The various layers of the retina are identified by the general nuclear stain DAPI (blue). The layers of the retina shown in the photo are (top to bottom): the Inner Segment of the photoreceptor cells (RED showing Kv 2.1); the Outer Nuclear Layer (ONL- some S1R shown in green); the Outer Plexiform Layer (OPL- which are the synapses); the Inner Nuclear Layer (INL - substantial S1R shown in green); the Inner Plexiform Layer (IPL - synapses); the Ganglion Cell Layer (strong green showing the S1R).

Dr. Ruoho believes that the S1R is critical in reducing the oxidative stress in retinal cells and plays an important role in reducing retinal neurodegeneration.
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Dear Friends,

Beginning in 1969 and continuing to the present day, RRF has worked tirelessly to advance our stated mission: “to reduce retinal blindness worldwide by funding programs in research and education.” The goal has always been ultimately to speed the pace of bringing scientific discoveries in the laboratory to the clinical level, resulting in better disease prevention, new treatments, and improved patient care. Scientific studies related to diagnosis and treatment of disease (clinical and translational science) will always be enthusiastically welcomed and will generate much interest with the public.

With a view to the end result at the clinical level, we never want to lose sight of the very beginning of the discovery process – basic science research. Basic science supplies the crucial puzzle pieces in understanding both healthy and diseased states at the molecular and cellular level. For example, studying the mechanisms of cell development, growth, and survival provide key insights.

The knowledge gained from basic science research may not immediately produce results applicable to patient care, but importantly adds to our understanding of the changes in cells and molecules that cause disease. With each new discovery comes new avenues for research that can then be pursued in additional studies or by other investigators. The framework of knowledge expands, and like a super highway this always-under-construction infrastructure facilitates the smooth transport of ideas and concepts across disciplines and across international boundaries.

In science, there is no one right way to the answers. RRF believes in a multi-faceted approach of basic science, clinical and translational research. In reading this annual report, we hope you will notice the broad scope of projects that make up our 2012 research and education program.

We invite you to join us in our journey toward building a world free of blindness. It’s a noble cause, and we can confidently predict that each passing year will bring new hope as we continue to support our wide variety of programs in research and education.

With gratitude,

Frank K. Eggleston, DDS
Chairman
Overview of Research - 2012

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 2012, 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
- Benjamin Frankfort, MD, PhD - Mueller 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
- Ramon Font, MD – Basic Research Project

UT MD Anderson Cancer Center, Houston, TX
- Louise Strong, MD - Humble Research Project

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

University of Wisconsin, Madison, WI
- Nansi Jo Colley, PhD - Murfee Macular Degeneration Project
- Barbara Klein, MD, MPH - Basic Research Project
- Leonard Levin, MD, PhD - Basic Research Grant

RRF Cox Macula Society Research Grant – administered by The Macula Society
- Stephen Tsang, MD, PhD – Harkness Eye Institute, Columbia University, New York, NY
- Stephen Jae Kim, MD – Vanderbilt Eye Institute, Nashville, TN

**Research Chairs – Ongoing Proven Research Projects**

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

Baylor College of Medicine, Houston, TX
- RRF Research Chair - Yet to be named

**Research Professorships – Ongoing Proven Research Projects**

University of Wisconsin, Madison, WI
- Arnold E. Ruoho, 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 – Washington, DC – Oct. 6
  Richard F. Spaide, MD – Vitreous-Retina-Macula Consultants, New York, NY
RRF Kayser International Award – presented by International Society for Eye Research (ISER) – Berlin, Germany – July 24
  Robert E. Anderson, MD, PhD – Dean McGee Eye Institute, Oklahoma City, OK
RRF Pyron Award – presented by American Society of Retina Specialists (ASRS) – Las Vegas, NV – August 26
  Daniel F. Martin, MD – Cole Eye Institute, Cleveland, OH
CL Schepens MD/AAO Award – presented by American Academy of Ophthalmology (AAO) and Schepens International Society (SIS) – Chicago, IL – November 9
  Alan C. Bird, MD – Moorfields Eye Hospital, London, England
RRF Gonin Lecturer – presented by Club Jules Gonin - Reykjavik, Iceland – June 22
  Professor José-Alain Sahel – Institut de la Vision – Paris, France
RRF Gonin Medalist – presented by ICO with Club Jules Gonin
  Will be presented again in 2014

