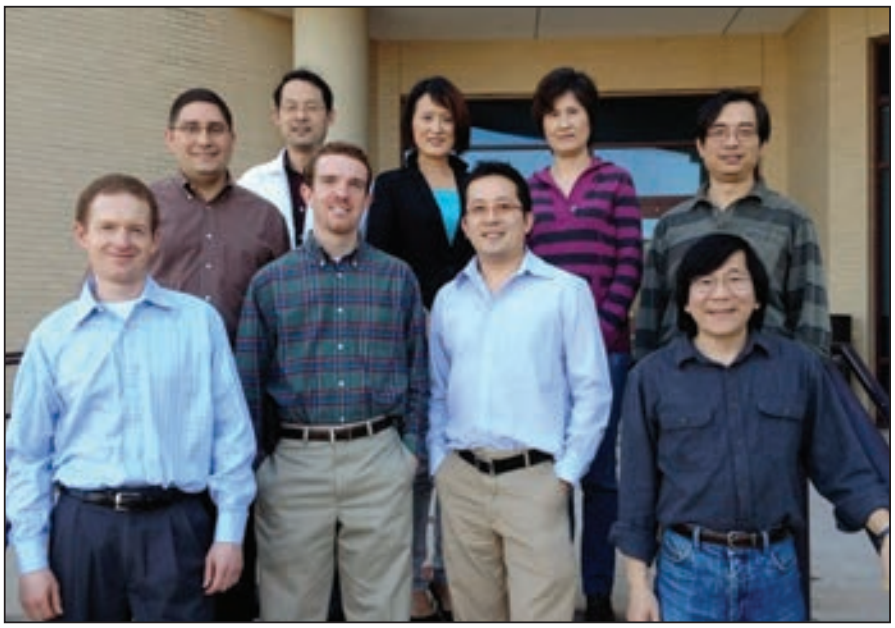
Genetic etiology of retinoblastoma

Dr. Strong is applying a novel cancer screening approach to early detection of the cancers that often occur later in hereditary retinoblastoma (HRb) patients. In Li Fraumeni Syndrome (LFS), which has many parallels to HRb, asymptomatic invasive cancers have been detected in 10% of individuals screened, all at an early stage for successful treatment. In HRb there is increased risk of a new cancer, primarily sarcoma, melanoma and bladder cancer, with age. The goal is to use the registry of HRb survivors, and parents of new HRb patients, to determine their interest in participating in this education/early cancer detection program, and to pilot the program in various age groups. Several candidates have been identified.

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 by C-reactive protein elicits retinal arteriolar dysfunction



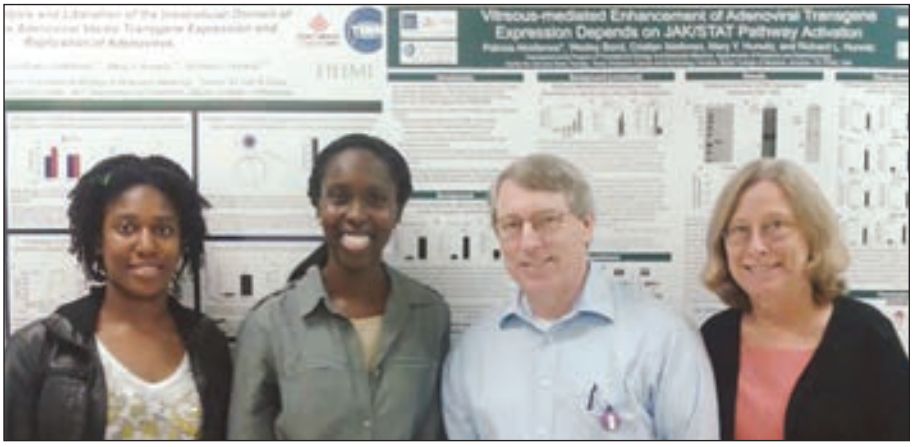
Dr. Kuo (front row, right) and his research team (Ophthalmic Vascular Research Program) at the Texas A&M Health Science Center and Baylor Scott & White Health

The purpose of this project is to understand the pathophysiology of inflammation and diabetes-associated retinal vascular dysfunction at molecular, cellular and intact-tissue levels and to develop a therapeutic approach for disease treatment. Dr. Kuo accomplished several projects to elucidate the mechanism responsible for the retinal arteriolar dilation to elevated shear stress (flow) and the dysfunctions induced by diabetes. The striking finding of his study is that VEGF receptors act as a mechanical sensor for vasodilation to increased flow, which is not compromised by the inflammatory vasoconstrictor ET-1 but by high levels of blood glucose. He is currently investigating the interaction of VEGF and stress-activated kinases in retinal disease development in diabetes.