International Fellowships – Advanced Subspecialty Training

ICO/Helmerich International Fellowships - administered by International Council of Ophthalmology Foundation (ICOF)
  Henry E. Nkumbe, MD - from Madagascar to the Eye Foundation Hospital in Lagos, Nigeria, and the Jules Stein Eye Institute at the University of California, Los Angeles
  Pukhraj Rishi, MD - from Chennai, India to Wills Eye Institute, Philadelphia, PA
Gillingham Fellowships - administered by Pan-American Association of Ophthalmology (PAAAO)
  Tammy Osaki, MD - from Brazil to Harvard Medical School, Massachusetts Eye and Ear Infirmary, Boston, MA
  Daniel Lavinsky, MD - from Brazil to Stanford University, Stanford, CA

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-four vitreoretinal scientists representing schools in sixteen states traveled to the ARVO Annual Meeting to present their scientific research.
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- 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

### RETINA RESEARCH SITES

#### 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

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<td>Center for Technology</td>
<td>Houston Advanced Research Center</td>
<td>UT MD Anderson Cancer Center</td>
<td>Southwest Research Institute</td>
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#### INTERNATIONAL: 32

- Asahikawa Medical College
- Bern University Hospital
- Eskisehir Osmangazi University
- Eye Foundation Hospital
- Hospital Ophthalmique
- Institut de la Vision
- Kasindo Eye Clinic
- Keio University
- L V Prasad Eye Institute
- Lariboisiere Hospital
- Lidcombe Hospital
- Lund University
- Magrabi ICO Cameroon Eye Institute
- Mashhad University Medical Services
- Melles Cornea Clinic
- McGill University
- Montpellier General Hospital
- Moorfields Eye Hospital
- Osaka Medical School
- Research Institute of Ophthalmology
- Royal College of Ophthalmologists
- Sankara Nethralaya Eye Hospital
- University of Cambridge
- University of Iceland
- University of Osaka
- University of Oxford
- University of Paris
- University of Erlangen-Nuremberg
- University of Leipzig
- University of Regensburg
- University of Tübingen
- Western General Hospital
- Asahikawa, Japan
- Bern, Switzerland
- Eskisehir, Turkey
- Laos, Nigeria
- Lausanne, Switzerland
- Paris, France
- E. Sarajevo, Bosnia and Herzegovina
- Tokyo, Japan
- Hyderabad, India
- Paris, France
- Sydney, Australia
- Lund, Sweden
- Yaounde, Cameroon
- Mashhad, Iran
- Rotterdam, Netherlands
- Montreal, Canada
- London, England
- Osaka, Japan
- Cairo, Egypt
- Edinburgh, Scotland
- Chennai, India
- Cambridge, England
- Reykjavik, Iceland
- Osaka, Japan
- Oxford, England
- Paris, France
- Erlangen, Germany
- Leipzig, Germany
- Regensburg, Germany
- Tübingen, Germany
- Edinburgh, Scotland
- Bethesda, MD
- Evanston, IL
- New York, NY
- Boston, MA
- Philadelphia, PA
- Baltimore, MD
- Palo Alto, CA
- New Orleans, LA
- Berkeley, CA
- Los Angeles, CA
- San Francisco, CA
- Gainesville, FL
- Kansas City, KS
- Miami, FL
- Omaha, NE
- Pittsburg, PA
- Los Angeles, CA
- Seattle, WA
- Madison, WI
- Nashville, TN
- St. Louis, MO
- Philadelphia, PA
- Baltimore, MD
A highlight of 2012 was the opportunity for representatives of Retina Research Foundation to travel to University of Wisconsin-Madison for scientific presentations, tours of research laboratories under construction, and events related to the renaming ceremony of the McPherson Eye Research Institute (MERI). Eight members of RRF’s Board of Directors, two Advisory Trustees, five members of the Helmerich family, two RRF guests, and two staff members traveled with Dr. Alice McPherson for a comprehensive site visit.

Activities planned for the group included an afternoon of scientific presentations by nine of the over 100 MERI scientists and scholars, plus a hard-hat tour of the new Wisconsin Institutes for Medical Research II (WIMR II) led by Dr. Robert Golden, Dean of the School of Medicine and Public Health, and Dr. Richard Moss, Associate Dean. The top floor of this second tower of the medical research complex will be home to the laboratories of MERI scientists when completed near the end of 2013. RRF supports four Chairs and three Professorships at the University of Wisconsin, so the visit by the Board members was an outstanding opportunity for them to see and hear detailed presentations from the scientists about their projects, discoveries, and plans for the future.