Mary Ellen Wilson Research Project

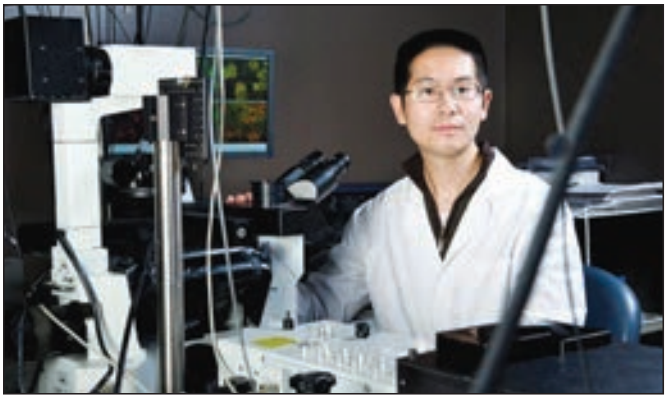
Richard L. Hurwitz, MD
Dept. of Pediatrics, Ophthalmology, Molecular and Cellular Biology
Co-Director, Retinoblastoma Center
Texas Children's Cancer Center
Center for Cell and Gene Therapy
Baylor College of Medicine, Houston, TX

Immune consequences of gene therapy for ocular disorders



Dr. Richard Hurwitz and Dr. Mary Hurwitz Lab Group

Dr. Hurwitz is continuing his investigation of the use of adenoviral vectors to transfer therapeutic genes to the ocular environment, and to examine the immune response as it pertains to gene therapy. The vector systems that his laboratory has developed for suicide gene therapy for Rb and for gene replacement approaches for the treatment of Stargardt Disease will be used to explore mechanisms of adenoviral-mediated transgene expression unique to the ocular environment. Preliminary results are consistent with the hypothesis that the hyaluronan-binding proteoglycan versican is the component of vitreous that enhances adenoviral-mediated transgene expression. The Hurwitz' lab is also exploring the use of targeted therapeutic delivery of transgenes using nanospheres.



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

Novel therapy for retinal neovascularization

The goal of this project is to develop a novel approach for topical delivery of anti-angiogenic drugs to selectively kill abnormal blood vessels in the retina without affecting normal blood vessels. Dr. Zhang's results indicated that targeting Epac alone is sufficient to achieve his research goal to specifically eliminate retinal neovascularization while sparing or even accelerating normal vascular repair. In addition, he developed in vitro 3D angiogenesis assay that allows him to examine the anti-angiogenic effect of testing agents in a pathophysiological environment. With these modifications, he has achieved the goal of the project to develop novel and specific treatment for retinal neovascularization. His continuing work will provide further insights of mechanisms by which activation of Epac1 induces retinal neovascularization.

Ruchira Singh, PhD
Stem Cell Research Program
University of Rochester, Rochester, NY

Elucidating the role of environment in the pathophysiology of macular degenerative diseases using an hiPSC model system

In age-related macular degeneration (AMD) and similar diseases, the retinal pigment epithelium (RPE) cells in the retina are the main sites of pathological defects. Data obtained on drug-induced alteration of lysosomal pH on processing of photoreceptor outer segment (POS) by RPE cells contributed to a peer-reviewed publication with Dr. Singh as the first author. Key milestones achieved included isolating POS successfully from a single non-human primate eye and demonstrating that POS isolated from non-human primate retina is phagocytosed and degraded more efficiently by hiPSC-RPE. She examined the effect of iron overload on RPE function and morphology in hiPSC-RPE and human fetal RPE cultures and evaluated the acute effect of another environmental stressor, cigarette smoke extract, on phagocytosis and degradation of POS in iPSC-RPE.

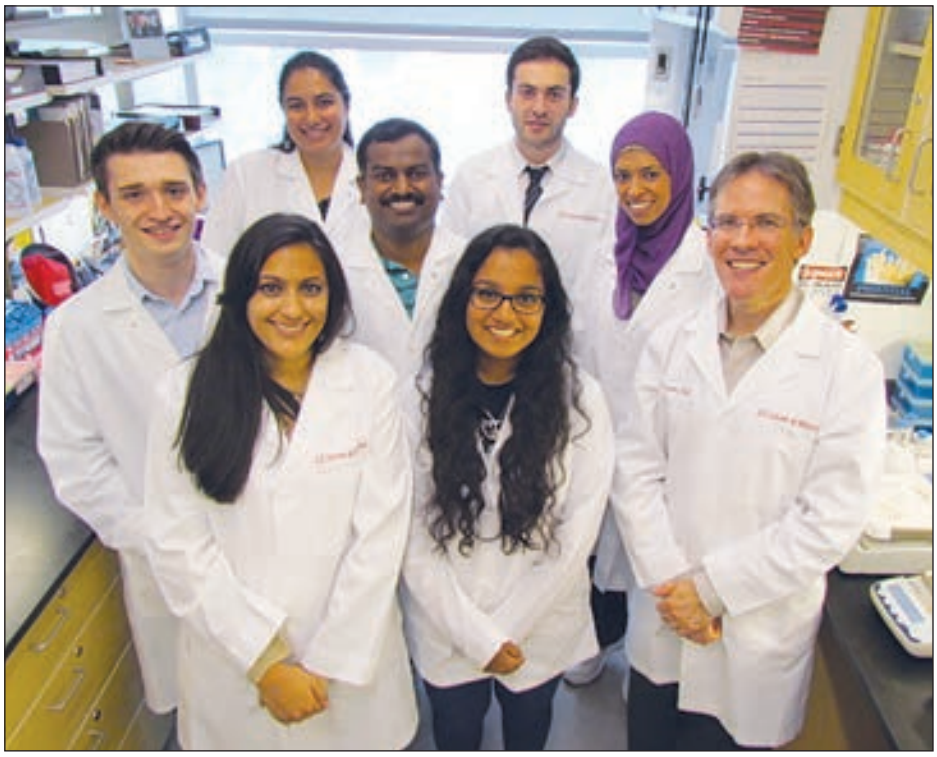
Ming Zhang, MD, PhD
Georgia Regents University
Augusta, GA

Autophagy and NLRP3 inflammasome in acute retinal necrosis (ARN)

Herpes simplex virus (HSV) is believed to be the leading cause of infectious blindness in the developed world. Dr. Zhang's lab investigates the relationship between autophagy and the NLRP3 inflammasome. By using inflammasome deficient mice, they hope to discover if the inflammasome participates in early innate immune response against ocular HSV-1 infection and determine if depletion of the NLRP3 inflammasome can reverse the inhibition of virus spread and replication and enhanced innate immune responses observed in BBD deficient, HSV-1 infected eyes.

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

Cellular target of a candidate AMD therapy



Dr. Corson (far right) with his lab group

Previously with RRF funding, Dr. Corson investigated a class of natural products, homoisoflavonoids, as antiangiogenic molecules. Dr. Corson's laboratory tested their most potent synthetic homoisoflavanone, SH-11037, in combination with anti-VEGF therapy. It showed efficacy comparable to the standard anti-VEGF treatment in the laser-induced choroidal neovascularization (L-CNV) mouse model, which models some of the features of wet AMD. SH-11037 could synergize with anti-VEGF, reducing the amount of each drug needed for an effect. Importantly, they saw no short- or long-term toxicity in the eyes of adult mice with SH-11037 injected into their eyes. They have begun to tease apart how SH-11037 works to block blood vessel growth, and have identified a novel target that is undergoing validation.

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

This project leverages new insights into how cone cells are normally generated during development to create a mouse stem cell model for cone genesis. Dr. Emerson's research focus is to engineer a modified line of embryonic stem cells that will glow green when they are on their way to making cone photoreceptors. His goal was to finish the cloning of the two transgenic constructs and submit the samples to the Memorial Sloan Kettering Cancer Centre core facility for injection, and the constructs were provided to the facility in early July. Founder mice for both of his constructs were identified by GFP genotyping and these mice were imported to the CCNY animal facility in mid-October.

Research

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

Dr. Baehr (center) with his lab group

Therapy for a mouse model of Senior-Løken Syndrome

NPHP5 null alleles in human patients are associated with Senior Loken syndrome, an autosomal recessive syndromic ciliopathy. The nephrocystin-5 (NPHP5)-deficient mouse, however, appears to have normal kidneys at one year of age. Most severely affected are photoreceptors that are unable to form outer segments in which the phototransduction machinery resides. The consequence of NPHP5 deletion is a rapid LCA-like degeneration and blindness (Ronquillo et al., Ciliopathy-associated IQCB1/NPHP5 protein is required for mouse photoreceptor outer segment formation. FASEB J, 2016 in press). Future steps will develop gene- and cell-based therapies for NPHP5-associated LCA.

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 or may be the source of dysfunction themselves. Dr. Park's project explores the possibility that GPR75 can serve as a neuroprotective target in the retina and the possibility that defects in this protein may contribute to retinal degeneration occurring in diseases such as age-related macular degeneration. Despite the scarcity of information on GPR75, current studies highlight the potential of this receptor to exhibit neuroprotective properties.

Grant Recipient from The Macula Society

The RRF Margaret and Mills Cox Macula Society Research Project

Robyn Guymer, MD
University of Melbourne Centre for Eye Research Australia
Melbourne, Australia

The role of reduced phagocytosis in the pathogenesis of AMD

Prof. Guymer is Australia's only academic ophthalmologist to focus exclusively on age-related macular degeneration (AMD). She has researched laboratory-based retinal functional tests to take them into the clinic. Her research into genetic and lifestyle risk factors, through the development of functional outcome markers and imaging algorithms, help advance our understanding of AMD.