Interim Chancellor David Ward and Judith Ward hosted a luncheon at their home, the historic Olin House, and dedicated the newly renamed McPherson Eye Research Institute at that time. Formerly the UW-Eye Research Institute, the McPherson Eye Research Institute was renamed in honor of Dr. McPherson’s lifelong dedication to vision research.

(continued on page 7)
Dr. David Gamm was named the Emmett Humble Distinguished Director of the McPherson Eye Research Institute (MERI) and began his new role effective July 1, 2012, upon Dr. Dan Albert’s retirement.

Dr. Albert is founding Director of the UW-Eye Research Institute. He has built an environment in which scientists of diverse disciplines work in collaboration to find novel approaches to the goals of curing blindness and preventing vision loss. Researchers focus on understanding the mechanisms of blinding diseases and also on developing strategies for the prevention or treatment of eye disorders.

Quoting Dr. Paul Kaufman, Chair of the Department of Ophthalmology and Visual Sciences, “David Gamm is that rarest of individuals in our field, a practicing physician and basic scientist who has already done transformative translational research and demonstrated outstanding leadership and team-building skills, all at an early career stage. He will be an outstanding director of ERI and a worthy successor to Dr. Daniel Albert, ERI’s distinguished founding director.”
Site Visit to Madison, Wisconsin: McPherson ERI

Tour of laboratory space

Judith Ward congratulates Dr. McPherson

Representatives of Retina Research Foundation at University of Wisconsin
Named Basic Research Projects

The Kathryn and Latimer Murfee Macular Degeneration Project

Nansi Jo Colley, PhD
Dept. of Ophthalmology and Visual Sciences
McPherson Eye Research Institute
University of Wisconsin, Madison, WI

Molecular genetic studies of retinal degeneration in Drosophila

Dr. Colley’s work on the GPI anchor and the enzyme GPI-MT2 has demonstrated that mutations in GPI-MT2 cause retinal degeneration in fruit fly models. This study, published in *Visual Neuroscience* in 2012, sheds light on a novel pathway for retinal degeneration in humans. Dr. Colley’s laboratory uses *Drosophila* (fruit fly) as a model for studying hereditary human retinal diseases such as retinitis pigmentosa (RP) and age-related macular degeneration (AMD).

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 Dr. Jamrich’s project is to identify genes and developmental processes that are responsible for development and survival of vertebrate retinal cells, leading to the better understanding of eye diseases. The retinal gene Rx, initially isolated in Dr. Jamrich’s laboratory, plays a critical role in the vertebrate eye development. To test the possibility that Rx acts during retinal development by interacting with other known transcriptional regulators, Dr. Jamrich began to analyze genetic interactions between Rx and other transcription factors. Using a mouse model, he found genetic evidence that Rx does interact with the transcription factor Lhx2. While the mode of action of Lhx2 is not known in detail, it has been shown that this gene is required for the specification and the morphogenesis of the retinal field. There is strong genetic evidence that Rx and Lhx2 interact.

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 retinal diseases and development

Understanding molecular mechanisms of normal retina development is an essential part for better understanding the mechanisms and designing novel treatments of eye diseases. The goal of Dr. Chen’s project is to identify novel genes involved in human retinal disorders and conduct functional analysis of genes involved in retinal development using a model organism such as *Mus musculus* (house mouse). Dr. Chen’s laboratory successfully cloned the LCA3 disease gene. To better understand its normal function in the retina, they examined the expression pattern of Spata7 in the developing and mature mouse retina and found that LCA3 is expressed in multiple layers, most strongly in the inner segment of photoreceptor cells. Results suggest a novel disease mechanism of LCA in which LCA3 functions as part of the protein transporter vesicle, potentially as a cargo receptor, in photoreceptor cells function.
The Paul Kayser Research Project

Samuel Wu, PhD
Cullen Eye Institute
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 focused on molecular, cellular, and genetic mechanisms underlying retinal cell death in glaucoma and age-related macular degeneration (AMD). His lab has designed and constructed new non-invasive devices for early detection of photoreceptor and ganglion cell dysfunction in animals and humans. Dr. Wu’s team has published five papers in top international journals in 2012. These publications report new discoveries on new animal models for retinitis pigmentosa (RP) and Leber congenital amaurosis, as well as physiological and pharmacological properties of healthy and diseased mouse retinal neurons. Currently, his group is studying synaptic mechanisms underlying retinal ganglion cell death in acute and chronic glaucoma models, and developing and constructing new non-invasive devices for early detection/diagnosis of AMD and glaucoma in animals and humans.