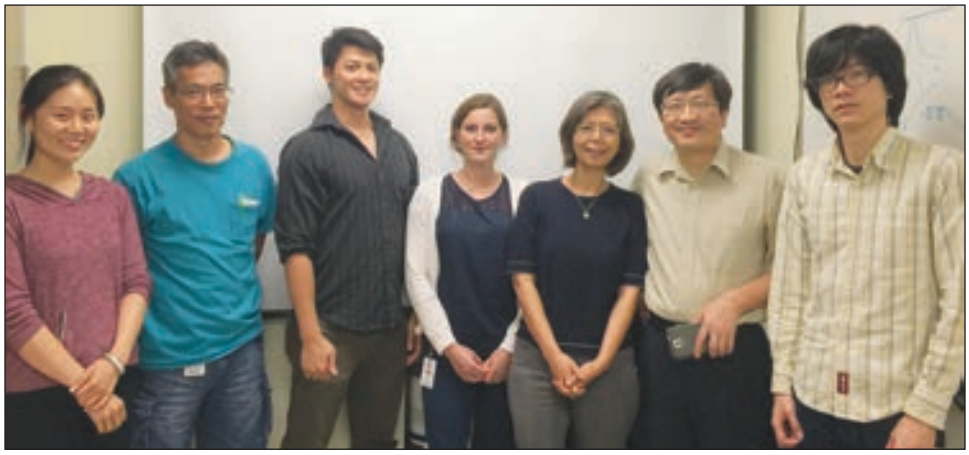
Research Chairs and Professorships

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 in the retina. Two papers are published to document the existence of multiple mechanisms for inner retinal neurons to oscillate following photoreceptor loss. Dr. Chen's group is developing genetic and pharmacological means to test an interesting hypothesis that such oscillations are not just pathological fallout of photoreceptor degeneration in the retina, but have an important biological function in maintaining projection of retinal ganglion cell axons to different vision centers of the brain. If proven correct, it will have a substantial impact on the direction of retinal prosthesis and cell/gene therapy fields. In 2015 Dr. Chen served as the chair of the NIH Biology of the Visual System (BVS) study section.

Walter H. Helmerich Chair

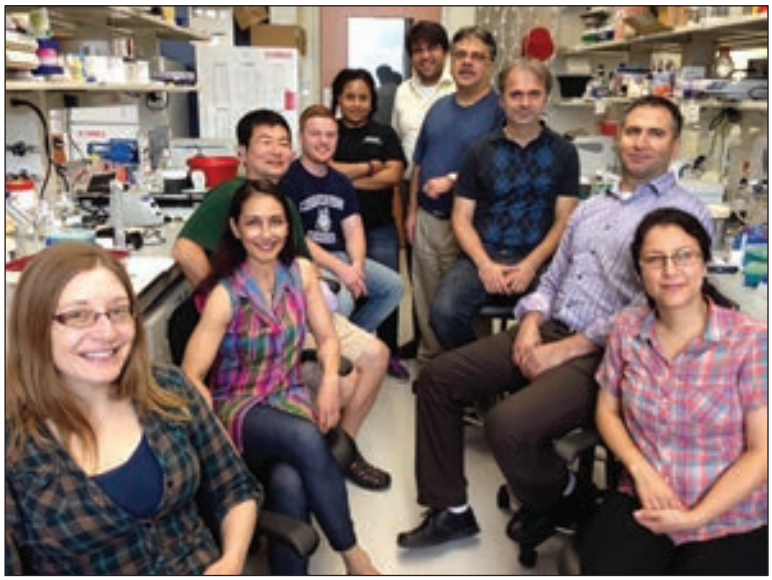
Akihiro Ikeda, DVM, PhD
Associate Director, McPherson Eye Research Institute
Department of Medical Genetics
University of Wisconsin, Madison, WI

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



Dr. Sheibani (standing, back right) with his research team

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. He recently showed intravitreal ocular safety of propranolol and its efficacy in attenuation of CNV. In collaboration with Dr. Zhang at Northwestern he demonstrated the utility of visible light OCT for measuring retinal oxygen metabolic response. In collaboration with Dr. Shah, he showed the important role of mitochondrial carbonic anhydrases in high glucose-mediated toxicity of pericytes. He also published two reviews on the functional role of inorganic trace elements in angiogenesis and on the importance of PECAM-1, eNOS, and endoglin axis in angiogenesis (reported in: IOVS (Dec 2015), LSA (Sept 2015), CROH (May 2015), JOVR (March 2015), Clin Sci (Aug 2015), and Physiol Rep (Jan 2015)).

Emmett A. Humble Distinguished Directorship

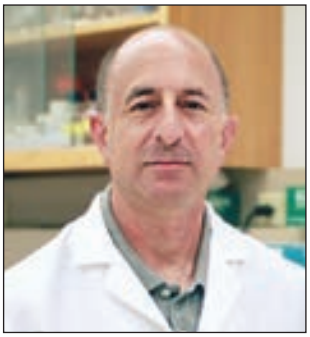
David M. Gamm, MD, PhD
Director, McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

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

Dr. Gamm has pioneered the use of human induced pluripotent stem cell (hiPSC) technology to model human retinal diseases (including macular degenerations) in a laboratory dish – a powerful system to test drug and gene therapies. In addition, he is developing stem cell-based photoreceptor replacement approaches to treat retinal degenerative disease. His ultimate goal is to utilize the stem cell differentiation methods invented in his lab to produce clinical-grade cells for the treatment of blind and low vision patients. He is also studying the key biological steps through which photoreceptors are created from stem cells so as to improve the efficiency of the process. Together with collaborators at the UW-Madison, Dr. Gamm's team is paving the way for hiPSC therapies for retinal disease.