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 Dr. Mardon’s project is to improve both the diagnoses and treatments of Leber congenital amaurosis (LCA). Dr. Mardon’s laboratory has identified a new gene associated with LCA3 (named SPATA7), which encodes a highly conserved but novel protein of unknown function and for which no animal models have been established. Dr. Mardon has knocked out the mouse SPATA7 gene by gene targeting, analyzed the phenotype of SPATA7 mutants by histology, immunohistochemistry, electrophysiology, and transmission electron microscopy, and has submitted this work for publication. His laboratory has also shown that the retinal defects observed in SPATA7 mutant mice can largely be rescued by gene therapy, suggesting that the ultimate goal of treating human patients with mutations in SPATA7 is possible.
Adolphe G. and Josephine Roberts Gueymard Research Project

Lih Kuo, Ph.D.
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

The purpose of Dr. Kuo’s project is to understand the pathophysiology of inflammation (CRP) – and diabetes-associated retinal vascular dysfunction. The objective of this application is to focus on the therapeutic potential of ECE-1 and RhoA/ROCK blockade on the restoration of retinal microvascular function during inflammatory insults caused by CRP elevation and ischemia, the common phenotype in association with diabetic retinopathy, acute angle-closure glaucoma, retinal vascular occlusion, and elevated intraocular pressure during vitreous surgery or after vitreoretinal surgery. The retinal arteriolar dysfunction can be produced by acute diabetes in the pig, which they have recently shown to resemble humans in retinal arteriolar physiology and pathophysiology. Preliminary data suggest that the retinal vascular dysfunction induced by diabetes might be related to the activation of ROCK via the endothelin system in the vascular wall.

Emmett A. Humble Research Project

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

Genetic etiology of retinoblastoma

Dr. Strong’s overall goal is to characterize the genetic mechanisms of the non-ocular cancers that occur in hereditary retinoblastoma patients and their relatives. This is a significant health problem as the most frequent cause of death in hereditary retinoblastoma patients is a second non-ocular malignant neoplasm; it is also an important biologic question, as the retinoblastoma “pathway” is considered to be critical to the development of most cancers.

Current research involves identifying genetic factors that affect the non-ocular cancer risk, with focus on differences in the Rb1 mutations, and/or other genes such as those that may modify radiation sensitivity. This work is based on some 30 families with hereditary retinoblastoma and non-ocular cancers who have contributed samples supported by the RRF.
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

Children treated with chemotherapy or radiation therapy for retinoblastoma (Rb) have a significantly increased risk of developing other types of cancer later in life. Sometimes small pieces of tumor break off into the vitreous, forming multiple small tumors called vitreous seeds. There is no good therapy for this condition, so developing alternative treatments is important. Dr. Hurwitz is investigating the feasibility of gene replacement as an innovative treatment for Stargardt Disease and as a prototype for other inherited retinal degenerative diseases. His laboratory has completed the first clinical trial that used suicide gene therapy (a method of forcing the tumor cells to produce a protein that converts a drug to an agent that is toxic to the tumor cells) to treat children with advanced Rb, and the successful results have encouraged him to continue his laboratory initiatives to improve this innovative therapy.

Carl G. Mueller, Jr. Research Project

Benjamin J. Frankfort, MD, PhD
Cullen Eye Institute
Baylor College of Medicine, Houston, TX

Impact of elevated intraocular pressure on retinal function in mice

Dr. Frankfort’s research goal is to understand the earliest visual function changes that occur to retinal ganglion cells (RGCs) in glaucoma. RGCs integrate all of the information from the retina and then transmit it to the brain via their axonal extensions, which make up the optic nerve. There is evidence for subtle visual changes occurring in early glaucoma resulting in a loss of contrast sensitivity. Dr. Frankfort’s lab has developed a technique by which the IOP can be mildly elevated in a mouse with a simple, reproducible, and rapid surgical technique. Once the IOP is elevated, changes in retinal activity may be identified with a combination of electrophysiological and behavioral techniques. These studies indicate that electrical activity of the retina and visual performance are disturbed prior to RGC death and suggest that retinal dysfunction precedes cell loss in mice with experimental glaucoma.
Basic Research Grants

Ramon Font, MD
Cullen Eye Institute
Baylor College of Medicine, Houston, TX

*Immunohistochemistry and molecular biology in ophthalmic pathology*

Dr. Font’s research interest is to study the histologic features, pathogenesis and immunohistochemical profile of ophthalmic lesions involving the eye and ocular adnexa. The purpose of his study is to correlate a selected group of inflammatory conditions that involve the eye and ocular adnexa and are rich in plasma cells with the subclass IgG4. Understanding the biologic immunologic behavior of the involved tissues makes possible an analysis of the role of specific immunomodulators to control the inflammatory process.

Leonard Levin, MD, PhD
Dept. of Ophthalmology and Visual Sciences
McPherson Eye Research Institute
University of Wisconsin, Madison, WI

*Pharmacological protection of endothelial cells for retinal vascular disease*

In some blinding retinal diseases, the initial event is damage to endothelial cells, which line the inside of the blood vessels. Dr. Levin has demonstrated, in collaboration with Dr. Timothy Kern of Case Western Reserve University, that endothelial cell death can be slowed down in a transgenic mouse where endothelial cell death is blocked with an anti-death protein. Dr. Levin has worked on developing novel drugs that block cell death. In the past four years, Dr. Levin’s laboratory has established that their drugs, phosphine-borane complexes, block endothelial cell death in tissue culture induced by radiation and by free radicals. The prevention of cell death from radiation is relevant to the eye because it is not uncommon that eyes undergoing radiation therapy for tumors develop “radiation retinopathy.” Radiation retinopathy can take away vision, and there is currently no effective treatment.

Barbara Klein, MD, MPH
Dept. of Ophthalmology and Visual Sciences
University of Wisconsin, Madison, WI

*Prevalence and incident changes in retinal vascular caliber associated with medication and supplement use*

Completing an exhaustive analysis of use of medication and supplements over 20 years in a population-based study, Dr. Klein’s project has disclosed several significant associations between medications and retinal vessel diameters (RVDs). Retinal vessel diameters are associated with cardiovascular diseases and also with other ocular diseases. For example, wider retinal venules are associated with the severity of diabetic retinopathy, and one study has reported evidence of an association of RVD and age-related macular degeneration (AMD). During this three year study, Dr. Klein’s goal has been to determine whether the use of vasodilating and anti-inflammatory medications should be accounted for when using retinal vessel measurements as biomarkers of systemic and ocular conditions.
Grant Recipients from The Macula Society

The RRF Margaret and Mills Cox Macula Society Research Project

Stephen Tsang, MD, PhD
Edward S. Harkness Eye Institute, Columbia University
New York, NY

Genetic and environmental factors in AMD

Dr. Tsang’s laboratory is tackling the problem of photoreceptor cell degeneration by pursuing investigations in three areas: probing the role of phosphodiesterase (PDE) signaling in retinal degeneration; developing stem cell-based therapies for retinal degeneration; and correlating the genotypes of various human photoreceptor cell degenerations with the phenotypes revealed in fundus autofluorescence (AF) images.

Stephen Jae Kim, MD
Vanderbilt Eye Institute
Nashville, TN

Safety, pharmacokinetics, and efficacy of Celecoxib and Valdecoxib after intraocular administration for macula edema

Dr. Kim is a nationally recognized expert in the medical and surgical management of retinal disease and uveitis, including the use and monitoring of systemic immunosuppression.

Established Research Awards

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

The Award of Merit in Retina Research

Richard F. Spaide, MD
Vitreous-Retina-Macula Consultants
New York, NY

Retinal Pigment Epithelial Cell Loss Assessed by Fundus Autofluorescence in Patients with Neovascular Age-related Macular Degeneration

In being chosen for the Award of Merit, Dr. Spaide gave the Charles L. Schepens Lecture at the 45th Annual Scientific Meeting of The Retina Society in Washington, DC, which was held in October.