Research Chairs and Professorships

Kathryn and Latimer Murfee Chair



Arthur S. Polans, PhD
McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Studies of the Resveratrol-stimulated calcium response in endothelial cells

Dr. Polans' long-term research goal is to develop safe and effective anti-angiogenic agents based on his studies of non-toxic natural products and to apply these agents initially to the prevention and/or treatment of exudative age-related macular degeneration. Dr. Polans has delineated the molecular mechanisms by which certain non-toxic natural products inhibit activated endothelial cells from forming abnormal blood vessels in an animal model of choroidal neovascularization. Both *in vitro* and pre-clinical studies have been completed. Based on these studies, he synthesized and compared several analogs of these natural products. His objective is to replicate the safety and mechanistic features of the natural products and to improve upon their efficacy.

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 neovascularization. Her studies continue to focus on the essential role that Bcl-2 expression plays during retinal neovascularization. Her studies have established key roles for the Bcl-2 family of proteins in retinal vascular development and neovascularization, and she is delineating their impact in specific retinal 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.

Edwin and Dorothy Gamewell Professor

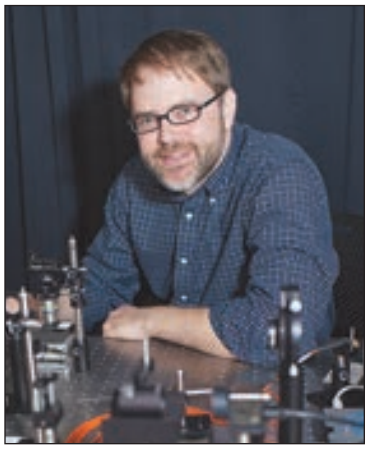


Photo by Todd Brown/Media Solutions

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

A critical component of the treatment, prevention, and basic research of retinal disease is the ability to image and quantify changes in structure and function of cells and tissue. Optical methods are particularly useful because of their potential to be adapted to clinical settings and their ability to image at cellular-scale resolution. Dr. Rogers is working to improve imaging technology by developing an accurate model of light scattering in the retina. By improving the understanding of how light is scattered, he will be able to optimize current instruments for improved contrast and explore new contrast methods that may be exploited for early disease screening or tracking of disease progression and treatment.

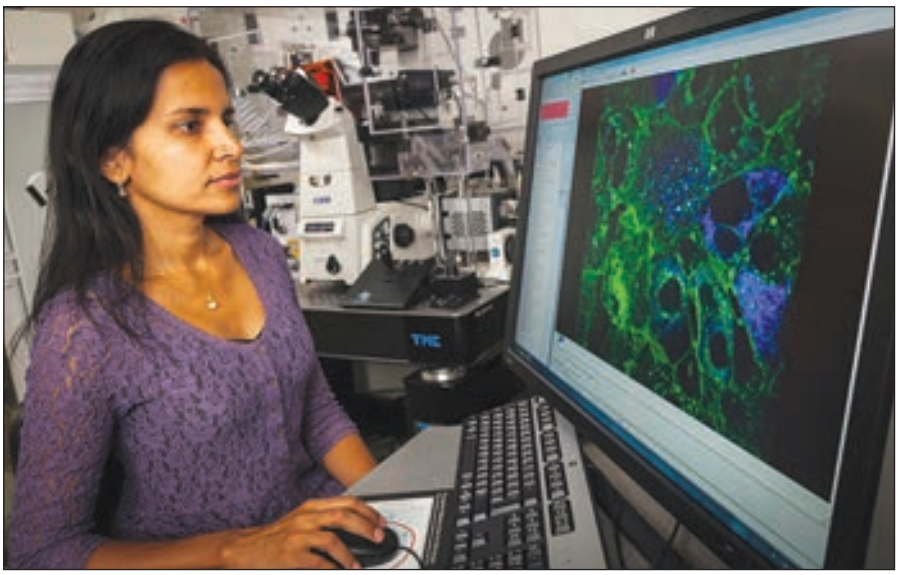
Research Chairs and Professorships

M.D. Matthews Research Professor

Nansi Jo Colley, PhD
McPherson Eye Research Institute
Department of Ophthalmology & Visual Sciences
University of Wisconsin, Madison, WI

Molecular genetic studies of retinal degeneration in Drosophila

Dr. Colley is focused on using *Drosophila* as a model for studying hereditary human retinal diseases, such as retinitis pigmentosa (RP) and age-related macular degeneration (AMD). Dr. Colley's research is focused in two directions. One area of investigation is on rhodopsin biosynthesis and signal transduction in the photoreceptors of *Drosophila*. The other area pertains to identifying novel rhodopsins and signaling molecules that could be used therapeutically. Dr. Colley continues to demonstrate that mutations in constituents of protein transport, rhodopsin function and phototransduction lead to severe retinal defects and retinal degeneration in *Drosophila*. Her goal is to identify novel genes that may be used therapeutically for the development of new technologies for treatments of retinal diseases.



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

Dr. Lakkaraju investigates mechanisms that drive vision loss in age-related macular degeneration (AMD) with the goal of using this information to develop effective therapies. She uses state-of-the-art high-speed, high-resolution live-cell imaging to identify functional deficits in the retinal pigment epithelium (RPE), a key site of damage in AMD. Recent research from Dr.Lakkaraju's team has identified a group of FDA-approved drugs that efficiently limit the accumulation of harmful debris and prevent chronic inflammation, two factors that promote RPE damage in AMD. These drugs are currently in preclinical testing in mouse models of retinal degenerations.