Dr. Spaide’s research interests include macular degeneration, biochemical analysis of lipids in Bruch’s membrane, ocular imaging, and intraocular inflammation. He was instrumental in the development of combined photodynamic therapy and intravitreal triamcinolone for age–related macular degeneration (AMD), a very promising therapy that is currently the focus of a randomized trial. He has developed numerous surgical instruments that were named after him. His current research interests include development of autofluorescent photography of the eye using a fundus camera.
Gertrude Pyron Award for Outstanding Achievement in Retina Research

Daniel F. Martin, MD
Chairman, Cole Eye Institute
Cleveland, OH

Two-year Results from the Comparison of AMD Treatment Trials (CATT)

Dr. Martin presented the RRF Pyron Award lecture at the 30th Annual Meeting of the American Society of Retina Specialists (ASRS), which was held in Las Vegas, NV in August.

Dr. Martin has been involved in the design, development, and execution of many clinical trials having served as principal investigator for many studies, including AREDS, SOCA, and numerous AMD and diabetes trials. He has served as the Study Chairman for many national randomized clinical trials, including the trials that led to FDA approval of the ganciclovir implant and valganciclovir. Dr. Martin currently serves as the Study Chair for the Comparison of AMD Treatments Trials (CATT), an NIH sponsored study evaluating the comparative efficacy and safety of Lucentis and Avastin for the treatment of neovascular AMD.

Charles L. Schepens, MD/AAO Award

Alan C. Bird, MD
Moorfields Eye Hospital
London, England

Potential Therapeutic Approaches to AMD

In being selected for the Charles L. Schepens, MD/AAO Award, Dr. Bird 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 November 9.

Dr. Bird is one of the world’s experts on treating retinal vascular disease and degenerative retinal disorders. His research has contributed to important breakthroughs in the understanding of retinal diseases such as retinal dystrophies and age-related macular disease. Investigative techniques have included molecular genetics, cell biology, electrophysiology, psychophysics, specialized imaging and morphology. In addition, Dr. Bird has undertaken studies in Africa on Onchocerciasis (river blindness) that have had a major impact on reducing blindness in the world by stimulating a new standard of treatment for that disease.
**Paul Kayser International Award in Retina Research**

**Robert E. Anderson, MD, PhD**  
Dean McGee Eye Institute  
Oklahoma City, OK

**AD Stargardt’s Disease: Biochemical Basis and Therapeutic Approaches**

The 20th Biennial Meeting of the International Society for Eye Research (ISER), held in Berlin, Germany, in July was the setting for Dr. Anderson’s lecture as recipient of the Kayser International Award.

Dr. Anderson’s laboratory established the essentiality of omega-3 fatty acids, which are major components of fish oils, in the development of the visual system in the retina. Later studies by his lab and others showed their beneficial effects in term and preterm human infant retinal development. As a result of these studies, DHA (the major omega-3 fatty acid in the retina) is now included in many infant formulas. Dr. Anderson’s laboratory showed over 10 years ago that PBN, a free radical spin trapping compound, protects the retina from light-induced retinal degeneration. Recently his team discovered that PBN inhibits a specific enzyme in the retinal pigment epithelium (RPE) that is important in the “visual cycle.” Slowing the visual cycle has been shown to reduce the levels of a toxic product called lipofuscin, which accumulates in the RPE in age-related macular degeneration, Best’s Disease, Stargardt’s Disease, and others.

**Club Jules Gonin Lecturer**

**Professor José-Alain Sahel**  
Institut de la Vision  
Paris, France

**Extending Cone Photoreceptors’ Life in Retinitis Pigmentosa**

Dr. Sahel gave the Gonin Lecture at the XXVIII Meeting of Club Jules Gonin in Reykjavik, Iceland, in June. This award is given every two years to a scientist making a significant contribution to the understanding and treatment of eye diseases.

Prof. Sahel has been instrumental in the development of treatments for hereditary retinal degenerations. While continuing uninterrupted clinical activity in vitreoretinal surgery and oncology, he is now focused on retinal dystrophies and AMD. He has designed innovative clinical trials based on improved retinal imaging (gene therapy) and developed improved visual restoration strategies.
RRF supports a total of five 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.

Funding is provided by gifts from Margaret and Mills Cox, Gertrude D. Pyron, W. H. Helmerich, III, Kathryn and Latimer Murfee, Rebecca Meyer Brown, Dorothy Portier, M. D. “Bill” Matthews Foundation, and gifts given in honor of Emmett A. Humble, RRF Board Chairman for many years.

**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. He believes that for age-dependent diseases to manifest themselves in an age-dependent manner, there must be tight association between the disease-causing mechanisms and cellular changes that occur with aging. Therefore, it is important to understand how aging process is regulated at the molecular level, and how aging process is associated with disease mechanisms. Specifically, Dr. Ikeda’s laboratory aims to identify gene mutations that lead to early onset of aging phenotypes in the mouse retina.

**RRF Chair**

**Nader Sheibani, PhD**

Department of Ophthalmology and Visual Sciences  
University of Wisconsin, Madison, WI

*Regulation of Ocular Vascular Development and Neovascularization*

Ocular vascularization is tightly regulated and exhibits a very restricted pattern, which is normally kept in check by finely tuned regulatory mechanisms. These mechanisms are altered under various pathological conditions such as diabetes, leading to growth of new and abnormal vessels, which can result in loss of vision. Dr. Sheibani’s main area of research is to delineate these regulatory mechanisms and identify how their alterations result in growth of new blood vessels. Dr. Sheibani utilizes various in vivo and in vitro models for his research, which will help to advance our understanding of these mechanisms and their therapeutic targeting.
**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 Retinal Disease with Human Pluripotent Stem Cells*

Dr. Gamm recently published a paper (January, 2013 *Human Molecular Genetics*) describing his laboratory’s ability to generate human retinal cells from a small skin sample taken from a patient with a form of macular degeneration (Best Vitelliform Macular Dystrophy). He did so using induced pluripotent stem cell technology, and used the retinal cells he created to study the disease process and learn why the cells did not function properly. He is now using this information to devise treatments to slow or stop the disease.

**Kathryn and Latimer Murfee Chair**

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

*New Agents for the Treatment of Ocular Tumors and Neovascular Diseases of the Eye*

Based on their studies of non-toxic natural products, the Polans laboratory has developed new small-molecule agents that can be used to prevent or treat ocular tumors as well as other diseases of the eye with a neovascular component. These new agents initiate calcium signals in both activated endothelial cells and cancer cells, thereby reducing their unwanted proliferation. The Polans laboratory is now modifying these agents to improve their bioavailability and safe delivery for testing in animal models of choroidal and retinal neovascularization and models of ocular cancer.

The RRF Chair at Baylor College of Medicine has yet to be named.
Human neurodegenerative diseases such as spinal cord motor neuron degeneration (e.g., Lou Gehrig’s Disease or ALS), Alzheimer’s disease, Parkinson’s disease, and retinal degenerative diseases result in part from increased levels of intracellular oxidative stress. Dr. Ruoho has identified the Sigma-1 receptor as a key common denominator in reducing neuronal oxidative stress. The Sigma-1 receptor stabilizes proteins, reduces formation of destructive forms of oxygen and nitrogen, and regulates the activity of cell surface ion channels. Dr. Ruoho’s goal is to prevent blindness by applying pharmacological and genetic approaches that will enhance the biological activity of the Sigma-1 receptor in the retina. Recently, his laboratory has shown that N, N-Dimethyltryptamine (DMT) is an endogenous activator of the Sigma-1 receptor. The enzyme that produces DMT (Indole N- Methyl Transferase or INMT), is highly expressed in the non-human primate retina.

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). An ongoing challenge in diagnosing and treating AMD and RP is that they are highly complex diseases with multiple subtypes, each with a distinct genetic and biochemical basis. This complexity, along with the limited availability of suitable tissues from RP and AMD patients and the broad base of knowledge of Drosophila genetics, all combine to make Drosophila a powerful animal model for studying inherited retinal degeneration disorders.

Dr. Lakkaraju’s focus is to tease out the cellular mechanisms underlying age-related macular degeneration. Her laboratory studies cells of the retinal pigment epithelium (RPE), which perform critical homeostatic functions that are crucial for the health of the retina and for vision. The RPE is also the site of the initial insult that eventually culminates in vision loss in many retinal diseases, including macular degeneration, although exactly how this occurs is unclear. Work from Dr. Lakkaraju’s laboratory has shown that with age, RPE cells accumulate abnormal amounts of cholesterol, which causes intracellular traffic jams and compromises RPE function. The ultimate goal of her work is to use this mechanistic information to develop new therapies that can clear cholesterol and relieve traffic jams, which could help preserve the health of the retina and RPE and prevent vision loss.
International Fellowships

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

**RRF Helmerich International Fellowships/ICO**

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.

These two, twelve-month fellowships of $25,000 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.