Established Research Awards

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

The Award of Merit in Retina Research

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

The Effects of Diabetic Retinopathy and Panretinal Photocoagulation on Photoreceptor Cell Function as Assessed by Dark Adapmetry

In being chosen for the Award of Merit, Dr. Gardner gave the Charles L. Schepens Lecture at the 48th Annual Scientific Meeting of The Retina Society in Paris, France, which was held in October.

Dr. Gardner's interests include vitreoretinal diseases and surgery, and clinical and experimental diabetic retinopathy. He has advanced the concept that diabetic retinopathy is a neurovascular disease, and he is the principal investigator for studies of retinal cell survival mechanisms and growth factor signaling in diabetes. Dr. Gardner's 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.

RRF Pyron Award for Outstanding Achievement in Retina Research

Gary W. Abrams, MD
Kresge Eye Institute
Detroit, MI

Vision Restoration Strategies for Retinal Degenerations

Dr. Abrams presented the RRF Pyron Award lecture at the 33rd Annual Meeting of the American Society of Retina Specialists (ASRS), which was held in Vienna, Austria, in July.

Dr. Abrams is an innovator in vitrectomy, showing that addition of glucose to the infusion solution prevented cataract during diabetic vitrectomy and described the en bloc dissection technique for diabetic tractional membranes. With his colleagues, he described the expansile properties of perfluorpropane gas in the eye and arrived at the non-expansile concentration for vitreoretinal surgery. As a leader in retina, he established a reputation as an expert in repair of complicated retinal detachments. He was the site Principal Investigator of the Macular Photocoagulation Study and the Silicone Study and participated in numerous other important clinical trials such as the ETDRS.

Established Research Awards

Charles L. Schepens, MD/AAO Award

Mark S. Blumenkranz, MD
Byers Eye Institute at Stanford
Palo Alto, CA

Digital Medicine: Implications for Retina and Beyond

In being selected for the Charles L. Schepens, MD/AAO Award, Dr. Blumenkranz gave the Charles L. Schepens, MD/AAO Lecture at the Retina Subspecialty Day of the American Academy of Ophthalmologists (AAO) Annual Meeting in Las Vegas, NV, on November 13.

Dr. Blumenkranz's research focus is development of novel technology to diagnose and treat vitreal retinal diseases, such as new forms of imaging, laser delivery systems, other microsurgical tools, and new drugs and drug delivery systems that inhibit new blood vessel growth, scarring and intraocular inflammation. He has been actively involved in translational research in the laboratory as well as technology transfer associated with that research for a variety of new therapies that have received FDA clearance and been introduced into clinical practice over the past 30 years.

Dr. Blumenkranz with Dr. McPherson

Paul Kayser / RRF Global Award

J. William Harbour, MD
Bascom Palmer Eye Institute
Miami, FL

The Harbour Laboratory: Two Decades of Discovery in Uveal Melanoma

The 31st Pan-American Congress, held in Bogotá, Colombia, in August, was the setting for Dr. Harbour's lecture as recipient of the Paul Kayser/RRF Global Award.

Dr. Harbour's research focus is understanding mechanisms of tumor progression in major forms of eye cancer, including uveal melanoma, retinoblastoma, intraocular lymphoma and others. The Harbour lab has developed a clinical prognostic test that has been validated in multiple studies and is now being used for routine clinical testing at the vast majority of ocular oncology centers in North America.

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, twelve-month fellowships of $33,000 each 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.

Yeshigeti Gelaw Birhanu, MD, from Ethiopia, for training in vitreoretinal surgery at the Eye and Laser World Center, Cairo, Egypt, with Dr. Ihab Saad Othman. Following fellowship Dr. Birhanu will return to Jimma University, College of Public Health and Medical Sciences in Jimma, Ethiopia, as leader of the team for vitreoretinal services and research.

Qisheng You, MD, PhD, from China, for training in retina at Jacobs Medical Center, Shiley Eye Center at UCSD, San Diego, CA, with Dr. William Freeman. After fellowship Dr. You will return to Beijing Institute of Ophthalmology in Beijing, China, to teach medical students, ophthalmology residents, and fellows.

Nopasak Phasukkijwatana, MD, PhD, from Thailand, for training in medical retina at Jules Stein Eye Institute at UCLA, Los Angeles, CA, with Dr. Bartly Mondino and Dr. David Sarraf. After fellowship Dr. Phasukkijwatana will return to Faculty of Medicine Siriraj Hospital, Mahidol University in Bangkok, Thailand, to teach medical students, ophthalmology residents, and fellows.

Gillingham Pan-American Fellowships/PAAO

This program is administered for RRF by the Pan-American Association of Ophthalmology (PAAO). Two, six-month fellowships, providing stipends of $10,000 each, were awarded this year to Latin American ophthalmologists for training at leading institutions in the United States.

Sergio Groman Lupa, MD, from Mexico, to University of Colorado, Dept. of Ophthalmology, Aurora, CO, for training in retina with Dr. Naresh Mandava.

Dr. Sergio Groman Lupa with Dr. Hugo Quiroz

Claudia Inés Osorio Moreno, MD, from Venezuela, to Wilmer Eye Institute, Johns Hopkins Hospital, Baltimore, MD, for training in ocular immunology with Dr. Jennifer Thorne.

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 2015 funding for this program was over $45,000.

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 Denver, CO.

In 2015, twenty-two ophthalmology students were selected from these schools:

University of California Berkeley, Berkeley, CA
IUPUI, Indianapolis, IN
New York University School of Medicine, New York, NY
University of California San Diego, La Jolla, CA
Stanford University Byers Eye Institute, Palo Alto, CA
Tufts University School of Medicine, Boston, MA
University of California Los Angeles, Los Angeles, CA
University of Utah, Salt Lake City, UT
Harvard Medical School, Boston, MA
Brown University, Providence, RI
The University of Texas at San Antonio, San Antonio, TX
New England Eye Center, Boston, MA
SUNY at Buffalo and SUNY Eye Institute, Buffalo, NY
University of Michigan, Ann Arbor, MI
Duke University School of Medicine, Durham, NC
Washington University, St. Louis, MO
University of Louisville, Louisville, KY
Emory University, Atlanta, GA
University of Nebraska Medical Center, Omaha, NE
West Virginia University, Morgantown, WV

RRF Board Tour of Baylor Laboratories

On March 25, eleven RRF Board members took a tour of the Retina Research Laboratory in the Cullen Eye Institute, Baylor College of Medicine. The special organized event was hosted by Dr. Tim Stout, Chair, Department of Ophthalmology; Dr. Ching-Kang Jason Chen, RRF Chair; and Dr. Sam Wu, RRF-supported scientist for over three decades.

Drs. Stout, Chen, McPherson and Wu

The newly renovated Retina Research Laboratory consists of the research labs of Dr. Chen, Dr. Wu, and Dr. Benjamin Frankfort. All aspects of modern retinal research endeavors at the electrophysiological, behavioral, biochemical, surgical, and genomic levels can be conducted therein. The laboratory contains 18 dark-rooms for behavioral testing and for various electrophysiological recordings of retinal neurons in total darkness. As retina functions under both starlight and sunlight, under red or infrared illumination these darkrooms allow retina responses initiated by rod and/or cone photoreceptors to be studied. The laboratory also contains five larger and so-called specialty rooms and six full bench islands for molecular biology, biochemistry, immunohistochemistry, and molecular genetic experiments.

The RRF guests toured the lab and participated in ongoing work in four demonstration stations, two in the dark rooms and two in the specialty rooms. Two demonstrations were conducted under dim red illumination to enhance retina light responses and to protect the extremely light-sensitive equipment.

Chen Lab: Confocal Microscopy

Wu Lab: Light Responses of Single Neural Neurons

McPherson ERI Honors RRF at ARVO Meeting

On May 4, McPherson Eye Research Institute hosted a reception honoring 46 years of RRF's excellence in vision research. Approximately 125 scientists, including many scientists who have been funded by RRF and who are now leaders in ophthalmology, attended. Seven renowned speakers described the significant impact that RRF funding had on their careers, especially in their early years when they were just getting established. Distinguished speakers were **David M. Gamm, MD, PhD**, RRF Emmett A. Humble Distinguished Director, McPherson ERI; **Matthew D. Davis, MD**, Founding Director, UW Fundus Photograph Reading Center; **Paul A. Sieving, MD, PhD**, Director, National Eye Institute, National Institutes of Health; **Nansi Jo Colley, PhD**, RRF M.D. Matthews Professor, McPherson ERI; **John E. Dowling, PhD**, Gordon & Llura Gund Professor of Neurosciences, Emeritus, Harvard University; **Alan Bird, MD**, Honorary Consultant, Moorfields Eye Hospital; and **Daniel M. Albert, MD, MS**, Founding Director, McPherson ERI.

Dr. McPherson with some of the scientists whose research has been or is supported by RRF

RRF Board Attends the 3rd McPherson Endowed Lecture

Ten Board members traveled to Madison, WI, in May to hear Dr. Sheila Nirenberg speak about her progress in developing new types of prosthetic devices that don't require surgery to correct blindness. While there, the Board participated in a tour of the new McPherson Eye Research Institute office space and some of the laboratories supported by RRF. RRF supports four Chairs and three Professorships at McPherson ERI.