**Pukhraj Rishi, MD,** from Chennai, India, for training in ocular oncology at Wills Eye Institute, Philadelphia, PA, with Drs. Carol and Jerry Shields. After fellowship, Dr. Rishi will return to train residents, fellows and ophthalmic personnel at the Sankara Nethralya Medical Research Foundation in Chennai, where he also conducts research and clinical trials.

**Henry E. Nkumbe, MD,** from Madagascar, for training in retina surgery at Eye Foundation Hospital in Lagos, Nigeria, and the Jules Stein Eye Institute at the University of California, Los Angeles. Following fellowship, Dr. Nkumbe will return to train ophthalmologists and staff at the ICO Magrabi Cameroon Eye Institute in Yaounde, Cameroon. This teaching hospital is the first project of the Africa Eye Foundation.

**Gillingham Fellowships/PAAO**

Established by W. J. Gillingham, 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.

**Daniel Lavinsky, MD, PhD,** from São Paulo, Brazil, for training in retina stem cell at Stanford University, Stanford, CA, with Daniel Palanker, PhD, and Mark Blumenkranz, MD.

**Tammy Hentona Osaki, MD,** from São Paulo, Brazil, for training in oculoplastics at Massachusetts Eye and Ear Infirmary (MEEI), Harvard University, Boston, MA with Aaron Fay, MD.
**Research Initiatives**

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

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**American Academy of Ophthalmology Educational Trust Fund**

Educational programs administered for RRF by the American Academy of Ophthalmology are funded by the endowed gifts from Laura I. Cannon, Burt L. Risley, and the Schlichting family. This program will upgrade clinical research skills in the field of retina. The 2012 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 Ft. Lauderdale, FL.

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In 2012, twenty-four ophthalmology students were selected from these schools:

University of Southern California, Los Angeles, CA
Medical University of South Carolina, Charleston, SC
VitreoRetinal Surgery PA, St Cloud, MN
Penn State University, Hershey Eye Center, Hershey, PA
Jules Stein Eye Institute, Univ. of California, Los Angeles, CA
Schepens Eye Research Institute, Mass. Eye & Ear, Boston, MA
Dean McGee Eye Institute, Oklahoma City, OK
Emory University School of Medicine, Atlanta, GA
Harvard University, Children’s Hospital, Boston, MA
New York Eye & Ear Infirmary, New York, NY
University of Florida, Gainesville, FL
Duke University Medical Center, Durham, NC
Memorial Sloan-Kettering Cancer Center, New York, NY
University of Minnesota, Minneapolis, MN
University of N. Texas HSC, Eye Research Institute, Ft. Worth, TX
University of Louisville, Louisville, KY
University of Rochester, Rochester, NY
Wayne State University, Detroit, MI
Brown University, Providence, RI
Herbert Eye Institute, University of California, Irvine, CA
Vanderbilt University School of Medicine, Nashville, TN
University of Tennessee Health Science Center, Memphis, TN
University of Virginia, Charlottesville, VA
## COMBINED STATEMENT OF FINANCIAL POSITION

RETINA RESEARCH FOUNDATION

COMBINED STATEMENT OF FINANCIAL POSITION

DECEMBER 31, 2012

(With Summarized Information as of December 31, 2011)

### ASSETS

<table>
<thead>
<tr>
<th></th>
<th>General Funds</th>
<th>Endowment Funds</th>
<th>2012 Total</th>
<th>All Funds Only</th>
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<td>$ 1,900,114</td>
<td>$ 3,727,239</td>
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### LIABILITIES AND NET ASSETS

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### COMMITMENTS AND CONTINGENCIES

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The accompanying notes are an integral part of these combined financial statements.
# COMBINED STATEMENT

## NET ASSETS

**RETINA RESEARCH FOUNDATION**

**COMBINED STATEMENT OF ACTIVITIES AND CHANGES IN NET ASSETS**

**FOR THE YEAR ENDED DECEMBER 31, 2012**

(With Summarized Financial Information for the Year Ended December 31, 2011)

The accompanying notes are an integral part of these combined financial statements.

## REVENUES:

<table>
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<tr>
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## EXPENSES:

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<td>1,671,558</td>
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<td>Net Assets, End of Year</td>
<td>$1,820,612</td>
<td>$73,000</td>
<td>$1,893,612</td>
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</table>

The accompanying notes are an integral part of these combined financial statements.
Officers and Boards

Officers

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President

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Secretary

Jacquelyn M. Royce
Assistant Secretary

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Shara Fryer
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Emmett A. Humble ♣
Nancy F. Japhet
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