Dr. Gamm welcoming the RRF Board to McPherson ERI

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RRF 46th Anniversary Luncheon, May 13, 2015

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President, CEO and Executive Dean, Baylor College of Medicine, Houston, Texas
RRF Lecturer "Innovations in Academic Medicine"

Dr. Sheppy Silverman, Janet Orman, and Pat Silverman

Laurie and Dr. Milton Boniuk with Charles Szalkowski

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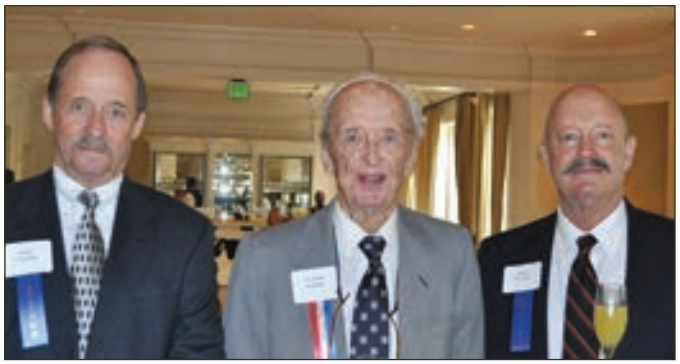

Keith Humble, Emmett Humble, and Deral Humble

RETINA RESEARCH FOUNDATION
COMBINED STATEMENT
FINANCIAL POSITION

December 31, 2015
(with summarized financial information as of December 31, 2014)

	General Funds			Endowment Funds					2014 Total All Funds
	Unrestricted	Temporarily Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	**2015 Total All Funds**	(Memorandum Only)
Assets									
Cash and cash equivalents	$ 417,688	$ 92,391	$ 510,079	$ -	$ 8,837,235	$ -	$ 8,837,235	**$ 9,347,314**	$ 3,721,366
Contributions receivable	31,327	3,000	34,327	-	-	8,000	8,000	**42,327**	34,834
Investments	1,291,803	-	1,291,803	3,178,718	16,859,653	18,823,643	38,862,014	**40,153,817**	48,919,735
Furniture and equipment, net of accumulated depreciation of $5,282	14,342	-	14,342	-	-	-	-	**14,342**	14,342
Charitable remainder trust	-	-	-	-	-	349,065	349,065	**349,065**	322,154
Intangible assets	12	-	12	-	-	-	-	**12**	12
Total assets	$ 1,755,172	$ 95,391	$ 1,850,563	$ 3,178,718	$ 25,696,888	$ 19,180,708	$ 48,056,314	**$ 49,906,877**	$ 53,012,443
Liabilities and net assets									
Accounts payable	$ 837	$ -	$ 837	$ -	$ 25,568	$ -	$ 25,568	**$ 26,405**	$ 87,416
Commitments and contingencies									
Net assets	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
Total liabilities and net assets	$ 1,755,172	$ 95,391	$ 1,850,563	$ 3,178,718	$ 25,696,888	$ 19,180,708	$ 48,056,314	**$ 49,906,877**	$ 53,012,443

RETINA RESEARCH FOUNDATION
COMBINED STATEMENT
NET ASSETS

For the year ended December 31, 2015
(with summarized financial information for the year ended December 31, 2014)

	General Funds			Endowment Funds				2015	2014 Total All
	Unrestricted	Temporarily Restricted	Total	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	**Total All Funds**	Funds (Memorandum Only)
Revenues									
Contributions	$ 183,011	$ 66,891	$ 249,902	$ -	$ -	$ 124,913	$ 124,913	**$ 374,815**	$ 350,675
Interest, dividend and distribution income	34,634	-	34,634	81,777	1,142,459	-	1,224,236	**1,258,870**	1,073,027
Realized and unrealized (losses) gains on investments, net	(77,786)	-	(77,786)	(193,483)	(2,703,227)	-	(2,896,710)	**(2,974,496)**	1,850,595
Mineral interest income and other income	29,502	-	29,502	-	-	-	-	**29,502**	90,635
Change in value of split-interest agreement	-	-	-	-	-	26,911	26,911	**26,911**	(7,799)
Income transferred from Endowment Fund investments	920,815	77,500	998,315	(66,687)	(931,628)	-	(998,315)	**-**	-
Net assets released from restrictions - satisfaction of program restrictions	63,000	(63,000)	-	-	-	-	-	**-**	-
Total revenues	1,153,176	81,391	1,234,567	(178,393)	(2,492,396)	151,824	(2,518,965)	**(1,284,398)**	3,357,133
Expenses									
Program services									
Research projects and grants	1,187,465	-	1,187,465	-	-	-	-	**1,187,465**	1,332,986
Public education	33,665	-	33,665	-	-	-	-	**33,665**	32,158
Career development and awards	80,208	-	80,208	-	-	-	-	**80,208**	79,612
Total program services	1,301,338	-	1,301,338	-	-	-	-	**1,301,338**	1,444,756
Supporting services									
Management and general	107,314	-	107,314	25,686	296,990	-	322,676	**429,990**	451,582
Fundraising	28,829	-	28,829	-	-	-	-	**28,829**	10,315
Total supporting services	136,143	-	136,143	25,686	296,990	-	322,676	**458,819**	461,897
Total expenses	1,437,481	-	1,437,481	25,686	296,990	-	322,676	**1,760,157**	1,906,653
Changes in net assets	(284,305)	81,391	(202,914)	(204,079)	(2,789,386)	151,824	(2,841,641)	**(3,044,555)**	1,450,480
Net assets, beginning of year	2,038,640	14,000	2,052,640	3,382,797	28,460,706	19,028,884	50,872,387	**52,925,027**	51,474,547
Net assets, end 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

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